INHABIT

Indoor HABItability during the Transition to Net Zero Housing Hub

UK Research and Innovation

NIHR National Institute for Health and Care Research

Medical Research Council

Engineering and Physical Sciences Research Council

Natural Environment Research Council

INHABIT Hub Launch Event

14th – 15th July 2025

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

LSE The London School of Economics and Political Science

Agenda – Day 1

10:30-11:00	Registration + tea/coffee/pastries
11:00-11:15	**Welcome and Opening Remarks** Chair: Zongbo Shi • Welcome from University of Birmingham - Bill Bloss • Welcome from Project Directors – Zongbo Shi and Ruth Doherty
11:15-11:45	**Keynote Speakers** Chair: Ruth Doherty Setting the scene: UK / regional landscape of the transition to Net Zero • Sani Dimitroulopoulou, Principal Environmental Public Health Specialist, UK Health Security Agency (UKHSA) • Graham Campbell, Head of Programme, Population and Systems Medicine Board, Medical Research Council (MRC) • Sophia Lentzos, Head of Sustainability, National Institute for Health and Care Research (NIHR) • Alex Gordon, Energy Projects Officer, West Midlands Combined Authority (WMCA)
11:45-1:00	**INHABIT Hub Overview** Chair: Zongbo Shi • Introduction to INHABIT - Zongbo Shi • Five work strands objectives - Strand Leads • Three cross-cutting themes objectives- Theme Leads • Questions + Answers
1:00-2:00	Lunch + networking
2:00-3:30	**Project Partner and Stakeholder Session** Chair: Anna Mavrogianni Lightning talks from project partners/stakeholders
3:30-4:00	Tea, coffee + cake
4:00-5:00	**Priorities and Scoping Discussion** Chair: James Milner Reflections from previous session, break-out groups to discuss key priorities / barriers going forwards, and group feedback
5:00-5:15	**Wrap up** Chair: Ruth Doherty/Zongbo Shi
5:15-7:00	Informal time – INHABIT Hub photo, drinks reception and networking, and time to check in (those staying over)
7:00 onwards	Dinner

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Welcome and Opening Remarks

Prof William (Bill) Bloss

Pro-Vice-Chancellor & Head of College of Life and Environmental Sciences

University of Birmingham

Purpose of the Launch Event

- Launch our INHABIT hub
- Bring together whole INHABIT hub in the same room – to get to know each other.
- Provide an opportunity to introduce the project and enable networking.
- Understand partner needs and priorities

- Start with keynotes, hub overview introducing work stream and cross cutting theme structure, followed by partner-focused sessions
- Tomorrow morning: Collectively work on INHABIT's impact statement

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INHABIT's Journey

Realising the health co-benefits of the transition to net zero

Opportunity status:	Closed
Funders:	UK Research and Innovation, Arts and Humanities Research Council (AHRC), Biotechnology and Biological Sciences Research Council (BBSRC), Economic and Social Research Council (ESRC), Engineering and Physical Sciences Research Council (EPSRC), Medical Research Council (MRC), Natural Environment Research Council (NERC), Science and Technology Facilities Council (STFC)
Co-funders:	National Institute for Health and Care Research (NIHR)
Funding type:	Grant
Total fund:	£30,000,000
Maximum award:	£6,000,000

Timeline

- **12 September 2023 9:00am** — Opening date
- **5 October 2023 3:00pm** — Webinar
- **14 November 2023 4:00pm** — Mandatory expression of interest deadline closing date
- **12 and 13 December 2023** — Workshop event

Realising the health co-benefits of the transition to net zero: invited stage two

Opportunity status:	Closed
Funders:	UK Research and Innovation, Arts and Humanities Research Council (AHRC), Biotechnology and Biological Sciences Research Council (BBSRC), Economic and Social Research Council (ESRC), Engineering and Physical Sciences Research Council (EPSRC), Medical Research Council (MRC), Natural Environment Research Council (NERC), Science and Technology Facilities Council (STFC)
Co-funders:	National Institute for Health and Care Research (NIHR)
Funding type:	Grant
Total fund:	£34,375,000
Maximum award:	£6,875,000
Publication date:	16 January 2024
Opening date:	16 January 2024 9:00am UK time
Closing date:	17 April 2024 4:00pm UK time

Timeline

- **16 January 2024 9:00am** — Invited stage two opening date
- **17 April 2024 4:00pm** — Invited stage two closing date
- **May/June 2024** — Panel meetings
- **June/July 2024** — Interviews
- **within 10 working days of funding decision meeting** — Informed of funding decision
- **by 1 November 2024**

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Building a Green Future – Targeting National Priorities

Realising the health co-benefits of the transition to net zero - networking workshop

12th and 13th December, Bristol

20 Feb 2024

Indoor HABItability during Transition to Net Zero Housing Hub (INHABIT)

Panel interviewees:

Prof Zongbo Shi
Air Quality and Net Zero
University of Birmingham
Hub Director

Prof Anna Mavrogianni
Sustainable and Healthy Built Environment
University College London
Hub Deputy Director

Dr James Milner
Population Health
London School of Hygiene and Tropical Medicine
Hub Deputy Director

Mr Nick Laws
Public Health Specialist
Solihull Metropolitan Borough Council
Hub Project Partner

Equality, Diversity & Inclusion

Hub leadership board:
52% 48%

INHABIT team:
44% female
28% ethnic minorities
56% early to mid-career

13 Feb 2025

14-15 July 2025

24 July 2024

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Indoor HABItability during the Transition to Net Zero Housing Hub

INHABIT hub leadership

Prof Zongbo Shi
INHABIT Director
University of Birmingham

Prof Ruth Doherty
INHABIT Co-Director
University of Edinburgh

Dr Cat Muller
Senior Project Manager
University of Birmingham

Dr. James Milner
Hub Deputy-Director
LSHTM

Prof Anna Mavrogianni
Hub Deputy-Director
UCL

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UK Research and Innovation

NIHR National Institute for Health and Care Research

Medical Research Council

Engineering and Physical Sciences Research Council

Natural Environment Research Council

Keynote Session:

UKHSA, UKRI MRC, NIHR, WMCA

Chair: Ruth Doherty (INHABIT Co-Director, University of Edinburgh)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

LSE The London School of Economics and Political Science

Keynote Speakers

Sani Dimitroulopoulou
Principal Environmental Public Health Specialist, UK Health Security Agency (UKHSA)

Graham Campbell
Head of Programme, Population and Systems Medicine Board, Medical Research Council (MRC)

Sophia Lentzos
Head of Sustainability, National Institute for Health and Care Research (NIHR)

Alex Gordon
Net Zero Neighbourhoods Programme Lead, West Midlands Combined Authority (WMCA)

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UK Health Security Agency

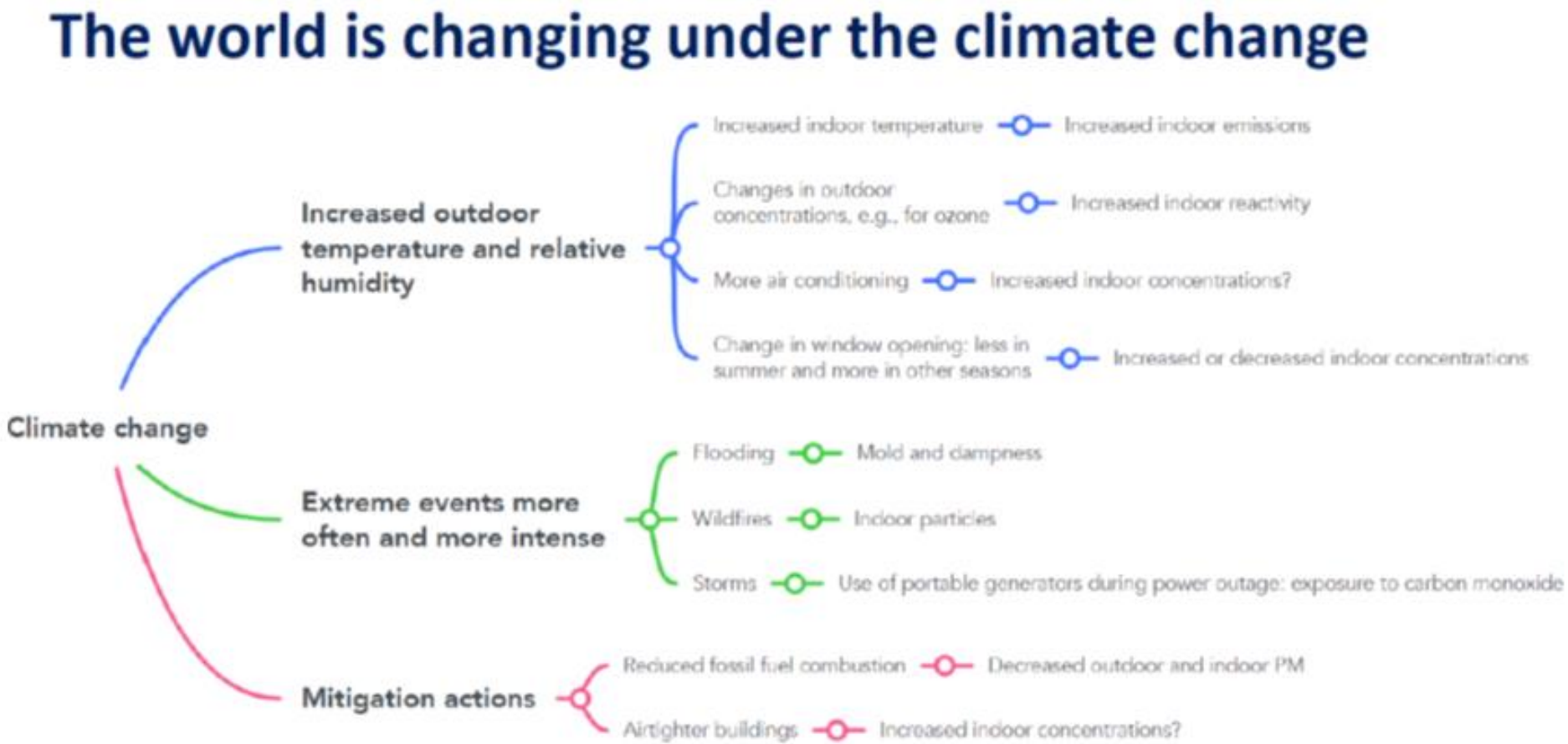
Impact of Climate Change policies on Indoor Air Quality and health

Professor Sani Dimitroulopoulou

Principal Environmental Public Health Scientist - Indoor Environments,
Air Quality and Public Health, Environmental Hazards and Emergencies Dept, UK Health Security Agency

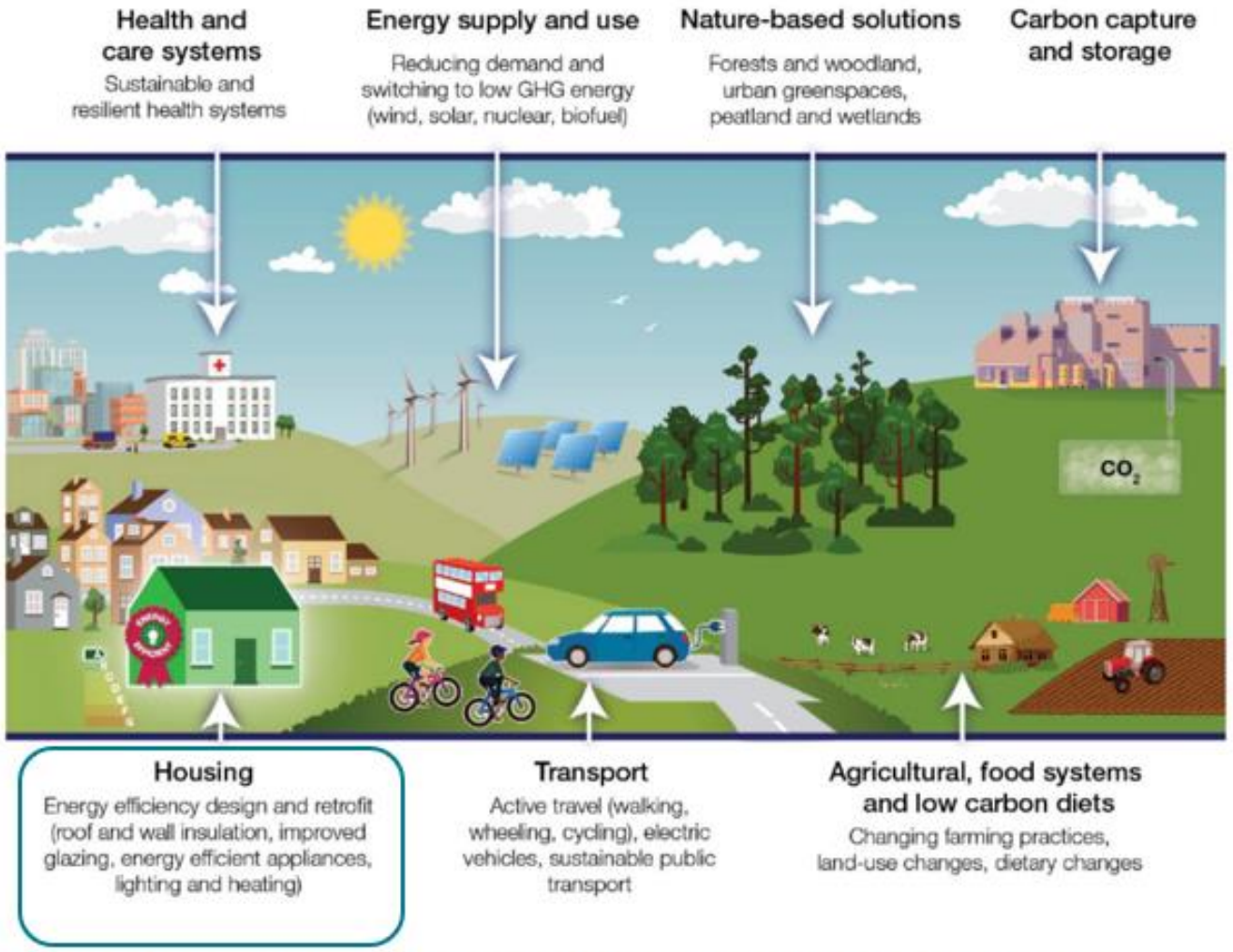
Visiting Professor, IEDE, The Bartlett School, University College London
Chair of UKIEG (UK Indoor Environments Group)
Fellow of ISIAQ Academy (International Society of Indoor Air Quality and Climate)

Climate Change Challenge



Kindly provided by Corinne Mandin (IRSN, France)

Measures to help achieve net zero



HECC 2023 report chapter 14. Net zero: health impacts of policies to reduce greenhouse gas emissions (publishing.service.gov.uk)

- UK housing stock: one of the oldest in Europe
- large-scale home retrofits are required to reduce energy demand and achieve net zero.
- EE measures aim to increase building airtightness:
  - may help alleviate fuel poverty and improve thermal comfort in winter, BUT
  - *without accompanying improvements in ventilation*, indoor environmental quality may be deteriorated, in both new builds and retrofitted

Net zero policies

Challenge:

❑ *Impact of net-zero policies*

- Need to understand how current and emerging building infrastructure design, construction, and materials used may affect IEQ parameters and hence our health and wellbeing.

HECC report 2023. Chapter 5: Impact of climate change policies on indoor environmental quality and health in UK housing (publishing.service.gov.uk)

Elsevier book; to be published

Impact on ventilation

- The provision of adequate ventilation may be disrupted by energy efficiency measures increasing building airtightness:
  - Energy efficient ventilation systems (e.g., MVHR) may not maintain good IAQ, if they are not well specified, designed, installed, commissioned, understood, operated and maintained properly, even in high performance buildings such as Passivhaus

- Ensuring continued operation of ventilation = important as provision
  - Improvements in energy efficiency through airtightness are often ineffective, due to lack of occupants' awareness of how to operate the ventilation systems or due to noise issues

- Use of air conditioning also discourages ventilation (closing windows to keep cool in), but many AC systems only provide cooling and not ventilation
  - air quality benefits by coupling mechanical ventilation systems with AC or air purification systems
  - when air conditioning is used improperly, mould spore formation may occur (de-humidification can be impaired and rendered ineffective)

Impact on indoor air quality - Inorganic, PM, chemicals

- European homes with energy efficient retrofits, **combined with mechanical ventilation**, have:
  - lower indoor concentrations of radon, VOCs (formaldehyde, toluene, butane), CO, CO2, mould, bacteria and dust mites compared to naturally ventilated homes.
  - NO2 and VOCs results other than formaldehyde are mixed, likely due to the presence of both indoor and outdoor sources

- If **whole-house mechanical ventilation is not implemented**, it may lead to:
  - reduced ventilation rates
  - increased levels of benzene, toluene, ethyl benzene, and xylene (BTEX) indoors,

  because of insulation materials (foam sealants and caulks)

Building Energy Efficiency

- If provision of mechanical ventilation is not possible, addition of passive ventilation systems (e.g. bathroom or kitchen fans, window trickle vents) significantly reduced indoor PM2.5, radon and mould, but slightly increased indoor concentrations of outdoor-generated PM2.5

- Increase in indoor hygrothermal conditions, due to improvements in thermal performance, reduced heating costs and personal preferences, also directly affect the indoor chemistry and off-gassing of pollutants from building materials or furnishings, increasing their concentrations. **The use of low-emission materials is recommended**

Impact on indoor air quality – Biological contamination

- Biological contaminants in indoor environments: bacteria, fungi, viruses, pollen, insects, mites and pet dander.
  - pollen may penetrate from outdoor air,
  - humans can spread biological pathogens (e.g. viruses and bacteria),
  - biological pollutants (HDM) can colonise indoor settings.

- Mould and damp can occur in
  - old buildings due to poor insulation,
  - energy efficient buildings, due to inadequate ventilation, or design and construction problems leading to thermal bridges.

- 'Green buildings' and properly executed energy retrofits should not increase moisture or bio-contamination

Conclusions

- There is a growing body of evidence suggesting that both private and public energy efficient buildings have the potential to maintain good IAQ, if implemented with correctly commissioned, installed and maintained ventilation systems.
- Building codes and performance standards should evolve to promote energy efficiency measures that are resilient to future climates, while still protecting IAQ and therefore public health.
- Possible interactions with other aspects of IEQ, such as thermal comfort and noise should also be considered.

Government + Industry + Academia: We produce our best when we ALL work together

Thank you

Sani.Dimitroulopoulou@ukhsa.gov.uk

Sophia Lentzos

Head of Sustainability

NIHR | National Institute for Health and Care Research

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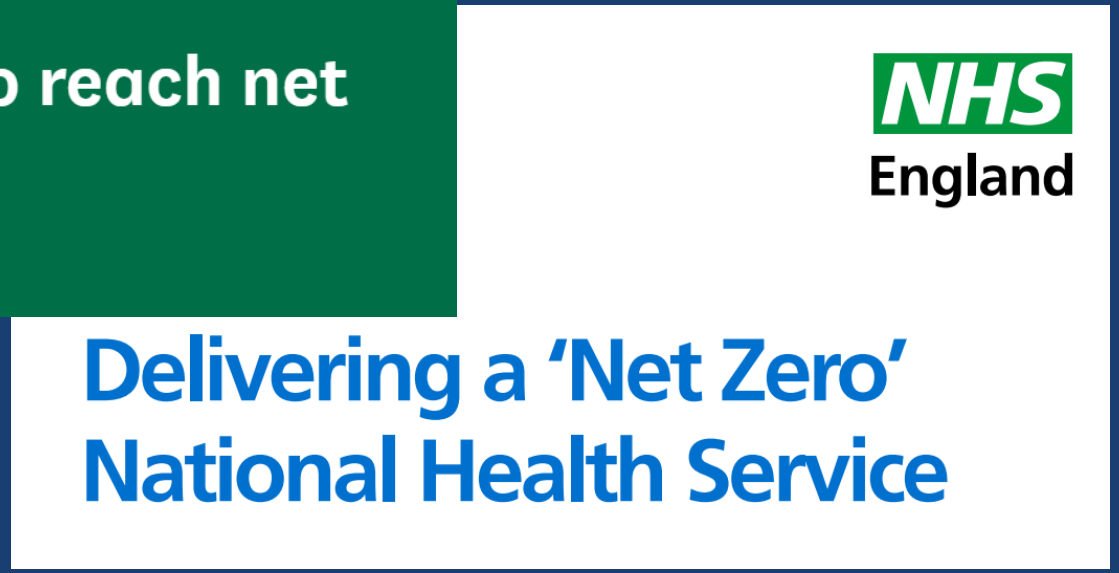
Climate, Health, and Sustainability NIHR

INHABIT Hub Launch

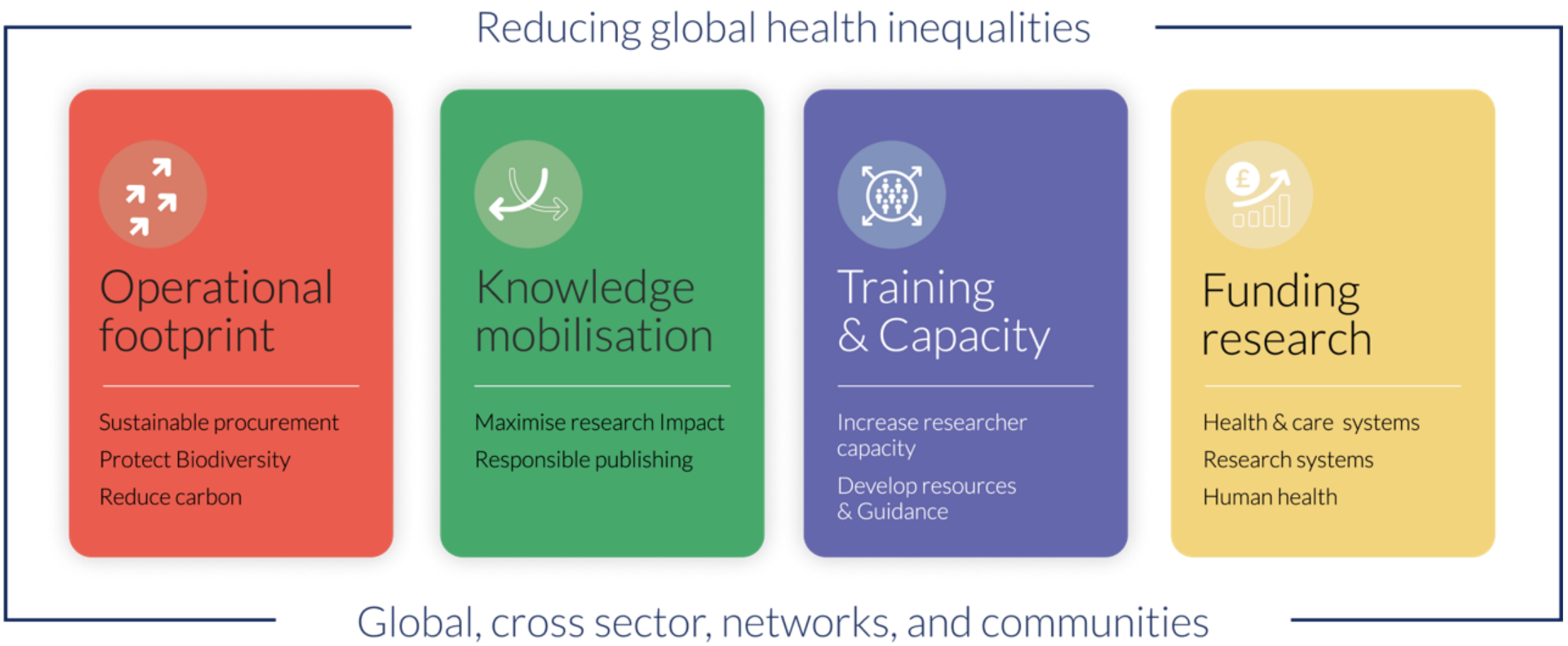
Dr Sophia Lentzos
NIHR Head of Climate, Health and Sustainability
Sophia.lentzos@nihr.ac.uk

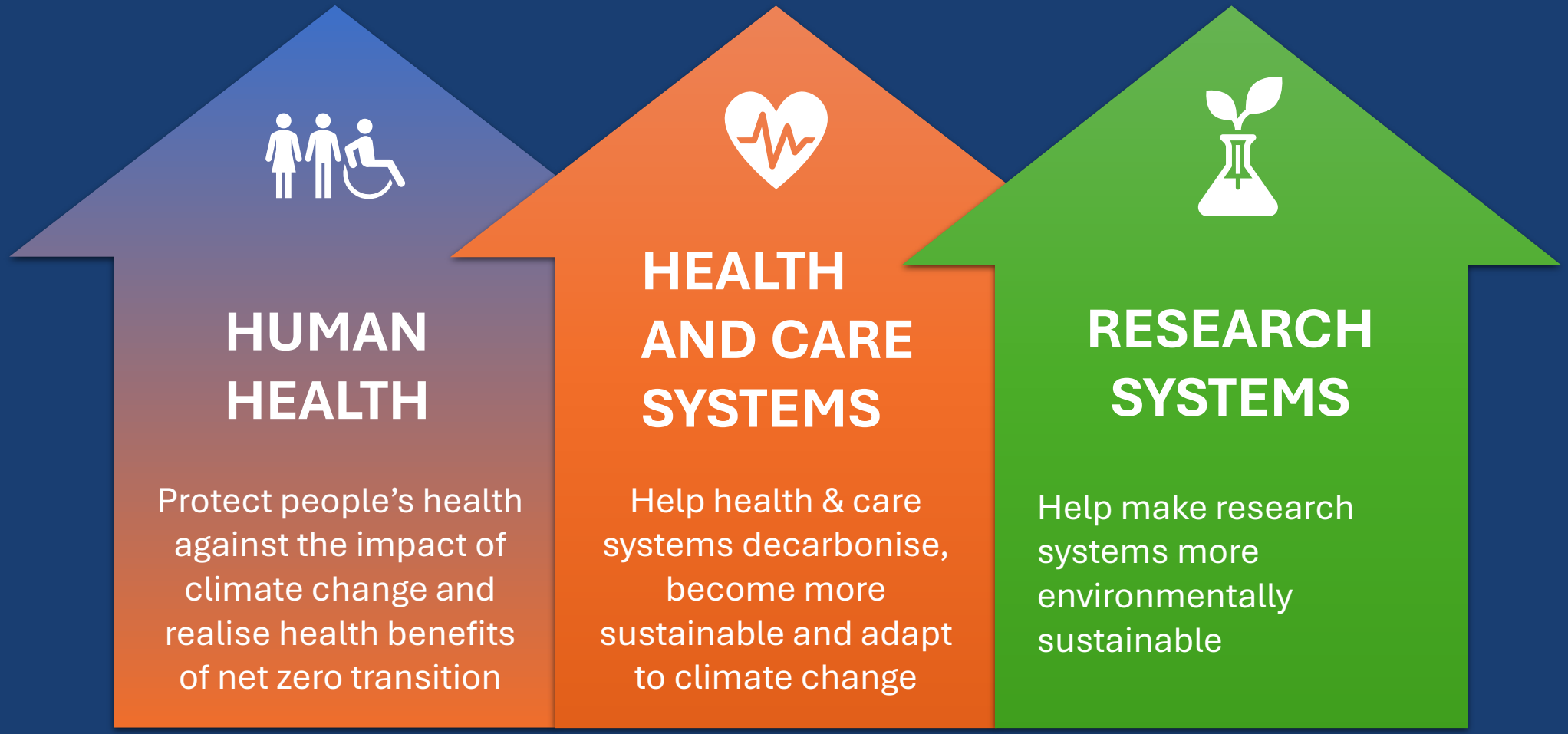
The UK Net Zero Landscape



- Evidence gaps exist across sectors on both how to achieve net zero and how to adapt to a changing climate

Our approach at NIHR





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Looking to the future

- **NIHR is actively looking to increase funding across all these areas**
- Hope is that outputs from current funding will begin to inform policy and practice
- Continue to identify and address research gaps across the system
- Continue to approach climate and health research through a transdisciplinary approach across sectors
- Ensuring health is at the heart of the UK transition to Net Zero

Graham Campbell

Head of Programme,
Population and Systems
Medicine Board

UKRI Medical Research Council

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Medical Research Council

Realising the health co-benefits of the transition to net zero

Graham Campbell
Head of Programme, Population and Systems Medicine Board

Building a green future

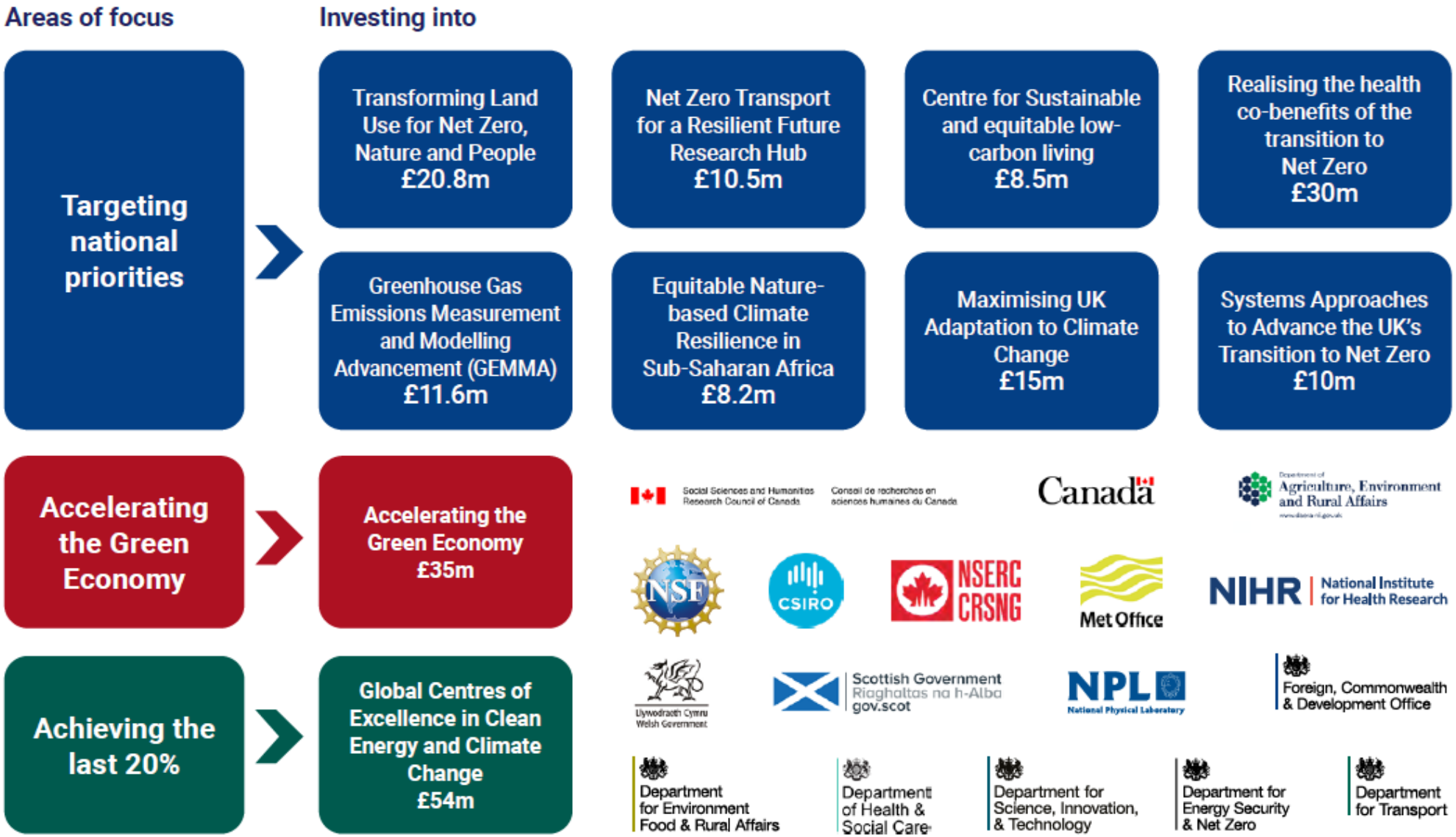
To accelerate the green economy by supporting research and innovation that delivers on national priorities and unlocks solutions essential to achieving net zero in the UK by 2050

- Helping to improve the health of our environment, transform behaviours and policy to deliver net zero and secure prosperity across the whole of the UK

- Our whole systems solutions will support growth of business, jobs, skills and sustainable, resilient public services and infrastructure, addressing environmental and net zero challenges in all sectors of the economy

UKRI Medical Research Council

Investment portfolio



Realising the health co-benefits of the transition to net zero

Transport and built environment

- Healthy Low-Carbon Transport Hub (HLTH) – William Powrie, University of Southampton

Indoor environments in a net zero world

- Child and adolescent Health Impacts of Learning Indoor environments under net zero: The CHILI Hub – Pia Hardelid, University College London

- Indoor HABItability during the Transition to Net Zero Housing Hub:INHABIT – Zongbo Shi, University of Birmingham

Sustainable healthy diets

- THRIVING food futures (Transdisciplinary Health Research to Identify Viable Interventions for Netzero Goals: food futures) – Peter Scarborough, University of Oxford

Extreme weather

- HEARTH: National Hub on Net Zero, Health and Extreme Heat – Rajat Gupta, Oxford Brookes University

Decarbonising health and social care pathways

- The UK Hub for One Health Systems: Creating Sustainable Health and Social Care Pathways – Ed Wilson, University of Exeter

- A transdisciplinary hub to decarbonise commissioning and delivery of healthcare – Mahmood Bhutta, University of Sussex

UKRI Medical Research Council

Securing better health, ageing and wellbeing

Improve population health, tackle the health inequalities affecting people and communities, and advance interventions that keep us healthier for longer.

Our goal is to achieve a holistic, 360-degree perspective of the biological, social, cultural and environmental influences on the physical and mental health and wellbeing across the lifespan, to:

- strengthen prevention and interventions
- reduce health inequalities
- improve human health

- Investments:
    - Centre for Net Positive Health and Climate Solutions (University of Exeter) ~£7.5m

    - Population and Health Improvement UK (PHI-UK) ~£35m
        - Healthy urban spaces (Bradford Institute for Health Research)
        - Enhancing policy modelling (University of Glasgow)

UKRI Medical Research Council

MRC applicant-led research

We aim to strengthen integration of research and data across environmental, health and biomedical domains to better understand health impacts of environmental change and develop interventions to promote human health.

Infections and Immunity Board

Understand how pathogens spread through the environment creating major public health threats

Neurosciences and Mental Health Board

Prevent mental illness by drawing together biological, social and environmental factors and identifying opportunities for action in early life

Population and Systems Medicine Board

Population health and the impact of environmental or extrinsic factors on health across the life course

Molecular and Cellular Medicine Board

Understanding causal pathways and mechanisms (cellular) through which environmental threats cause adverse health outcomes

Speak to us!

UKRI Medical Research Council

Alex Gordon

Net Zero Neighbourhoods
Programme Lead

West Midlands
Combined Authority

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West Midlands Combined Authority

Net Zero in the West Midlands

Alex Gordon

Net Zero Neighbourhoods

Programme Lead

Housing

Decarbonise (or make Net Zero ready)
1.2m homes by 2041

18 years – 63,000 homes per year

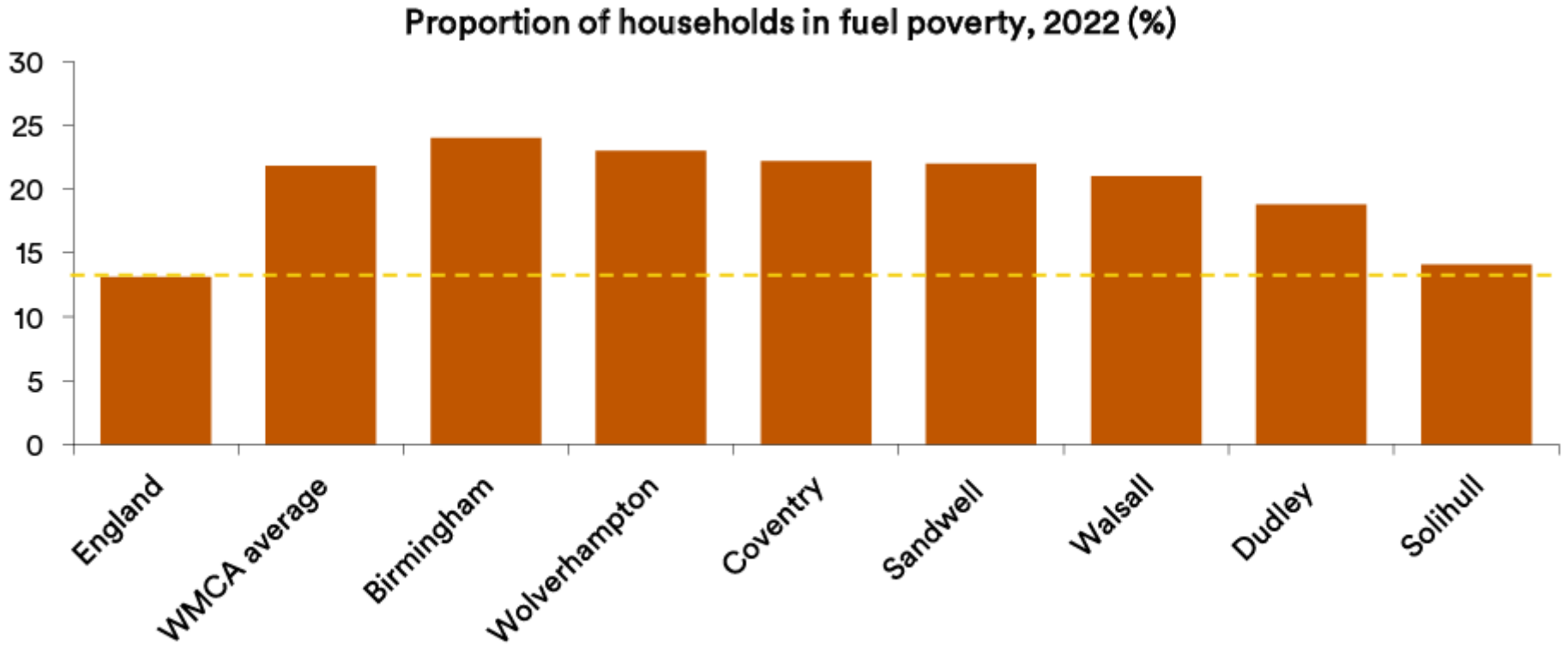
50 working weeks per year – 1,263 homes per week

40 hours per working week – 32 homes per hour

1 home every 2 minutes

Can we develop a **replicable funding and delivery model** for creating **low carbon energy communities** on a **street-by-street or neighbourhood-by-neighbourhood** basis.

Housing

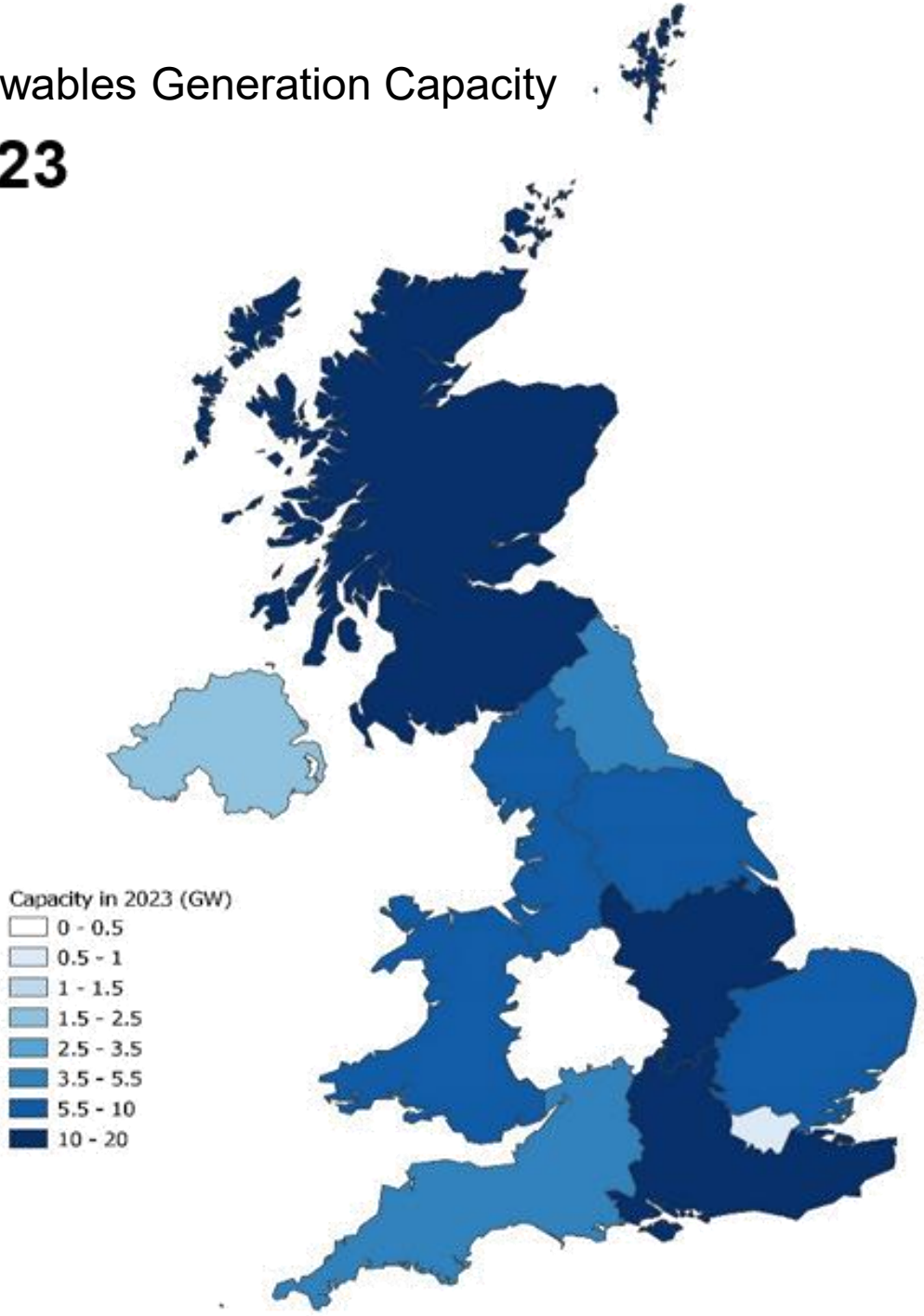


Data from DESNZ: Sub-regional fuel poverty data 2024 (2022 data) (Open Government Licence).

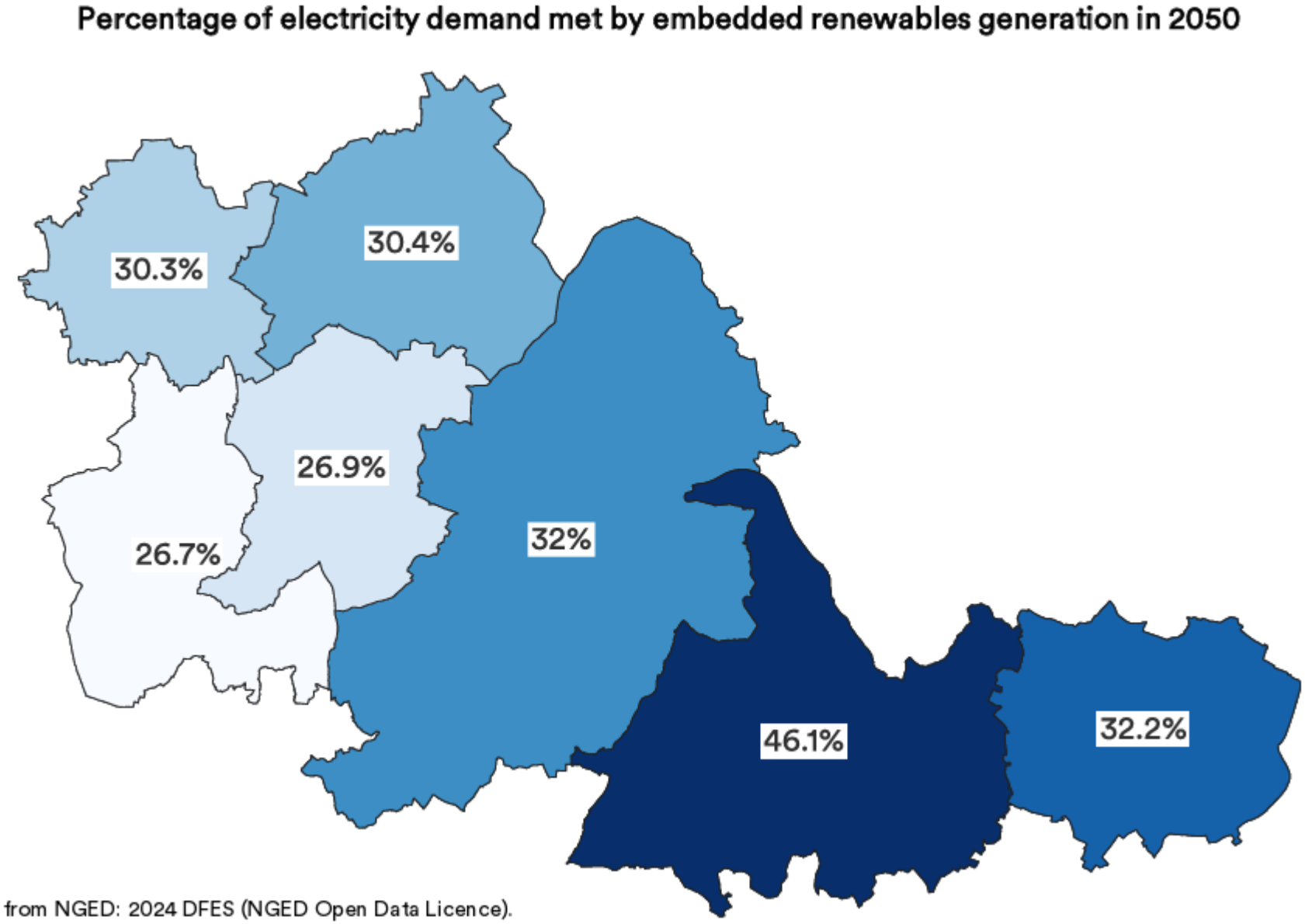
Generation

Renewables Generation Capacity

2023



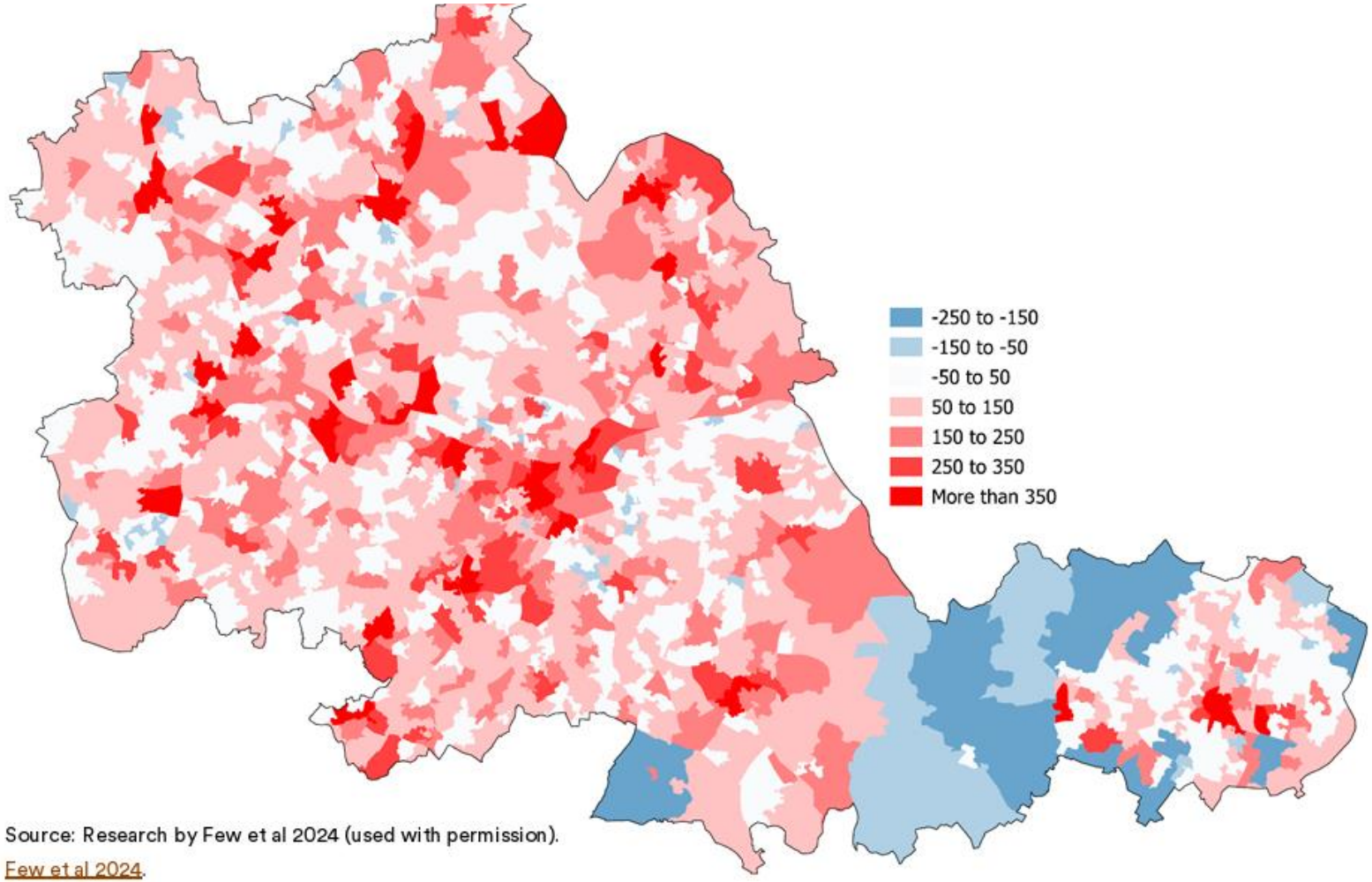
Generation


Percentage of electricity demand met by embedded renewables generation in 2050
30.3%
30.4%
26.9%
26.7%
32%
46.1%
32.2%
Data from NGED: 2024 DFES (NGED Open Data Licence).

Distribution

Extent of local network upgrade required to reach net zero

Estimated excess local upgrade cost in 2050 (£k per LSOA)

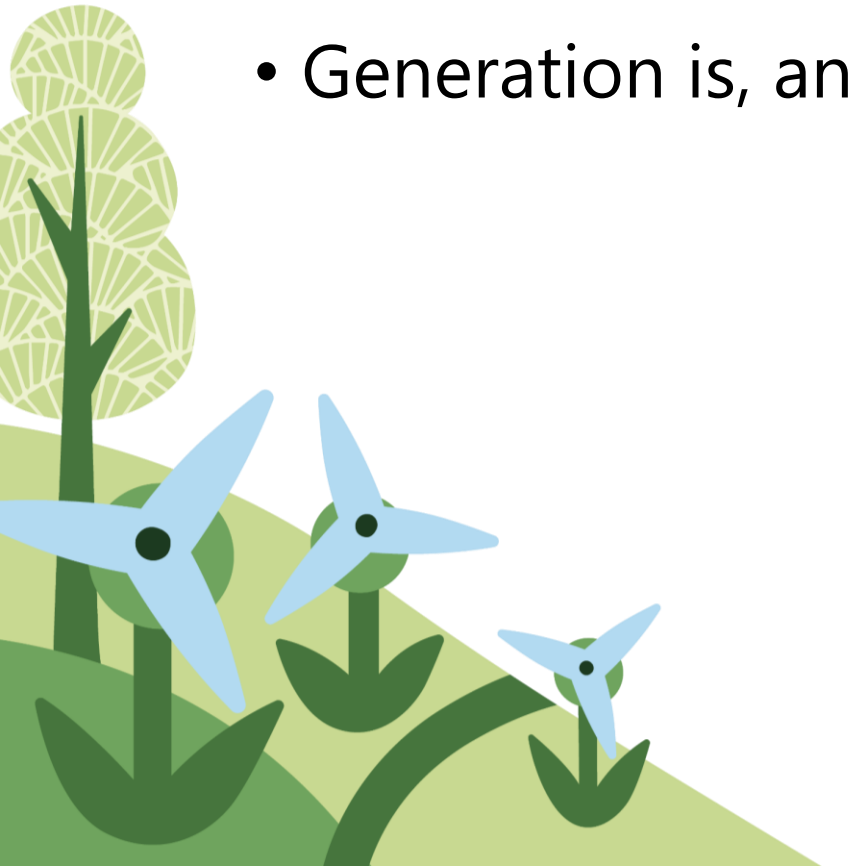


Source: Research by Few et al 2024 (used with permission).

Few et al 2024.

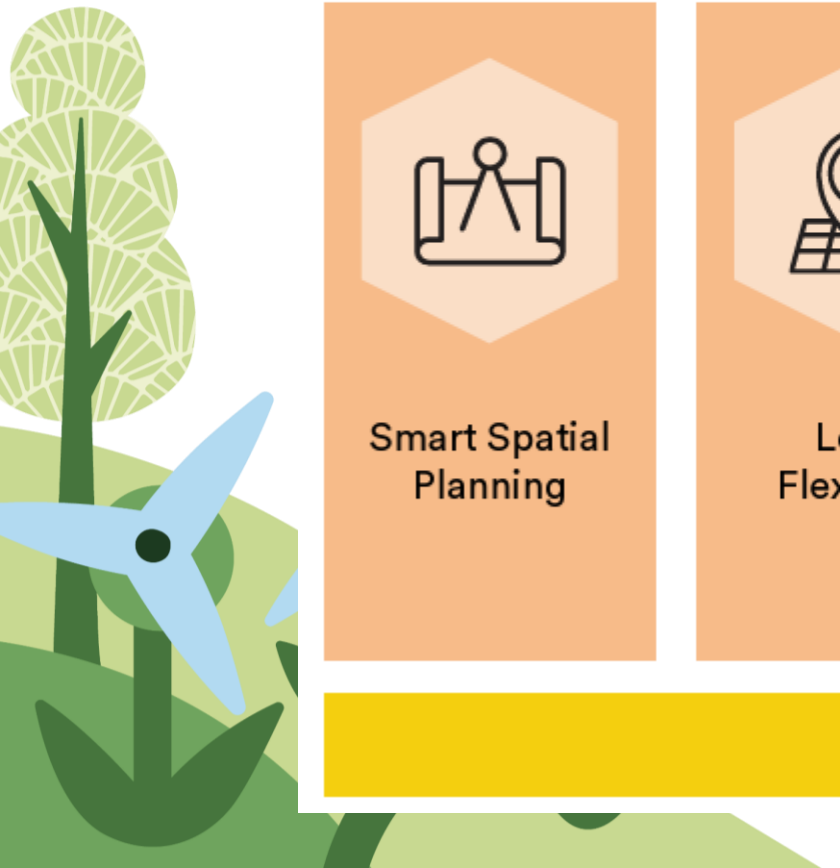
Summary

- We can’t pay our way to Net Zero
- Generation is, and will continue to be, challenging



What can we do?

Vision: By 2041, the West Midlands will have trailblazed the route to a smarter UK energy system, creating prosperity for the region and enabling a fairer net zero transition for our communities.



Smart Spatial Planning

Local Flexibility

Co-located Clean Generation

Skilled Workforce and Supply Chain

Commercial and Financial Innovation

Policy Foundation

The Regional Energy Strategy

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INHABIT Hub Overview

Zongbo Shi (University of Birmingham)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

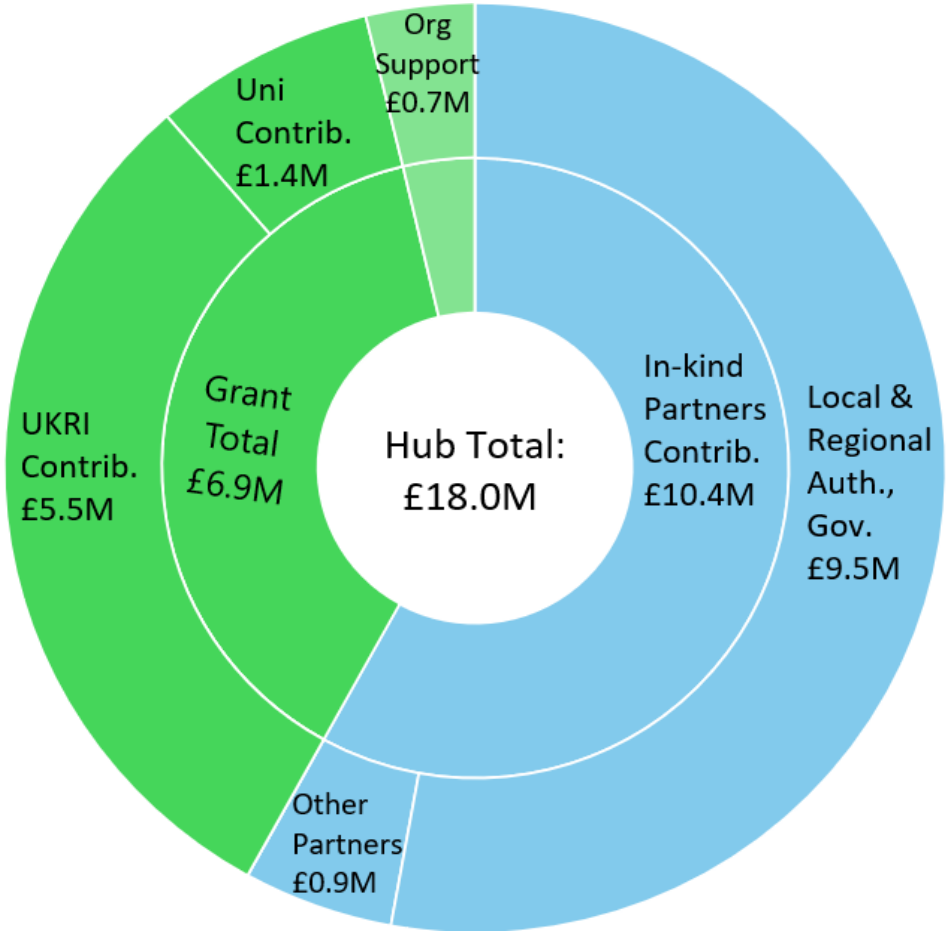
King's College London

Cranfield University

LSE The London School of Economics and Political Science

INHABIT overview

- Official start: 13 February 2025
- Five-year initiative
- 11 funded partners
- £7.3 M Grant total
- 2 PhD studentships
- £10.4 M In-kind contribution
- Total ~ £18 Million



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Transdisciplinary Team with Geographical Representation

Health and Social Sciences, Built and Natural Environment

42 Diverse Partners

10 Universities

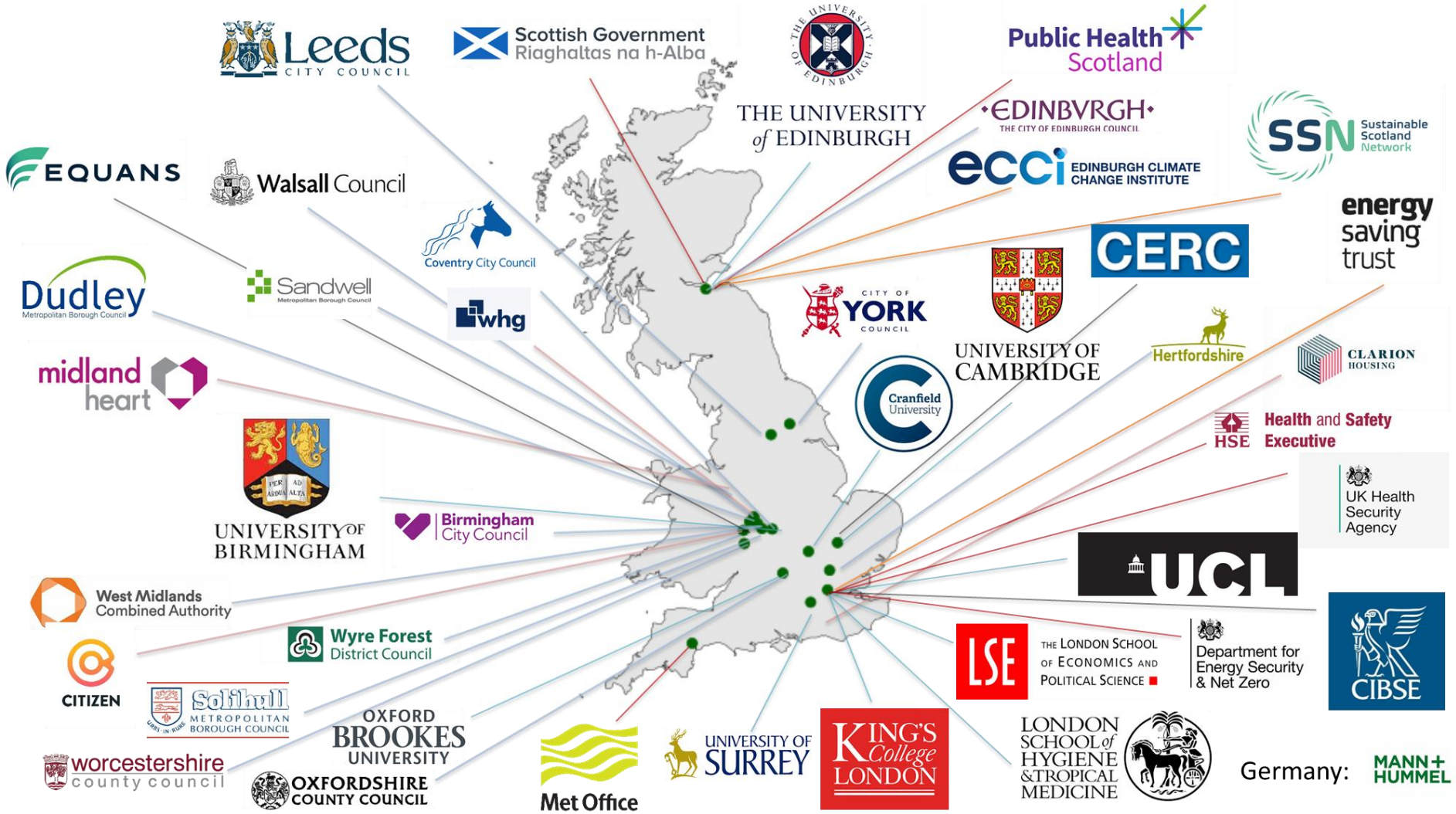
14 Local authorities

6 Government-related

4 Housing associations

4 Industrial partners

4 NGOs



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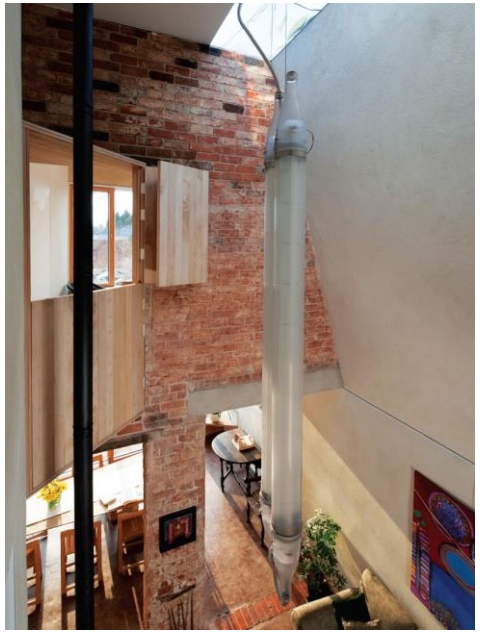
Net Zero Housing: Challenges

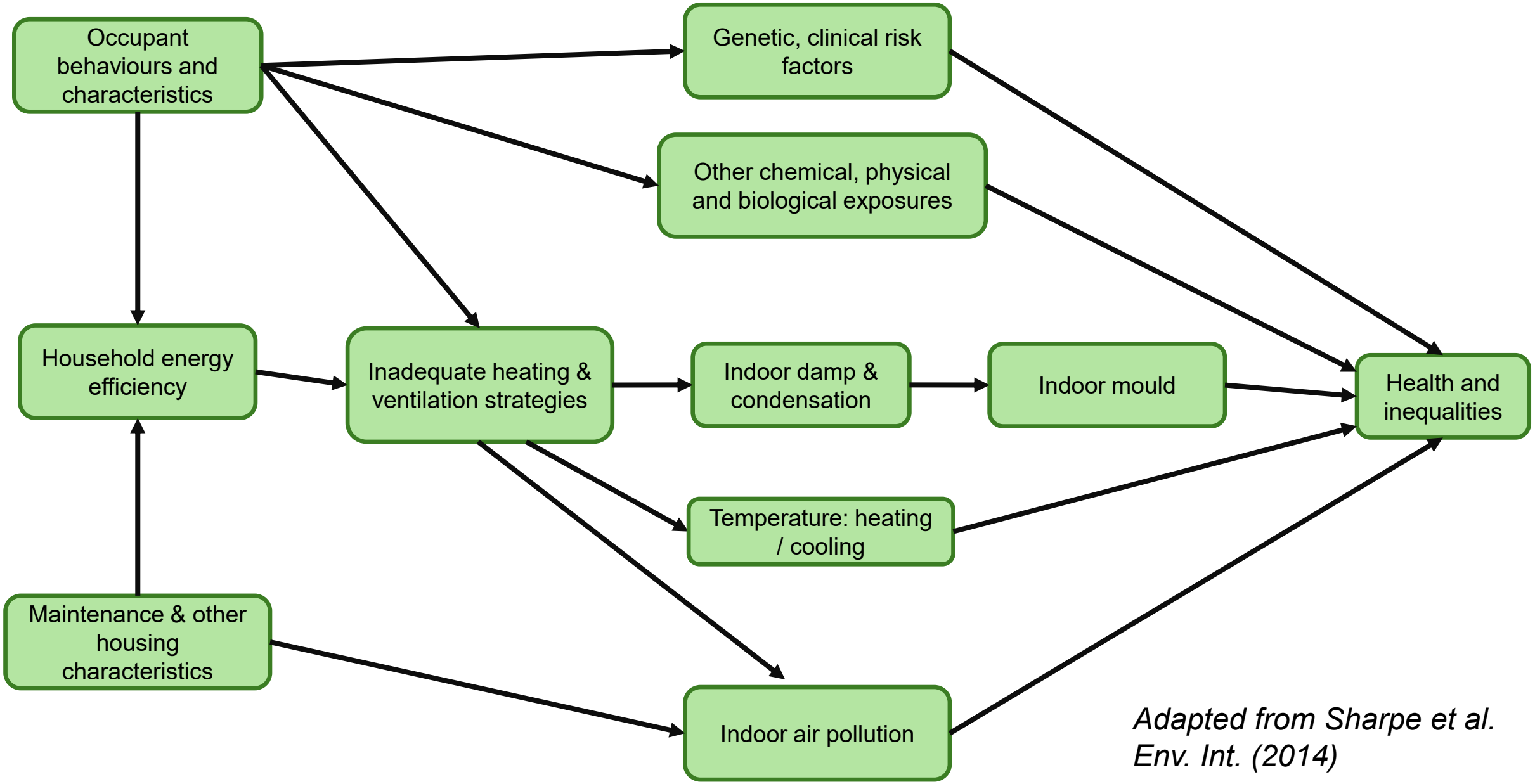
Energy retrofit



UK Government target: **NZ GHG emissions** by 2050

- Housing sector – 25% GHG emissions
- UK homes are not fit for future
- 80% of the existing 29 million homes will be around in 2050. Half of these were built before 1960, and a sixth before 1919.
- **Large-scale energy retrofits needed**

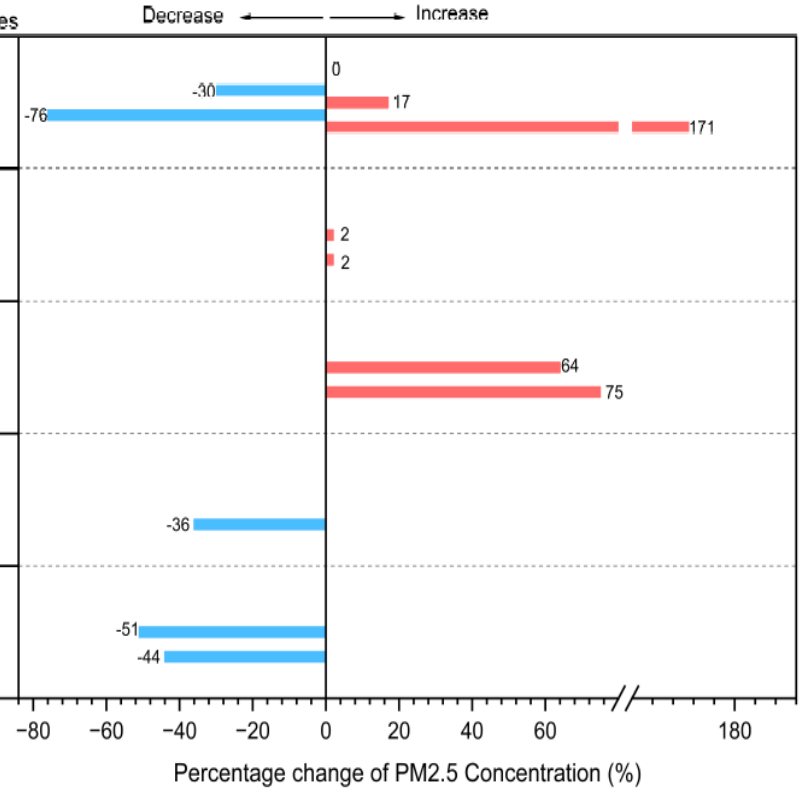
Net Zero Housing: systems impacts



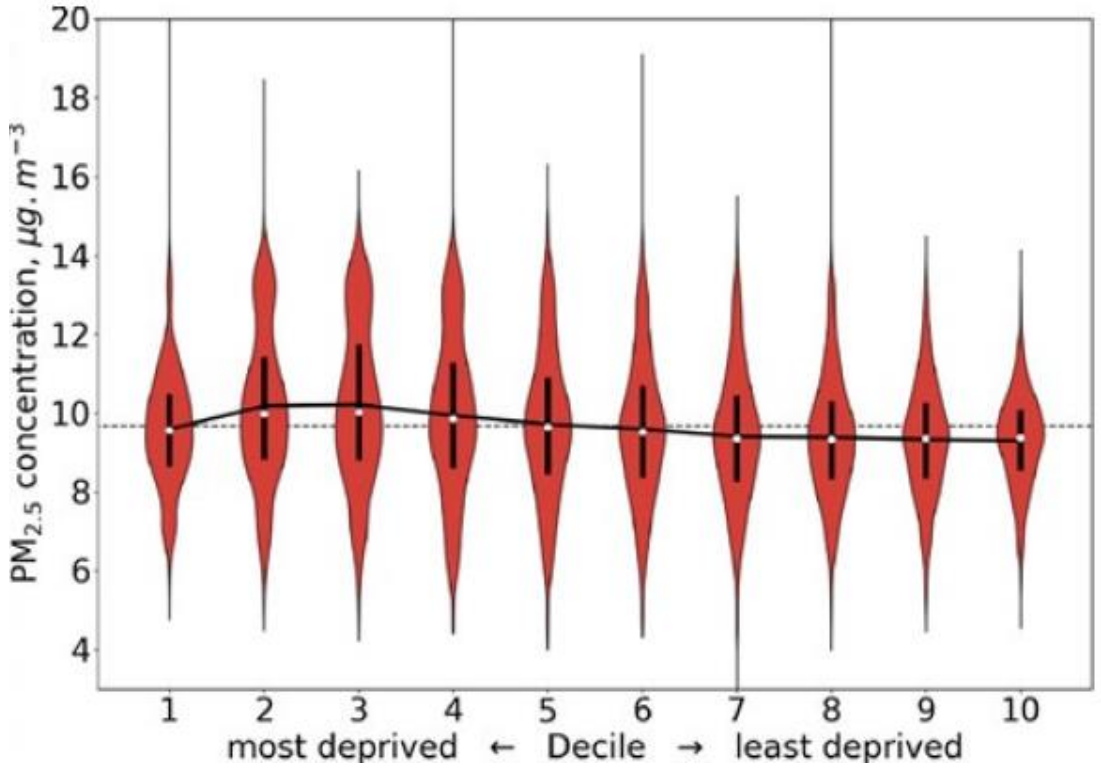
Adapted from Sharpe et al. Env. Int. (2014)

Retrofit: impacts on indoor environment, health and inequalities

Reference	N	Location	Duration	Control Homes
Gupta[24]	5	Oxford, UK	1 week pre and post retrofit	0
Haverinen-Shaughnessy et al.[25]	15 39	Lithuania Finland	24 hours pre and post retrofit	5 7
Broderick et al.[26]	8 7	Ireland	24 hours pre and post retrofit	0
Frey et al.[27]	72	Phoenix, US	1 hour pre and post retrofit	0
Noris et al.[28]	6 5	Richmond, US Fresno, US	2 weeks pre and post retrofit	0



Qian et al., 2025. In preparation



COMEAP, 2010; RCP, 2025

Health in the centre of climate mitigation

Our vision

To accelerate the creation of healthy, net zero homes where *everyone* enjoys clean air and comfort indoors

Overall aim

To produce scientific evidence and policy-relevant solutions to realise the ***health co-benefits*** of the net zero transition in housing

"*Our homes provide the living environment that dictates our future health.*" **- Sir Michael Marmot**

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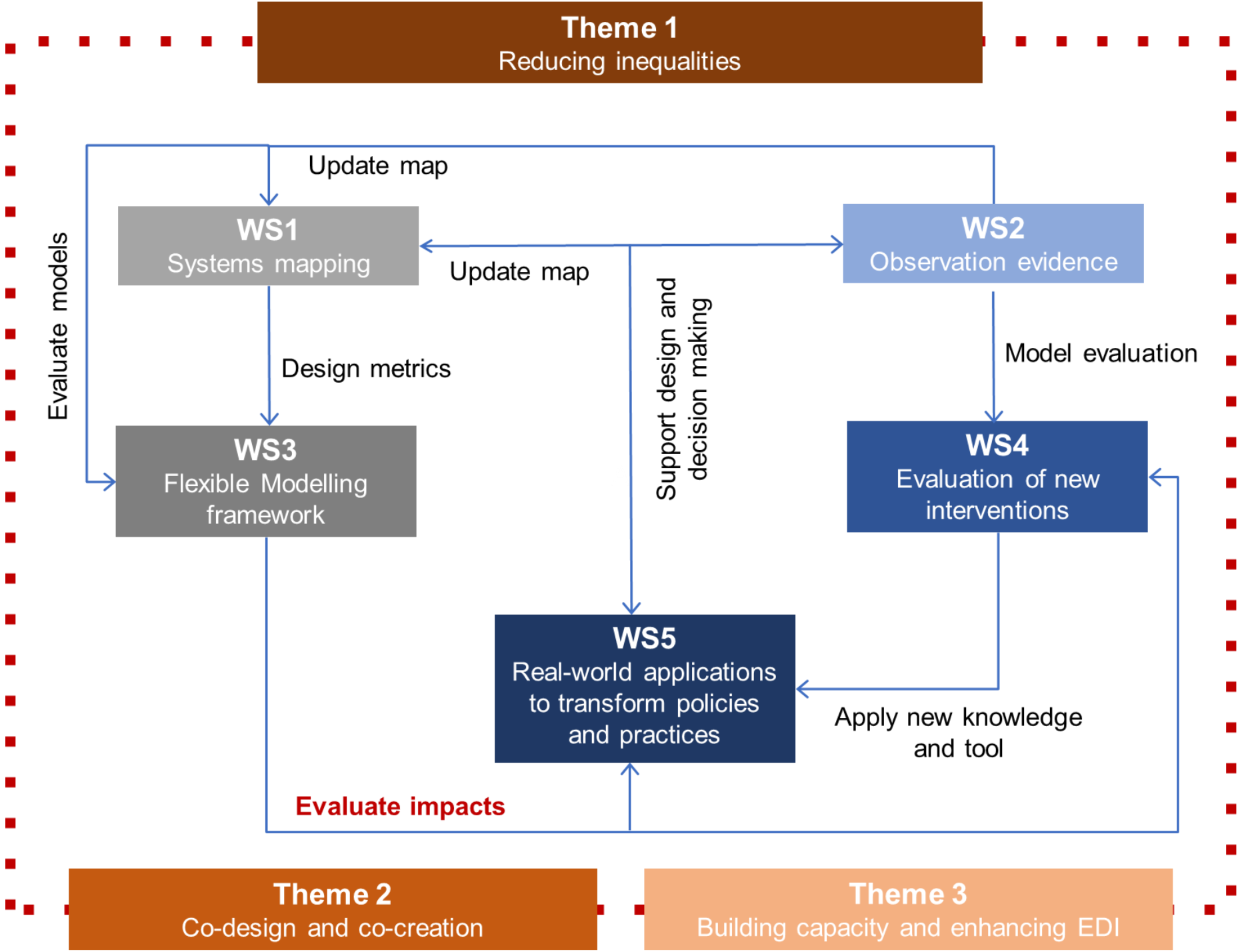

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Research: observations and modelling (quantitative)

WS2: Real-world measurements:

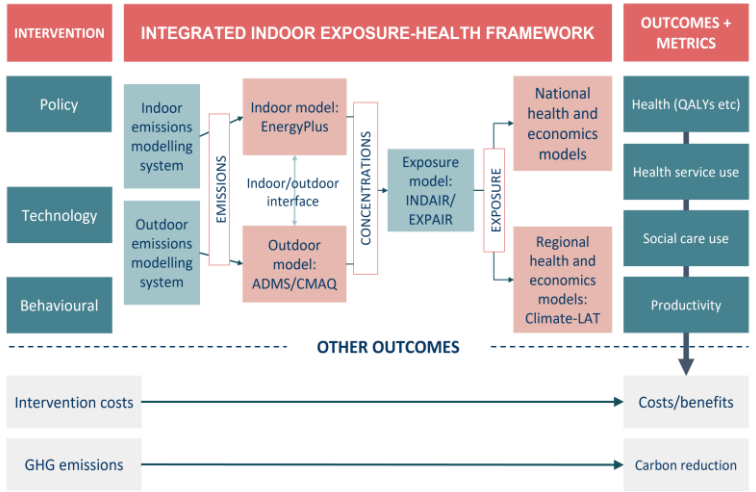
- 200+ control and retrofit homes; N-RCT
- Indoor air pollutants, T&RH, bioaerosols, Damp and mould, EPC
- Surveys e.g. Short Warwick-Edinburgh Mental Well-being Scale

WS3: Exposure-Health modelling

- Framework development

WS4: Evaluating interventions

- Structural and Behavioural interventions
- Decision support tool



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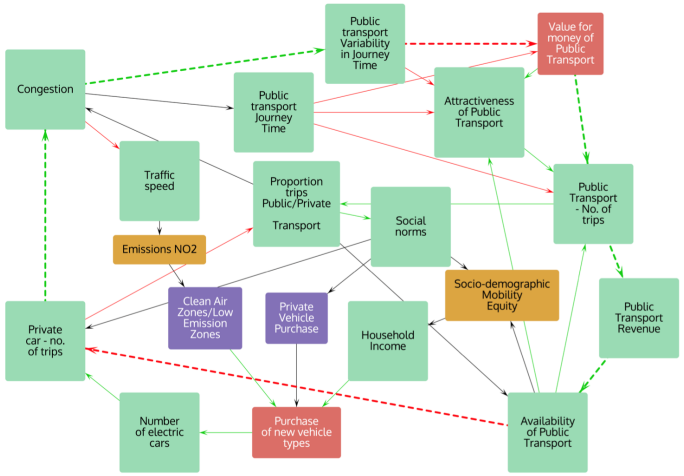
Research: co-create solutions

WS1: Systems understanding

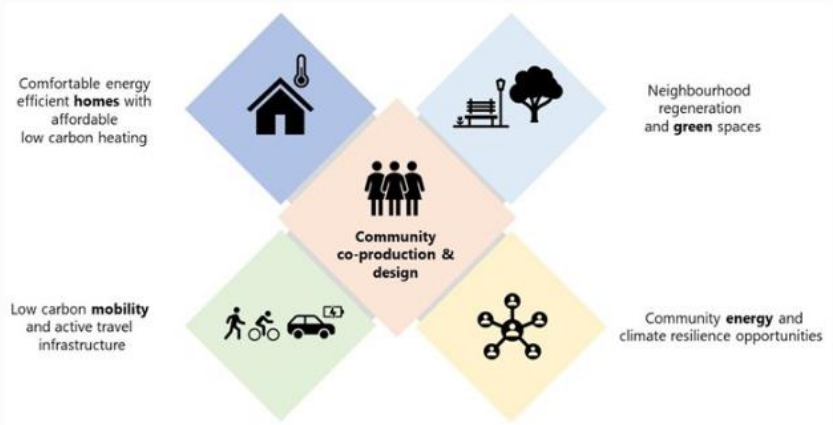


WS5: Real-world applications with our partners

CC1: Embed Health & inequalities

What are Net Zero Neighbourhoods?

The West Midlands Net Zero Neighbourhoods focus on a holistic approach to neighbourhood-scale transitions. Our key pillars are retrofit, low carbon travel, green space interventions and local, low carbon electricity generation. At the centre of these pillars is a deep focus on co-production, empowering citizens through co-design to create a vision for their very own Net Zero Neighbourhood.



Outcomes and Impacts

CC2: Co-design and co-production

CC3: Build Capacity

Real-world solutions

Skills and capability

Transdisciplinary legacy

Improved health and equity

Partnerships

- **Collaborate** on real-world measurements
- **Contribute** to Systems mapping workshops
- **Collaborate** on behaviour change assessment
- **Collaborate on** real-world exemplar NZN or retrofitting programmes
- **Co-create** further impact case studies
- Impact Fund

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Indoor HABItability during the Transition to Net Zero Housing Hub

INHABIT - integrating transdisciplinary researchers and stakeholders to realise the health benefits of the transition to Net Zero.

Examining the impact of net-zero housing interventions on health and inequalities especially for vulnerable groups. Utilising systems thinking, real-world monitoring, integrated modelling, and showcasing Net Zero projects to inform policy development and implementation, enhancing the physical and mental health of the population.

Email: inhabit@contacts.bham.ac.uk
Website: inhabithub.org.uk
LinkedIn: linkedin.com/company/inhabit-hub/

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Work Strand 1: A systems overview

Leads: Nigel Gilbert (Uni Surrey), Sophie Morris (Sandwell BC)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

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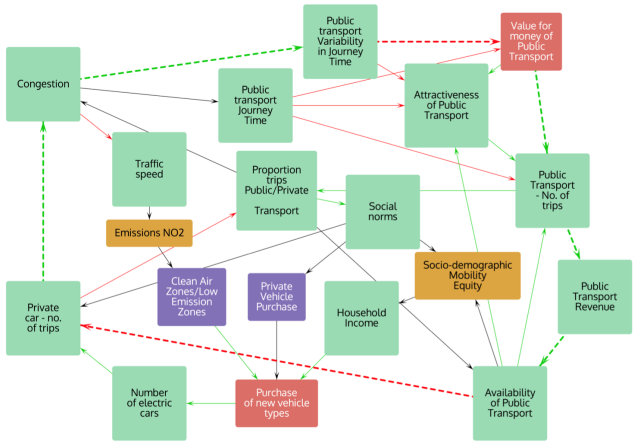
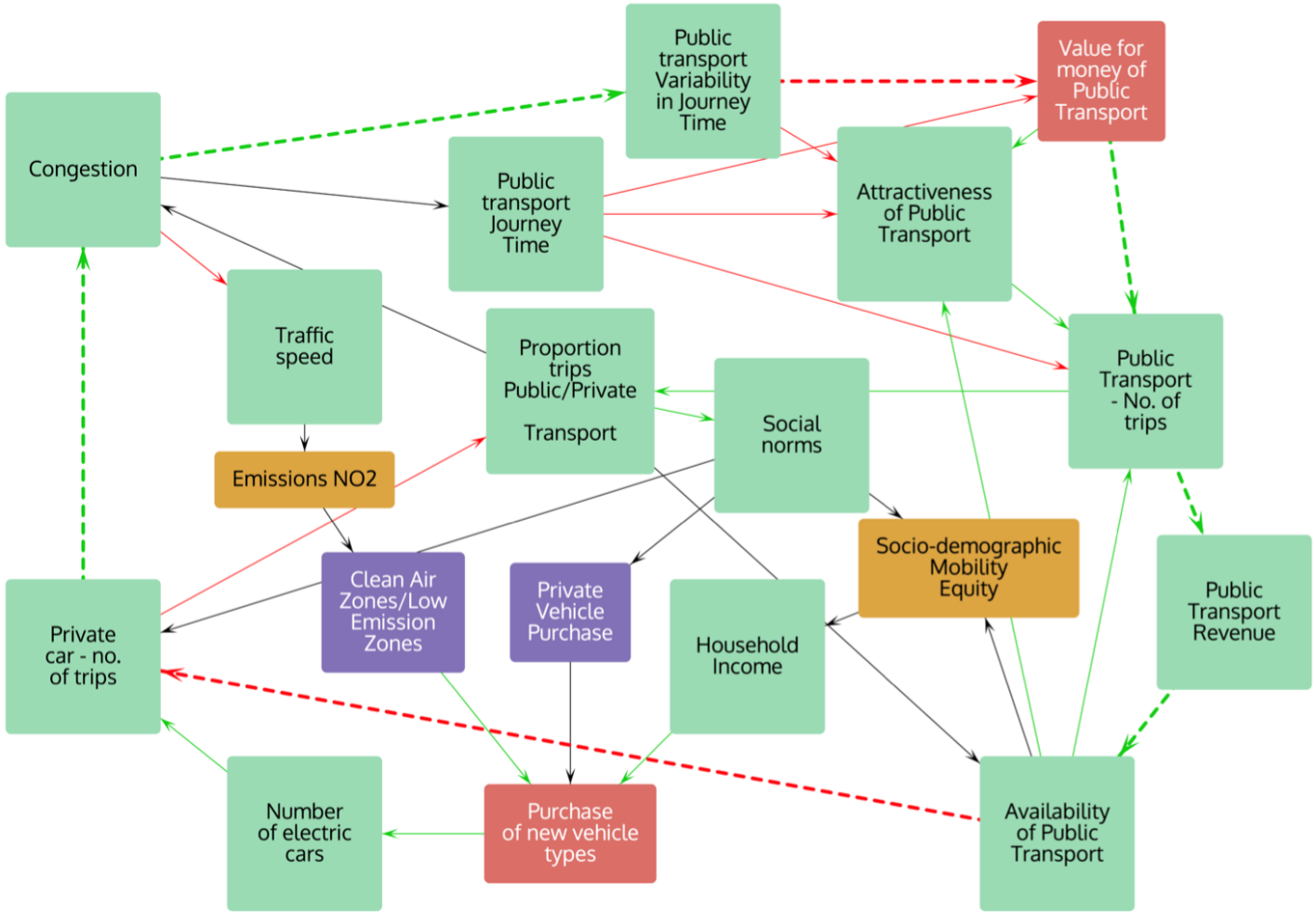
System mapping

- Complex interventions like retrofitting have wide-ranging impacts, which can be illustrated through systems maps. These maps visualise system interactions, including elements such as health, environment, inequality, finance, and regulation, and outcomes: feedback loops, tipping points, and unintended consequences.



System mapping



WS1: Tasks

- WS1.1 Stakeholder mapping
- WS1.2: Policy and interventions mapping
- WS1.3: Participatory System Mapping
- WS1.4 Co-create “living” systems maps

Year	2025*				2026				2027				2028				2029				2030*		
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
WS1: Systems mapping																							
WS1.1 Stakeholder mapping					3																		
WS1.2 Policy and intervention mapping						4																	
WS1.3 Participatory System Mapping									5			6											
WS1.4 Co-create/apply 'living' maps													7a				7b				7c		
WS2: Observational evidence																							

Milestones
2 Final programme approval
3 Stahekholders mapped
4 Draft map produced
5 Workshops completed
6 System maps produced
7 Map updated/used

Deliverables

Staff

1 Post-doc full-time from January 2026 for 2 years

Others from other work streams

D1 Stakeholder map (month 9)

D2 Initial Systems map and policy/interview review (month 12)

D3 Systems map refined in workshops (month 24)

D4 Updated systems maps, feeding to retrofitting projects (months 36, 48, 60)

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WS2: Observational evidence from existing retrofitting interventions

Professor Rajat Gupta, Oxford Brookes University; Dr Bowen Liu, University of Birmingham; Helen Langley (Dudley BC)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

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WS2 – Objective and Team

- Develop a systems understanding of retrofits' impacts on indoor air quality (IAQ) and health in real homes through observations.

- Team: **Gupta (OBU, Co-Lead), Liu (UoB, Co-lead),** Langley (Dudley BC, Stakeholder lead)

- Contributors: Giorio (Cambridge), Nasar (Cranfield), Miller (Edinburgh), Marczylo (UKHSA), Fisher (KCL), Shi (Birmingham), Elliott (Birmingham), Jones and PDRAs, wider INHABIT team

WS2 - Tasks

- WS2.1 Selecting retrofitting and control homes for trial
- WS2.2 Indoor environment observations
- WS2.3 Built, residential characteristics, and mental and physical health observations
- WS2.4 Quantifying retrofitting impacts

WS2 – Dependencies and deliverables

Dependencies

- WS3: Derived exposure-response relationships in WS2.4 inform health models in WS3.
- WS4.1: Observation-based evaluation of interventions

Deliverables

- Impacts of retrofitting on indoor environment
- Impacts of retrofitting on health and wellbeing of residents
- Predictive mould risk/bioaerosol model

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Natural Environment Research Council

Works Stand 3

Exposure-Health modelling framework

Leads: James Milner (LSHTM), Sani Dimitroulopoulou (UKHSA), Ruth Doherty (UoE)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

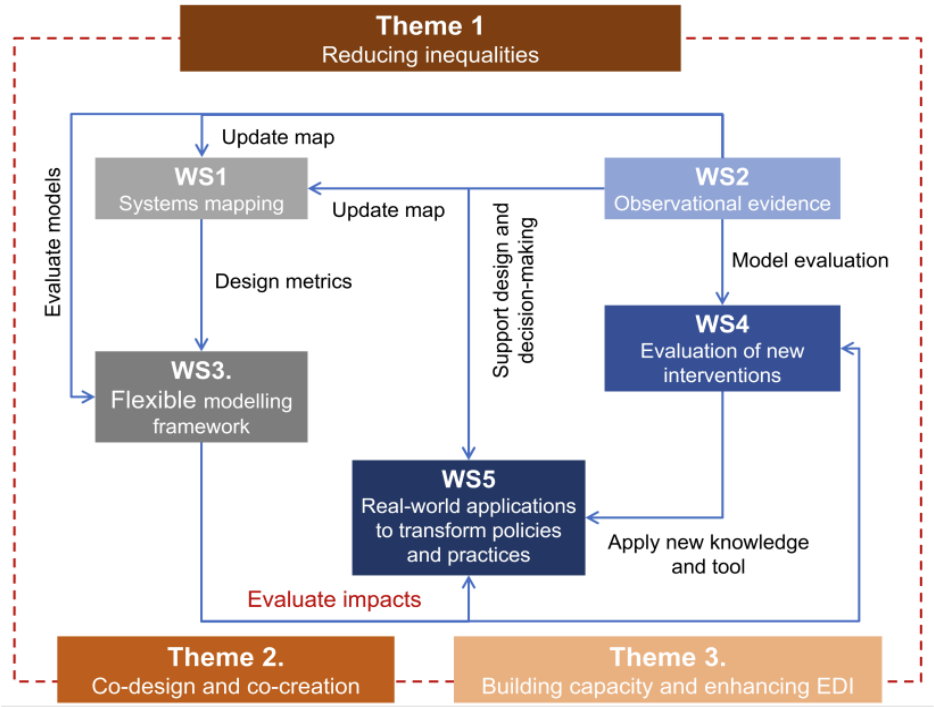
Cranfield University

LSE The London School of Economics and Political Science

INHABIT WS3 overview

Objective: Deliver a flexible, integrated modelling framework and standardised metrics to evaluate the impacts of retrofits on IAQ, health, and the economy.

*"We will develop an **integrated indoor environment-exposure-health modelling framework** with holistic metrics for evaluating net zero interventions at different scales"*



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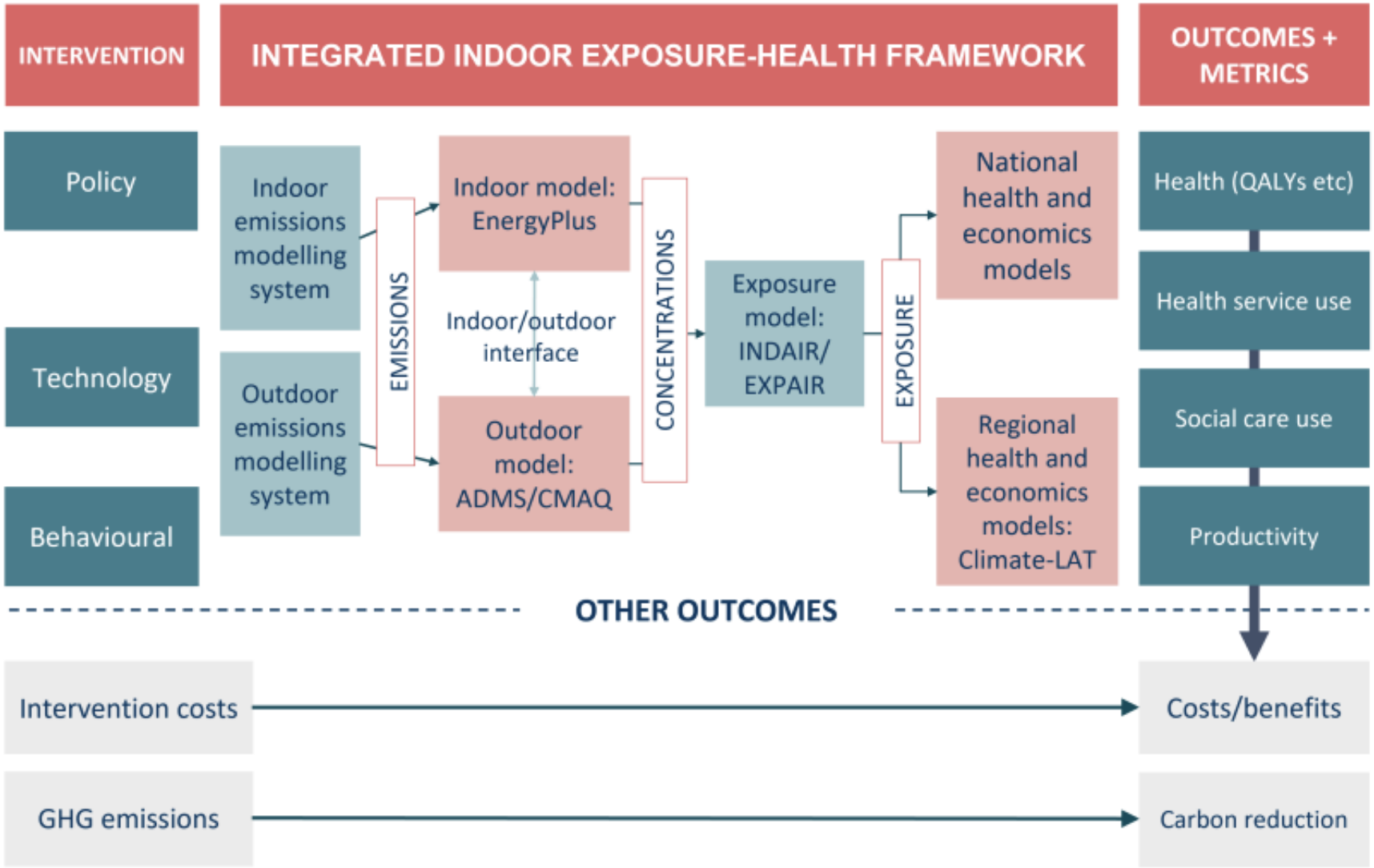

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INHABIT WS3 overview

WS3.1 New integrated indoor environment-exposure capability

- Housing stock modelling of thermal and energy performance (meta-model based on EnergyPlus – **UCL**)
- Indoor air pollutants: emissions and chemistry (**UCL/UoB**)
- Indoor air quality modelling for other indoor microenvironments to enable the assessment of personal exposure (INDAIR – **UKHSA**)
- New time-activity profiles for different socio-demographic groups (EXPAIR – **UKHSA**)
- Street-scale outdoor air pollution modelling (ADMS-Urban – **UoE/CERC/UoB**)

INHABIT WS3 overview

WS3.2 New health and economic modelling

- National-level health model ('Synthetic population' – **LSHTM**)
- Burden-of-disease quantification at regional-scale for damp/mould (**UKHSA**)
- Regional-level health and economic model (ClimateLAT – **UoB**)

WS3.3 Integrated indoor environment-exposure-health framework

- Deliver integrated indoor exposure-health modelling framework (combining WS3.1 + WS3.2)
- Indicators and metrics developed
- Framework applied in WS4 + WS5

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INHABIT WS3 overview

WS3.4 New health and economic metrics for intervention assessment

- In collaboration with stakeholders, we will develop a new set of fit-for-purpose metrics:
  - *GHG reductions*
  - *indoor exposures*
  - *health*
  - *economic costs*
  - *vulnerability/inequality*

- Individual/household and/or area-level

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Deliverables

D8: New modelling capabilities and integrated indoor environment-exposure-health framework (month 24, 30)

D9: Standardised sets of metrics (month 36)

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Natural Environment Research Council

WS4: Developing and evaluating interventions to improve health

Leads: Anna Mavrogianni (UCL), Sefi Roth (LSE)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

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Introduction

WS4 will use the **WS2 empirical measurements** and the **WS3 modelling framework** to:

- **Evaluate** planned and new energy retrofit and related **interventions**
  - at local to national scales,
  - for a range of metrics focusing on health and equity.
- **Develop** a stakeholder-friendly **decision-making tool**.

Team: Anna Mavrogianni (UCL), Sefi Roth (LSE), with inputs from the UKHSA, UoB, UoE, OBU, UoS

Objectives

WS4.1: Observation-based evaluation of technological and/or behaviour interventions

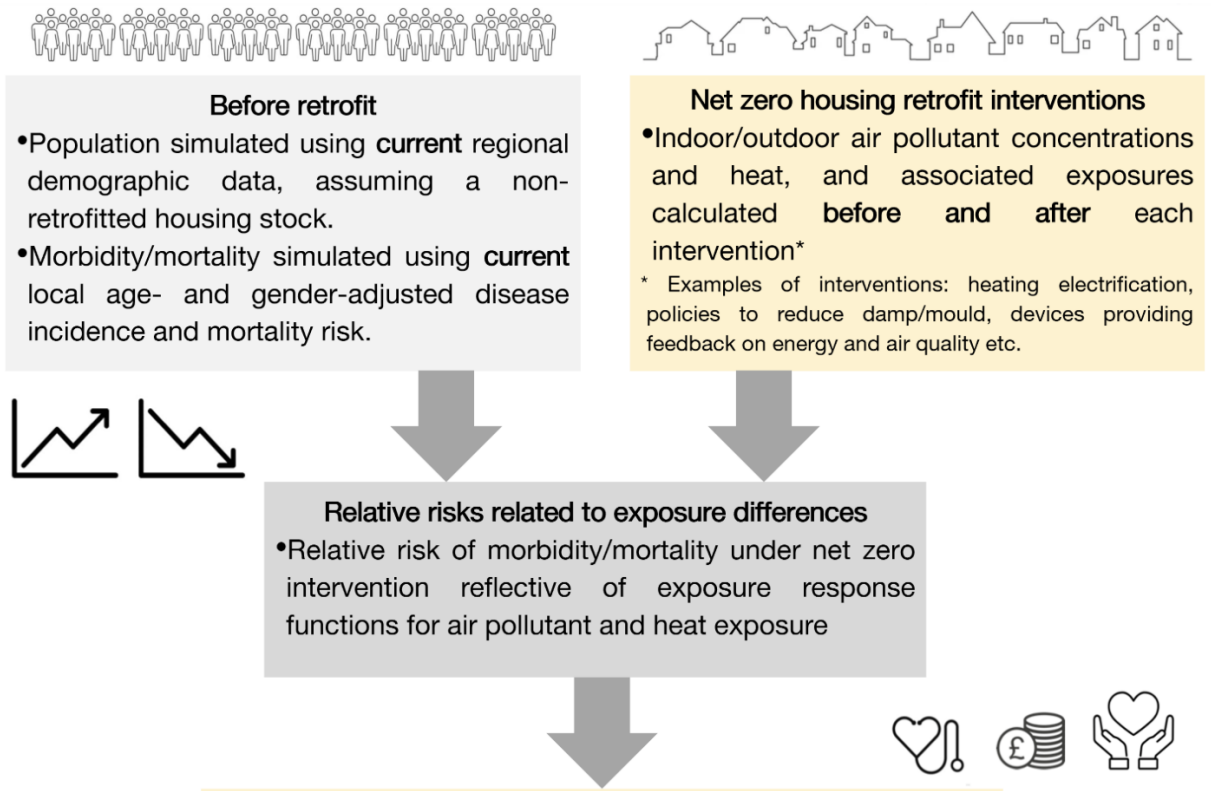
- Assess strategies to promote IAQ improvement and energy use reduction **behaviours in homes**.
  Examples: personalised energy/IAQ information and feedback provision, educational workshops, peer support networks.
- Collect additional data in **testing facilities** and explore emerging needs for net zero interventions.
  Examples: smart ventilation with/without air purifiers or dehumidifiers.
- Deliverable (month 50): **Effectiveness assessment** of behavioural and technological interventions.

Objectives

WS4.2: Modelling-based evaluation of interventions

- With stakeholders, **shortlist** policy, technological, and/or behaviour interventions (WS1.2). **Evaluate** their impacts across a range of **metrics** (WS3.4), including health and inequalities.
- Use the flexible modelling framework (WS3) for **multi-scale assessment (local to national) of interventions**.
  Examples: smart ventilation strategies, policies to reduce mould risk (e.g. heating subsidies for vulnerable people, Awaab's law), wide heat pumps installation, dehumidifiers, EPC ratings improvement policies, private home retrofit uptake promotion, gas hob replacement.
- Deliverable (month 36): **List of optimal interventions.**

Objectives



Evaluation of policies/ interventions on health and other outcomes

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Objectives

WS4.3: Development of decision-support tool

Deliverable (month 40): An integrated, user-friendly, **decision-support tool** co-created with our stakeholders, based on:

- **WS4.1 qualitative findings**, and
- an interrogable database of **WS4.2 model outputs**.

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Natural Environment Research Council

WS5: Applications to retrofitting programmes for better health

Leads: James Hall & Mike Davies on behalf of WS5 team

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

LSE The London School of Economics and Political Science

Introduction

- Many potentially effective policies fail due to **poorly identified implementation pathways, insufficient partnerships**, and a lack of implementation and evaluation
- Systems thinking and co-production with stakeholders necessary to deliver net zero.
- WS5 is about collaboration across work streams and stakeholders to apply tools, capabilities and learnings
- Ultimately providing evidence on how to design and implement policies such that **health co-benefits are maximised, unintended consequences minimised, and trade-offs made explicit.**

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Overview

Two workstream subpackages

- **WS5.1:** Application in two real-world net zero housing programmes

  Evaluation of projects using our project capabilities to help stakeholders consider how best to maximise health co-benefits, both quantitative evidence and systems-based evidence

- **WS5.2:** Delivering wider impact via case studies

  Case studies can provide best practice examples and learning successes to support other national / future retrofitting projects.

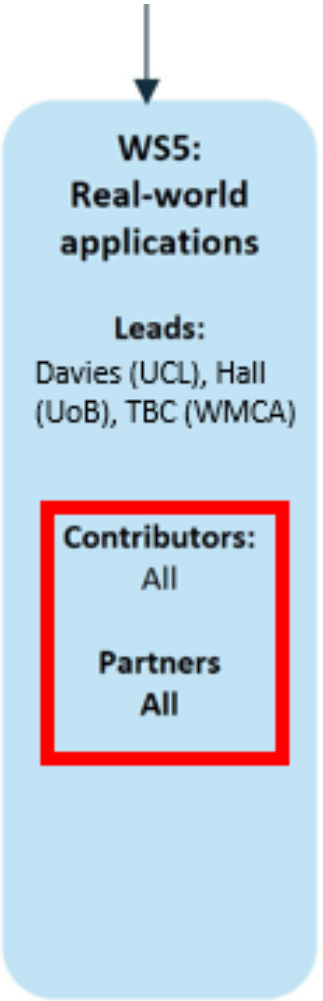
Team

Everyone contributes to the success of WS5

Co-lead by Hall and Davies and colleague from WMCA (likely NZN)

- Yuqing Dai (UoB) to coordinate collaborations with LAs
- PDRA1 (UoS) to support training (timing tbc)

- Resource limited WS5 to coordinate tools and capabilities and pool resources as needed for deliverables
- Seek out existing funding including with partners to seek mutually beneficial arrangements



WS5.1: Application in two real-world net zero housing programmes

Leveraging major retrofitting initiatives in WMCA & Oxfordshire

- Upskilling stakeholders to apply systems maps (WS1) and decision-support tool (WS4.3) (with new evidence (WS2-4)) to guide realisation of health co-benefits of interventions.

- Co-develop implementation plans, to improve health and uptake via behaviour change (WS4.1) and observations to evaluate health impacts and intervention performance.

- Co-deliver new observational capacity and modelling programmes for initiatives (WP3/ WS4) integrating health with wider goals plus partnerships to overcome implementation barriers. System responses to interventions continuously reflected in ‘live’ maps.

- Co-create exemplar retrofitting projects to guide future NZN programmes

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WS5.2: Delivering wider impact via case studies

Best practice examples and learning successes to support other national / future retrofitting projects.

- Train partners (e.g. Hertfordshire, Leeds, Edinburgh Councils, and Clarion Housing) to update systems maps (WS1) and tools (WS2, 4 and 5.1) to maximise health co-benefits of their net zero projects. Examine regional perspective (e.g. devolved administration (Scotland)

- Develop a mechanism for a rapid response to emerging policy needs (e.g., WMCA Five Year Plan for Net Zero) by stakeholders. Using insights, tools, and models (WS1-4). Resources for such case studies (£550k Impact Fund).

- Some project partners including Hertfordshire County Council are committed to exploring case studies, allowing us to tackle region-specific issues and with an integrated and health-focused approach.

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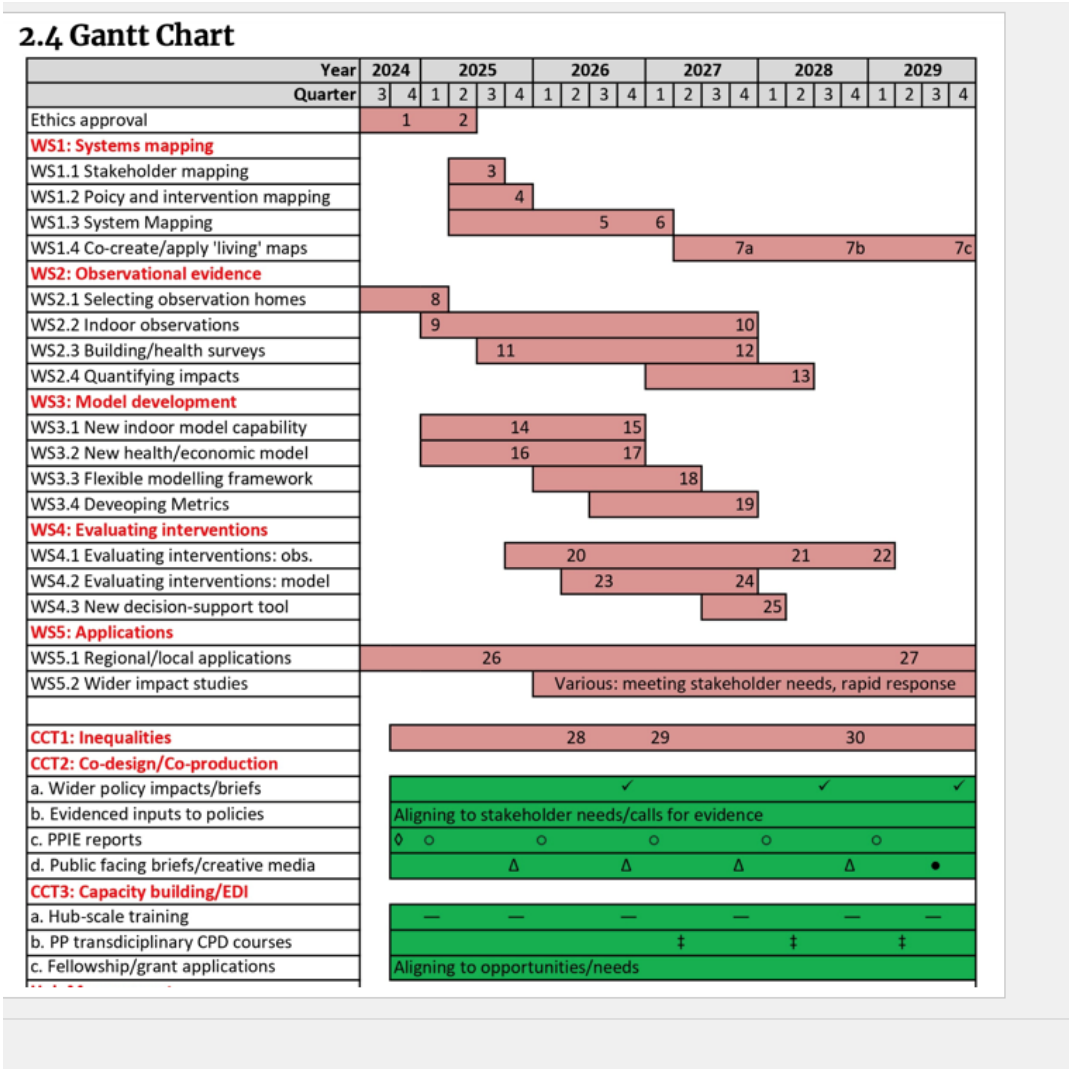
Deliverables

- **D13:** Co-created implementation and evaluation plans, including standardised approach to measure the trade-offs of net zero interventions (originally month 9, tbc)
- **D14:** Example NZN report(s) (Month 56).
- **D15:** Impact case studies (variable).



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Cross-Cutting Theme 1: Reducing inequalities

Leads: James Milner (London School of Hygiene & Tropical Medicine) and Jamie Pearce (UoE)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

LSE The London School of Economics and Political Science

Introduction

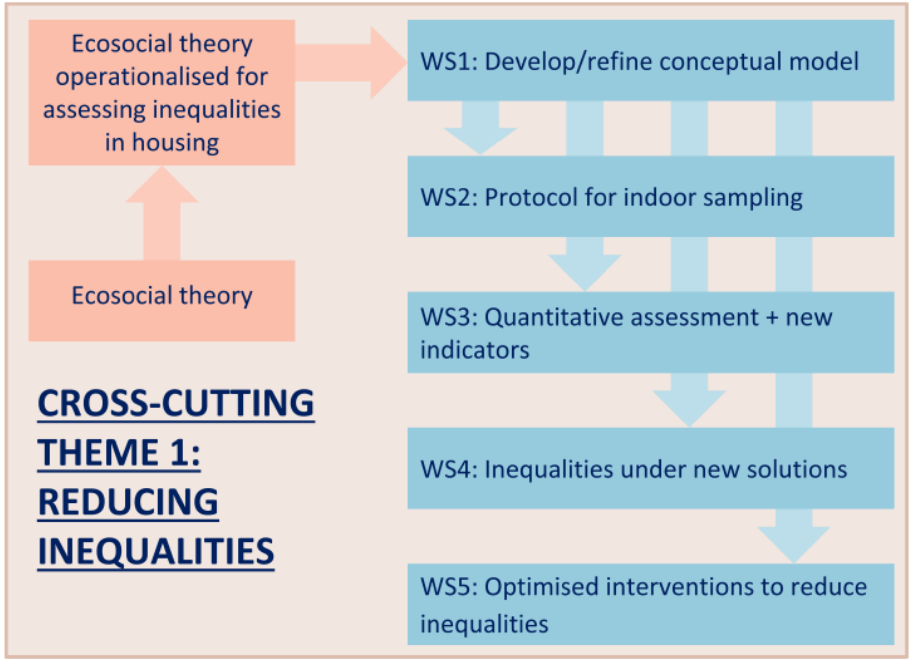
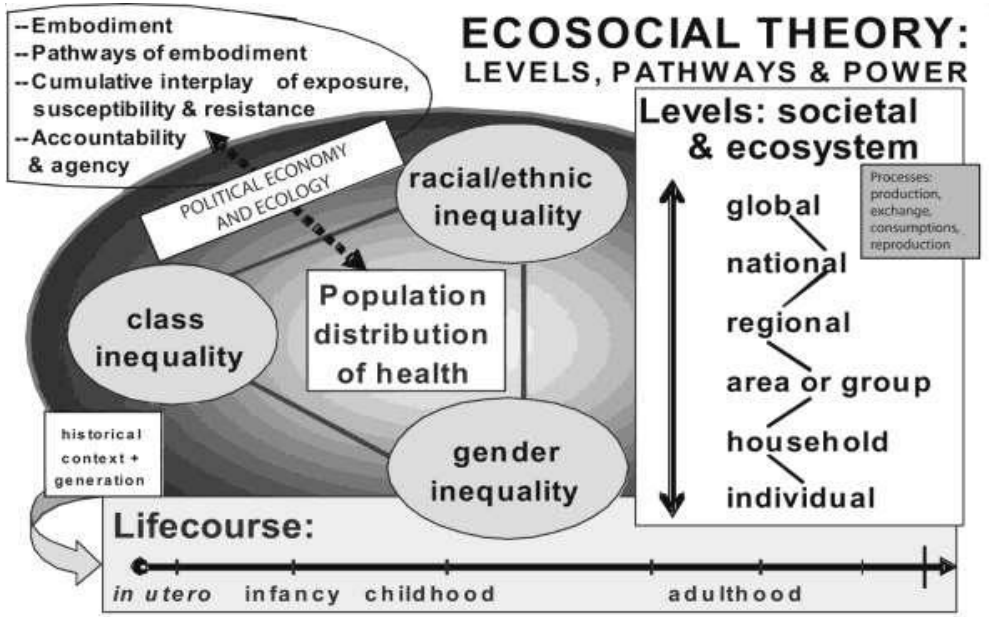


Figure 6: Assessment of inequalities across all WSs.

Multilevel, temporal drivers



New conceptual model of co-benefits of net zero: how solutions can be modified to reduce inequalities?

- Review existing climate-health frameworks
- Consider how equity markers integrated (SES, ethnicity, etc)
- Scoping review (co-benefits for health equity)?
- Draw on ecosocial theory, intersectionality & systems mapping (WS1) to produce conceptual model to facilitate equity focus across WS2-5

Objectives

1. Develop and refine a conceptual model to systematically analyse solutions from an environmental/health justice perspective (WS1)
2. Develop and apply robust sampling protocols for understanding how home retrofits affect inequalities (WS2)
3. Produce distributions of exposures/health risk metrics aggregated to the appropriate scale and according to sociodemographic factors, and derive new inequality indicators (WS3)
4. Assess ‘win win’ situations, trade-offs and unintended consequences for inequalities due to new solutions (WS4)
5. Develop interventions that are implemented optimally to reduce inequalities (WS5)

Core team

- Jamie Pearce (UoE, co-lead)
- James Milner (LSHTM, co-lead)
- Matthew Clark (Hertfordshire CC, stakeholder lead)
- PhD studentship (UoE)
- PDRA (UoE)?

Deliverables

- Conceptual model for assessing inequalities (month 18)
- New capabilities for assessing inequalities related to housing (month 28)
- Policy reports on optimisation of interventions for reducing inequalities (month 48)

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Natural Environment Research Council

Cross Cutting Theme 2

Public involvement in Co-Design and Co-Production

Leads: Suzanne Bartington(UoB) and Elizabth Ralston (UKHSA)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

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INHABIT Public Involvement and Engagement

Our objective is for INHABIT to be co-designed and co-produced with public members to ensure our research is relevant, successful and useful

Co-design

A collaborative process where academics, stakeholders, and the public shape all project stages, integrating diverse perspectives from the start.

Co-production

Joint delivery and implementation of the project in equal partnership with citizens and stakeholders.

Approach

- INHABIT Public Involvement members
- Community involvement activities across the 5 years
- Creative and imaginative outputs to reach diverse groups
- Team tracker to capture and reflect on involvement activities

UK Standards *for* Public Involvement

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INHABIT Cross-Cutting Theme 2 Team

- Suzanne Bartington
  CCT2 co-lead
- Elizabeth Ralston
  CCT2 co-lead
- Kaja Milczewska
  Knowledge mobilsation lead
- Peter Richardson
- Umm Ilyaas
- Bianca Ungureanu
- Toqueer Quyyam

If you have anyone interested in being involved: inhabit-ppie@contacts.bham.ac.uk & 07483103594

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Knowledge Mobilisation

"The process that paves the way to impact via **active collaboration** with key stakeholders throughout your research" - NIHR

Identifying key stakeholders → Working with people and organisations who benefit or use the research to change practice and policy → real-world impact.

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Medical Research Council

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Natural Environment Research Council

CCT3: Building capacity and enhancing EDI

Zaheer Nasar, Cranfield University

14 July 2025

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

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Objectives

Developing mechanisms for capacity building between researchers and stakeholders, and for dissemination through initiatives such as:

- Hub-wide training on accessibility and EDI, building an inclusive team culture
- Cross-Hub training workshops/webinars
- Continuing Professional Development (CPD) courses
- Secondments to and from stakeholder organisations
- Support for stakeholder academic training
- Empowering early career researchers (ECRs) through:

  - **Writing training** for journal articles, position papers and policy briefs
  - **Media outreach** and **public engagement** training
  - **Workshops, webinars**, and writing retreats
  - **Fellowship and grant applications** writing training
  - **Mentorship** by academics and project partners
  - **Annual 'researcher week'** events with international speakers
  - **Dissertation supervision** to engage students with INHABIT activities

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Team and Deliverables

Team

Lead: Nasar (Cranfield)

Stakeholder Lead: James (Birmingham City Council),

Contributors: All teams including project partners

Deliverables

D22: Hub-wide training (month 6, 12, 24, 36, 48).

D23: CPD courses (month 36, 48, 60).

D24: ECR led fellowship/grant applications (various)

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Natural Environment Research Council

Project Partner and Stakeholder Session:

Lightning Talks

Chair: Anna Mavrogianni (INHABIT Deputy Director, UCL)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

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WE ARE **SANDWELL!**

Sandwell
Metropolitan Borough Council

Sandwell MBC – Park Estate NZN
Rushpal Dhaliwal

The priorities for the Park Estate are:

- Built Environment
- Low carbon activity & active travel
- Natural environment & green space
- Community growth & engagement
- Public Health

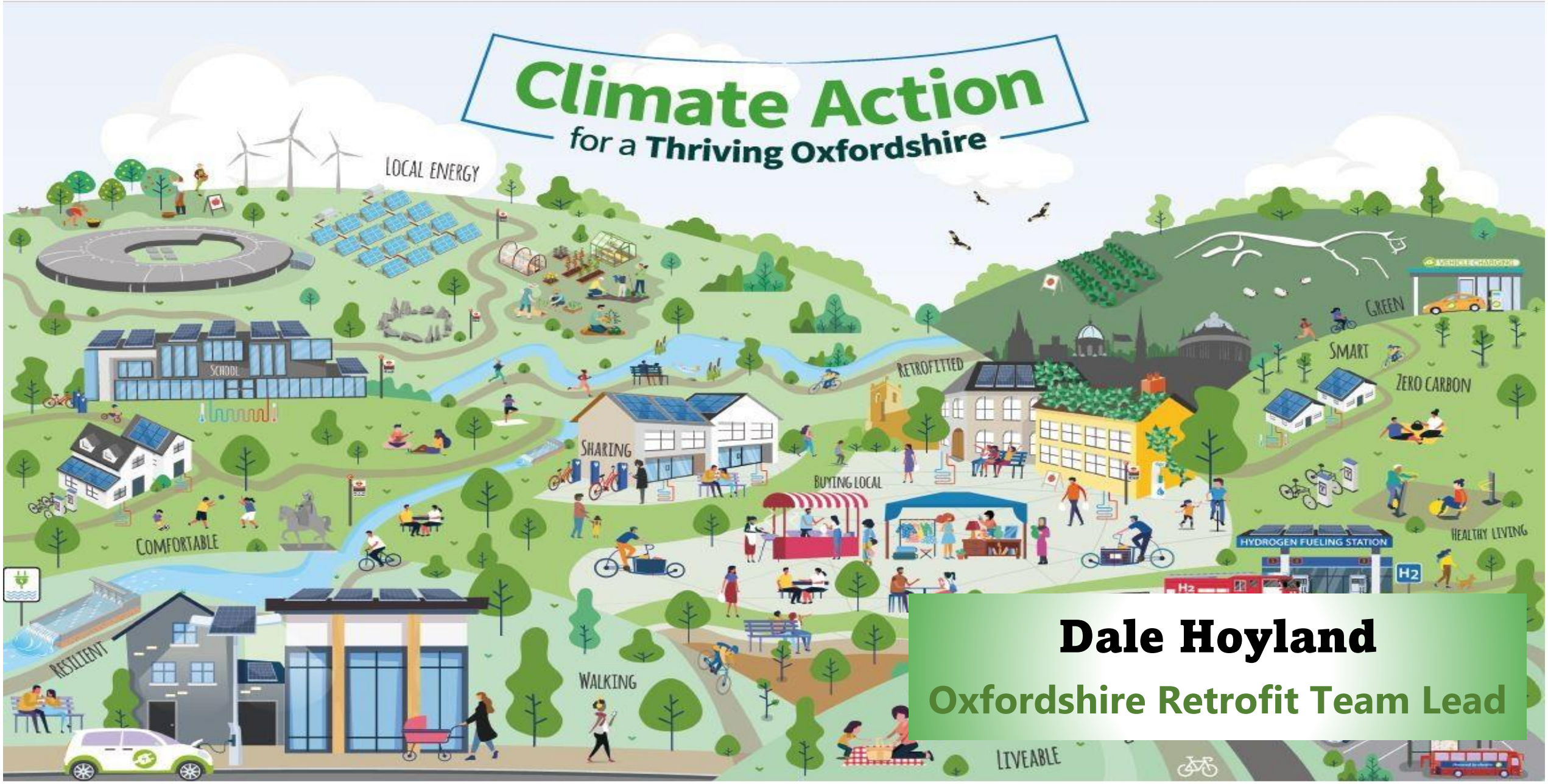
INHABIT & the Park Estate demonstrator project:

- Early links made with the UoB
- Access to technical guidance and initiatives which we can use and trial in our locality
- Good early success, however, we need to other ways to reach the wider community. Innovation could result in existing participants talking up the benefits of engagement within the community. Word of mouth!
- Bring academia into our processes and delivery

Cameron Ley, PhD – Coventry HDRC

- **Research Fellow** in Evidence Synthesis
- 30 **H**ealth **D**eterminants **R**esearch **C**ollaborations across the country
- Coventry in first wave of 10 that started in October 2022
- £5 million over 5 years
- Local authority research capacity and culture build

NIHR | Health Determinants Research Collaboration Coventry



Dale Hoyland

Oxfordshire Retrofit Team Lead

Monday, 14th July 2025

OXFORDSHIRE COUNTY COUNCIL

Oxfordshire County Council – INHABIT involvement

- Facilitating the applications of hub outcomes and methods in Oxfordshire, including the systems maps and new models.
- Sharing the wealth of learning gained from our retrofit, climate mitigation and adaptation programmes.
- Potential for access to retrofit installations (e.g. for pre & post monitoring / evaluation).
- Joining forces to carry out behaviour change campaigns to improve population health during the transition to Net Zero in the housing sector.
- Facilitating public involvement, dissemination or engagement activities.
- The new policy tool will facilitate the evaluation of policy scenarios, highlighting potential health benefits, unintended consequences, and necessary compromises, allowing for a comprehensive policy assessment. This will additionally help build links between the Public Health and Climate Action teams within Oxfordshire County Council.

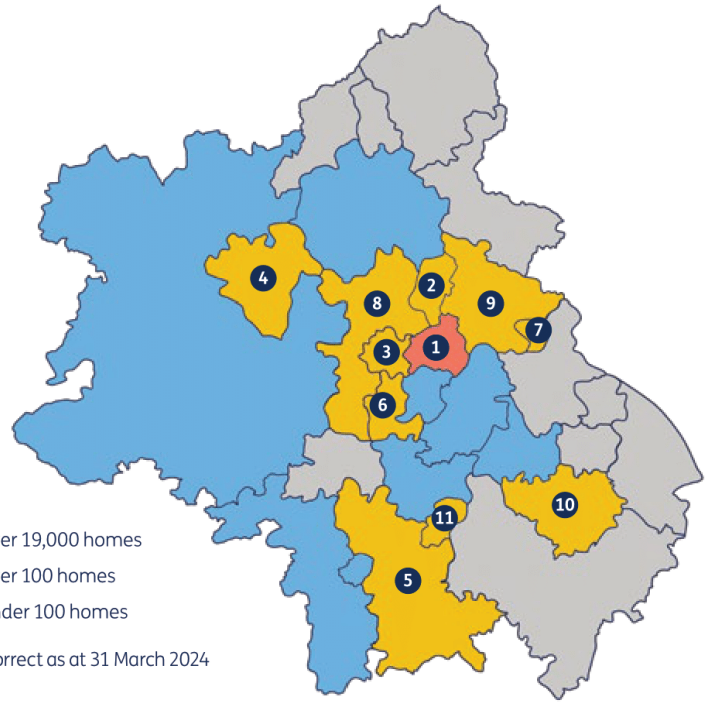
About us

We are a regional housing association with 22,000 homes owned and managed across the Midlands. We started life in Walsall, where most of our homes are, and it is still the place that anchors us to our communities. This approach is echoed in our work across the region.

More than just a landlord, we are a proud champion of our places, working with our partners to secure future prosperity through regeneration, place shaping, community investment and improving wellbeing. Over the last five years we've developed more than 2,000 new homes for social and affordable rent and shared ownership.

Environmental sustainability runs through everything that we do. We will ensure we are enhancing local areas, driving a commitment to green practices through our supply chain and positively contributing to long-term societal change.

None of what we do would be possible without the dedication of our 800 colleagues. We promote an inclusive and empowering culture; we are committed to being a great employer that supports our people to develop their professional skills and knowledge.



Data correct as at 31 March 2024

1. **Walsall** 19,307 homes
2. **Cannock Chase** 436 homes
3. **Wolverhampton** 322 homes
4. **Telford and Wrekin** 287 homes
5. **Wychavon** 180 homes
6. **Dudley** 163 homes
7. **Tamworth** 159 homes
8. **South Staffordshire** 155 homes
9. **Lichfield** 140 homes
10. **Warwick** 126 homes
11. **Redditch** 121 homes

Our mission

"Dedicated to the success of our people and places."

Our ambition

"We will provide safe and secure homes and deliver high-quality services. Our communities will be empowered to thrive and we will always do the best for our customers."

Our values

Our culture is built on our strong values, with diversity, inclusivity and support for customers at the heart of our work.

Our values set out a clear expectation of 'how we do things around here'. They are our core beliefs which inform our decision-making and help shape our organisation. We are:

Trustworthy
You can rely on us. We are honest in everything we do.

Collaborative
Achieving great things by working together.

Respectful
Valuing people and treating everyone with empathy and fairness.

Excellent
Striving to be the best and delivering the best outcomes for customers and the organisation.

Accountable
Taking responsibility for our actions and owning the delivery of our promises.

WMCA Environment Team

Beth Haskins-Vaheesan, Climate Adaptation Project Management
Elle Winning, Air Quality Lead
WMCA works collaboratively with the 7 constituent local authorities and regional stakeholders *to make the West Midlands the best place to live, work and visit*.

The Environment team focuses on air quality, circular economy, climate adaptation, and natural environment, with a focus on behaviour change.

Key asks of the INHABIT hub:

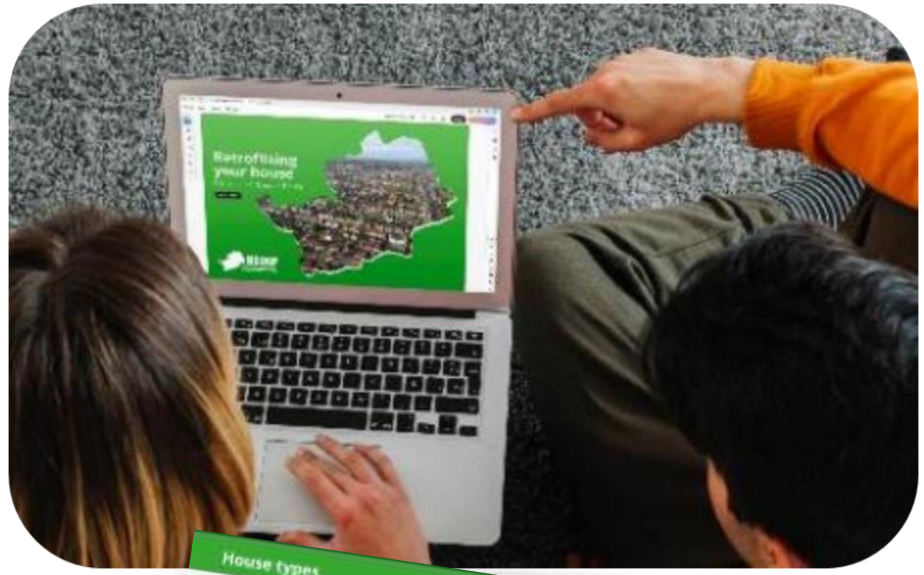
- Provide a greater understanding of indoor air quality and how improved **air quality can be a co-benefit of net zero policy and programmes**.
- Take a holistic approach to indoor comfort, considering not only thermal comfort but also the impacts of climate change—such as **overheating and flood-induced mould and damp**.
- Without **future-proofing net zero retrofits** to account for evolving climate conditions, we risk undermining their health benefits and potentially locking in future health risks.
- Understanding of how **surrounding natural assets** benefit the quality of indoor environments.

West Midlands Combined Authority | Greener Together

HCCSP

Hertfordshire Climate Change and Sustainability Partnership

- 12 Partners:
  - Hertfordshire County Council
  - Hertfordshire Futures (formerly LEP)
  - 10 District and Borough Councils
- 6 Strategic Action Plans
- First Pilot: Local Area Retrofit Accelerator
- www.hccsp.org.uk/retrofit



Sally Hodgkinson – The National Energy Foundation

- NEF is an independent charity established in 1988 with two objectives:
  1. To alleviate fuel poverty – Delivered via our Better Housing Better Health (BHBH) service
  2. To enable retrofitting of homes – Delivered via our SuperHomes service

- At this event, I want to understand the roles delegates have in each work strand;
- And how NEF can best work with delegates to fulfil the aims of the INHABIT hub

National Energy Foundation

Our mission: addressing the climate emergency

energy saving trust

People helped through energy advice services

Loans and grants distributed to homes and businesses

3,400 public EV chargepoints approved

Reach from our marketing and communication campaigns

People reached through our digital and data products

Kate Jenkins, Senior manager – Insight & evaluation

Inhabit Project

ADAM DENNY – ASSET AND PLANNING MANAGER.
JOHN KYFFIN-HUGHES –SUSTAINABILITY MANAGER

About Citizen

- Large housing stock - over 30,000 Homes
- Based in the West Midlands region, largest stock in Coventry
- Identified 4,500 homes below EPC C
- Diverse housing stock – if they built it, we have it!

Our Citizen retrofit journey

- Dedicated decarb team with experience of PAS 2035/2030
- Extensive retrofit experience, completed fabric first retrofit to nearly 2000 homes as part of SHDF, WHSF - EWI, loft and ventilations upgrades, with ongoing programmes.

Citizen aims for this project

- Aim for this project to share data, what can we learn from our stock and others?
- Awaab's Law and Sustainably Strategy key organisation focus
- Continue to build relationships -share positive practice.

SHDF completed house

Passivhaus Trust and National Retrofit Hub

Sister organisations within the Sustainable Development Foundation family

Passivhaus Trust:

Promotes and shares learning on Passivhaus via expert groups, seminars and formal training

Passivhaus: Ultra low energy and low carbon buildings - proven international standard, science-based

Design and construction independently quality assured – no performance gap

Sets requirements for energy demand, comfort, and ventilation performance – testing shows lower bills and better IAQ than standard builds

Occupants anecdotally report improved health, particularly respiratory health

Trust covers UK and Ireland, 600 member organisations and companies

Projects being built to the Passivhaus standard now approximately 1% of all new homes under construction – majority by social landlords

National Retrofit Hub

Collaborative organisation bringing together the retrofit sector - input from almost 700 professionals, wide reach via newsletter and events

Robust evidence and scalable solutions gathered and shared via working parties and webinars

Prioritises reduced bills, comfort, and health alongside energy security, innovation and jobs; campaigning for health standards to be regulated eg in EPCs

Engaging with government on range of areas inc Warm Homes Expert Panel, ECO, MEES & more


MANN+
HUMMEL

Global research and development network

R&D employees

1,116

worldwide

R&D locations

30

worldwide

Patent applications

70+

per year

University partnerships

60+

Patents and applications

4,300

overall

Filters per second

30

in Automotive only

Figures from the year 2024

Collaboration and Impact Opportunities

Jamie Brogan

INHABIT Launch, 14th July 2025

EDINBURGH CLIMATE CHANGE INSTITUTE

THE UNIVERSITY OF EDINBURGH

Scottish Climate Intelligence Service

About SCIS

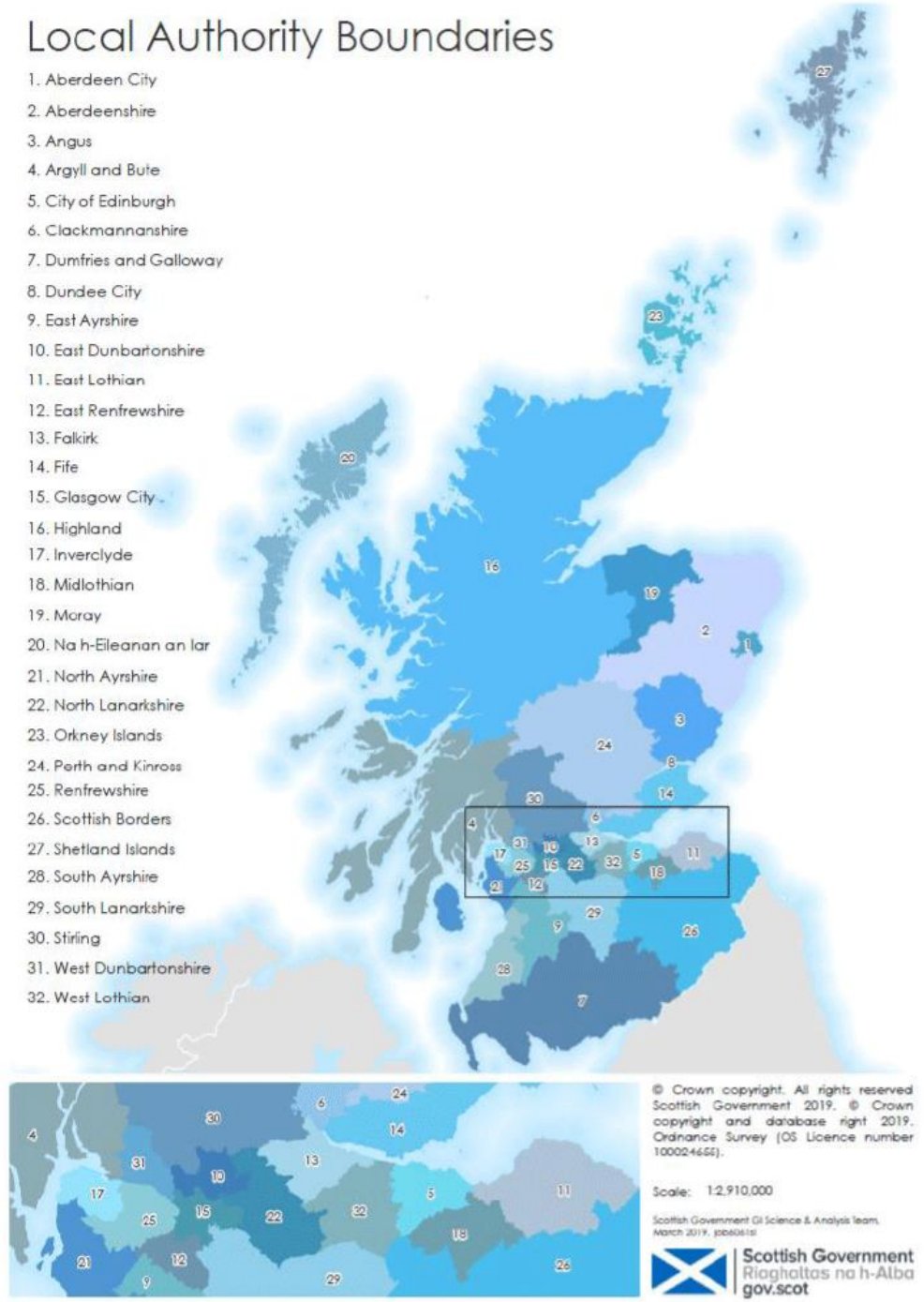
We support all of Scotland's 32 local authorities to manage, monitor and deliver area-wide plans for emissions reduction.

Scottish Climate Intelligence Service

ecci EDINBURGH CLIMATE CHANGE INSTITUTE

SSN Sustainable Scotland Network

improvement service



INHABIT: Opportunities & Project Role

Stakeholder Role

- National **capacity building programme for climate change delivery**, mitigation led but supporting connection across other policy priorities – e.g. adaptation, just transition, economic development
- Access to a **complete stakeholder system** and **practitioner network** for policy impact and implementation – includes local and national government, plus all of Scotland's public bodies.
- Working with Public Health Scotland, NHS, Scottish Govt, DESNZ and CCC to assess **economic co-benefits of climate action** (including health benefits and costs), with published research outputs
- Data assets include; **breakdown of all local climate plans** vs emissions profiles; **spatial maps of 100+ climate-related data layers**, including energy systems, housing, socioeconomic data.

Project Role

- Design **Monitoring and Evaluation** to reflect and capture INHABIT programme outcomes, contribution, and impact.

THE UNIVERSITY OF EDINBURGH

ecci EDINBURGH CLIMATE CHANGE INSTITUTE

SSN Sustainable Scotland Network

Scottish Climate Intelligence Service

Scottish Climate Intelligence Service

- www.climateintelligenceservice.scot
- www.linkedin.com/company/scottish-climate-intelligence-service/
- info@climateintelligenceservice.scot

improvement service

EDINBURGH CLIMATE CHANGE INSTITUTE

Sustainable Scotland Network

Who are we?

UK100 is the only network of ambitious councils led by all political parties working together to tackle climate change.

We help local leaders overcome challenges and turn innovation into solutions that work everywhere. We build the case for the powers needed to make change happen. From cities to villages, we help communities across the UK create thriving places powered by clean energy — with fresh air to breathe, warm homes to live in, and a healthy natural environment.

UK100

UK100's Theory of Change

Advocacy

We change the rules to put local leaders at the heart of climate action.

We do this by:

- Building consensus across party lines to empower local delivery
- Bridging the gap between local and national leadership
- Engaging with Westminster and Whitehall to influence policies and laws

Membership

We ensure that our members can deliver at pace and scale.

We do this by:

- Sharing knowledge and best practice
- Providing coaching and 1-2-1 support to our members
- Convening sector-leading stakeholders and facilitating partnerships

Research

We gather insights from our members to build the case for greater climate action.

We do this by:

- Identifying challenges and solutions to climate action
- Producing practical delivery resources for our network
- Building the evidence base for national change

INHABIT

Indoor HABItability during the Transition to Net Zero Housing Hub

UK Research and Innovation

NIHR National Institute for Health and Care Research

Medical Research Council

Engineering and Physical Sciences Research Council

Natural Environment Research Council

Project Partner and Stakeholder Session:

Lightning Talks

Chair: Anna Mavrogianni (INHABIT Deputy Director, UCL)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

LSE The London School of Economics and Political Science

INHABIT

Indoor HABItability during the Transition to Net Zero Housing Hub

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Medical Research Council

Engineering and Physical Sciences Research Council

Natural Environment Research Council

Priorities and Scoping Discussion

Chair: James Milner (INHABIT Deputy Director, LSHTM)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

LSE The London School of Economics and Political Science

Tables leads

1. Matt Clark
2. Chris Hammond
3. Kate de Selincourt
4. Ellie Hignett
5. Harleen Chima
6. Dale Hoyland
7. Sophie Morris
8. Alex Baines
9. Chrissy Galerakis

Question 1 (20 minutes)

How can INHABIT help to promote health in the net zero agenda?

(How can we change the narrative?)

Question 2 (20 minutes)

What are the main barriers to INHABIT's proposed programme of work?

Let’s work together…

- **Co-create** research agenda and co-deliver research
- **Co-develop** policy scenarios, action plans, strategies etc.
- **Collaborate** on real-world measurements
- **Contribute to** Systems mapping workshops
- **Collaborate** on behaviour change assessment
- **Co-develop** real-world exemplar NZN or retrofitting programmes
- Joint funding **applications**

Get involved and stay connected:
Email: inhabit@contacts.bham.ac.uk
Website: inhabithub.org.uk
LinkedIn: linkedin.com/company/inhabit-hub/

INHABIT
Indoor HABItability during the Transition to Net Zero Housing Hub

Plans for this evening

5pm:

- Hub Photo
- Drinks Reception + Networking – Horton Grange Bar
- Check-in for those staying over – Edgbaston Park Hotel

7pm:

- Dinner - Horton Grange (Lloyd Suite)

Agenda for tomorrow morning

7:00-8:30	Breakfast + check-out for those staying at Edgbaston Park Hotel
8:30-9:00	Tea/coffee/pastries
9:00-10:00	**INHABIT Vision Session (with project partners)** Facilitator: Ethny Childs (IES) • Initial Theory of Change
10:00-10:10	Comfort break (tea and coffee available)
10:10-11:30	**INHABIT Vision Session (with project partners) - continued** Facilitator: Ethny Childs (IES) • Stakeholder mapping • Outcomes
11:30-12:30	Lunch + Networking (External partners/stakeholders depart)

INHABIT
Indoor HABItability during the Transition to Net Zero Housing Hub

Thank you for your time and contributions

Get involved and stay connected:
Email: inhabit@contacts.bham.ac.uk
Website: inhabithub.org.uk
LinkedIn: linkedin.com/company/inhabit-hub/

UK Research and Innovation
NIHR National Institute for Health and Care Research
UKRI Medical Research Council
UKRI Engineering and Physical Sciences Research Council
UKRI Natural Environment Research Council

INHABIT

Indoor HABItability during the Transition to Net Zero Housing Hub

UK Research and Innovation

NIHR National Institute for Health and Care Research

Medical Research Council

Engineering and Physical Sciences Research Council

Natural Environment Research Council

Day 2:
INHABIT Project Meeting

15th July 2025

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

King's College London

Cranfield University

LSE The London School of Economics and Political Science

Agenda – Day 2 (am)

7:00-8:30	Breakfast + check-out for those staying at Edgbaston Park Hotel
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INHABIT

Indoor HABItability during the Transition to Net Zero Housing Hub

UK Research and Innovation

NIHR National Institute for Health and Care Research

Medical Research Council

Engineering and Physical Sciences Research Council

Natural Environment Research Council

Introduction to Theory of Change

Ethny Childs (Facilitator, Institution of Environmental Sciences)

University of Birmingham

The University of Edinburgh

UCL

London School of Hygiene & Tropical Medicine

UK Health Security Agency

University of Surrey

Oxford Brookes University

University of Cambridge

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Introductions

Ethny Childs, Communities & Partnerships Lead

I am Communities & Partnerships Lead at the Institution of Environmental Sciences. I am a member of the Senior Management Team, responsible for managing the IES Communities, and building relationships with partners and stakeholders in the sector. I am a Trustee for Charityworks, sits on the Specialist in Land Condition (SiLC) Board and holds positions on the Steering Groups for the Professional Bodies Climate Action Charter and the Media Trust's Communicating Climate Programme. I was listed as one of the 100 most influential environmental professionals on the ENDs Power List 2024.

I have delivered similar workshops in the past for the Clean Air Programme and WM-Net Zero.

The Institution of Environmental Sciences

Aims

1. Develop an overarching impact statement for the INHABIT project
2. Build an understanding of the pathways to impact for the INHABIT project
3. Map key stakeholders in the pathway to impact
4. Discuss outcomes needed to achieve desired impact

The Institution of Environmental Sciences

Agenda

- Introduction to Theory of Change
- Breakout discussion 1: Impact statement
- Group discussion
- Introduction to PRSM
- Breakout discussion 2: Stakeholder mapping
- Identifying outcomes
- Breakout discussion 3: Outcomes for impact

The Institution of Environmental Sciences

Introduction to the Theory of Change (ToC)

- A framework to support a group in understanding how their activities can lead to their desired impact. It is often iterative.
- Theory of Change is done backwards – you start with defining the **impact** of the project, then the **outcomes** that would be needed to achieve that impact, the **outputs** needed to achieve the outcomes and finally the **activities** that need to be done to produced those outputs.
- Theory of Change is often a visual process as it allows you to outline the pathway to impact of a project
- It is a structured process to build consensus across the team – it cannot go into complete detail!

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Key definitions

- **Impact:** The long-term change INHABIT is working to achieve in society.
- **Outcomes:** The short-and medium-term changes that need to happen to achieve the impact and can happen as a direct result of INHABIT.
- **Outputs:** The direct products or deliverables of INHABIT activities.
- **Activities:** The activities directly done by INHABIT.

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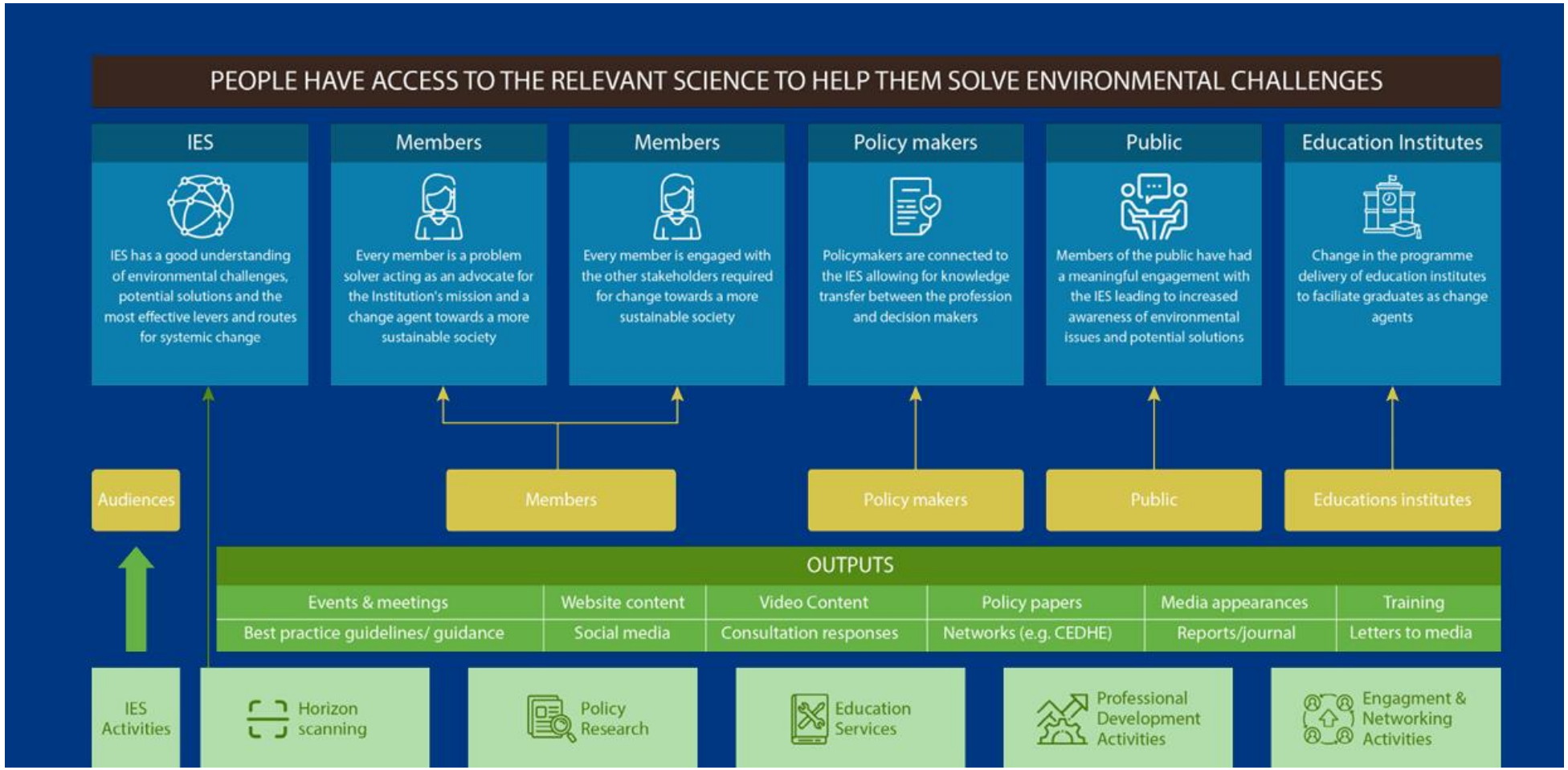
Example ToC


PEOPLE HAVE ACCESS TO THE RELEVANT SCIENCE TO HELP THEM SOLVE ENVIRONMENTAL CHALLENGES
IES
IES has a good understanding of environmental challenges, potential solutions and the most effective levers and routes for systemic change
Members
Every member is a problem solver acting as an advocate for the Institution's mission and a change agent towards a more sustainable society
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Every member is engaged with the other stakeholders required for change towards a more sustainable society
Policy makers
Policymakers are connected to the IES allowing for knowledge transfer between the profession and decision makers
Public
Members of the public have had a meaningful engagement with the IES leading to increased awareness of environmental issues and potential solutions
Education Institutes
Change in the programme delivery of education institutes to faciliate graduates as change agents
Audiences
Members
Policy makers
Public
Educations institutes
OUTPUTS
Events & meetings
Website content
Video Content
Policy papers
Media appearances
Training
Best practice guidelines/ guidance
Social media
Consultation responses
Networks (e.g. CEDHE)
Reports/journal
Letters to media
IES Activities
Horizon scanning
Policy Research
Education Services
Professional Development Activities
Engagment & Networking Activities

INHABIT Project

Vision

To accelerate the creation of healthy, net zero homes where *everyone* enjoys clean air and comfort indoors

Aim

To produce scientific evidence and policy-relevant solutions to realise the ***health co-benefits*** of the net zero transition in housing

INHABIT
Indoor HABItability during the Transition to Net Zero Housing Hub

Why use a ToC approach?

- Supports a shared and comprehensive understanding of a project's desired impact across the project team.
- Ensures there is a logical pathway between the activities of a project and the desired impact.
- Identifies gaps in delivery and priority actions.
- Identifies interconnections between different activities and outcomes in a project.
- Helps develop a holistic view of a project.
- Powerful engagement tool.
- Can support development of an indicator framework for impact measurement.

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Session 1. Articulating impact

- Breakout into 8 groups

- Each group develop an impact statement for INHABIT(25 mins)

  - Keep in mind the stated vision and aims of the project – how does this translate to real-world impact?
  - Try to use clear, specific language

- Group discussion (20 mins) – agree impact statement

The Institution of Environmental Sciences

Session 2. Stakeholder mapping

What is a stakeholder?

A **stakeholder** is any individual, group, or organization that has an **interest in** or **is affected** by the **outcomes** of a project, decision, policy, or organization.

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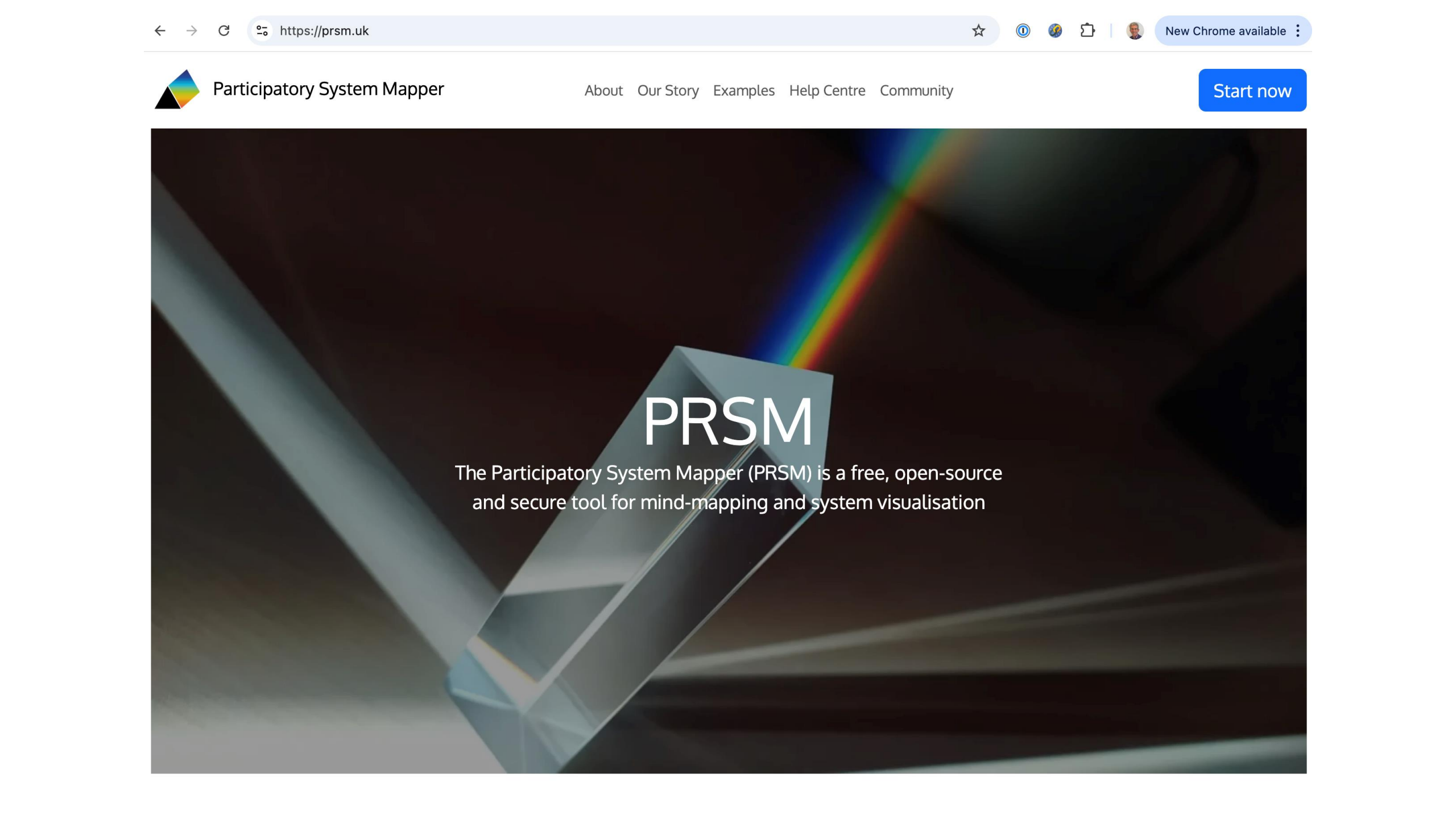
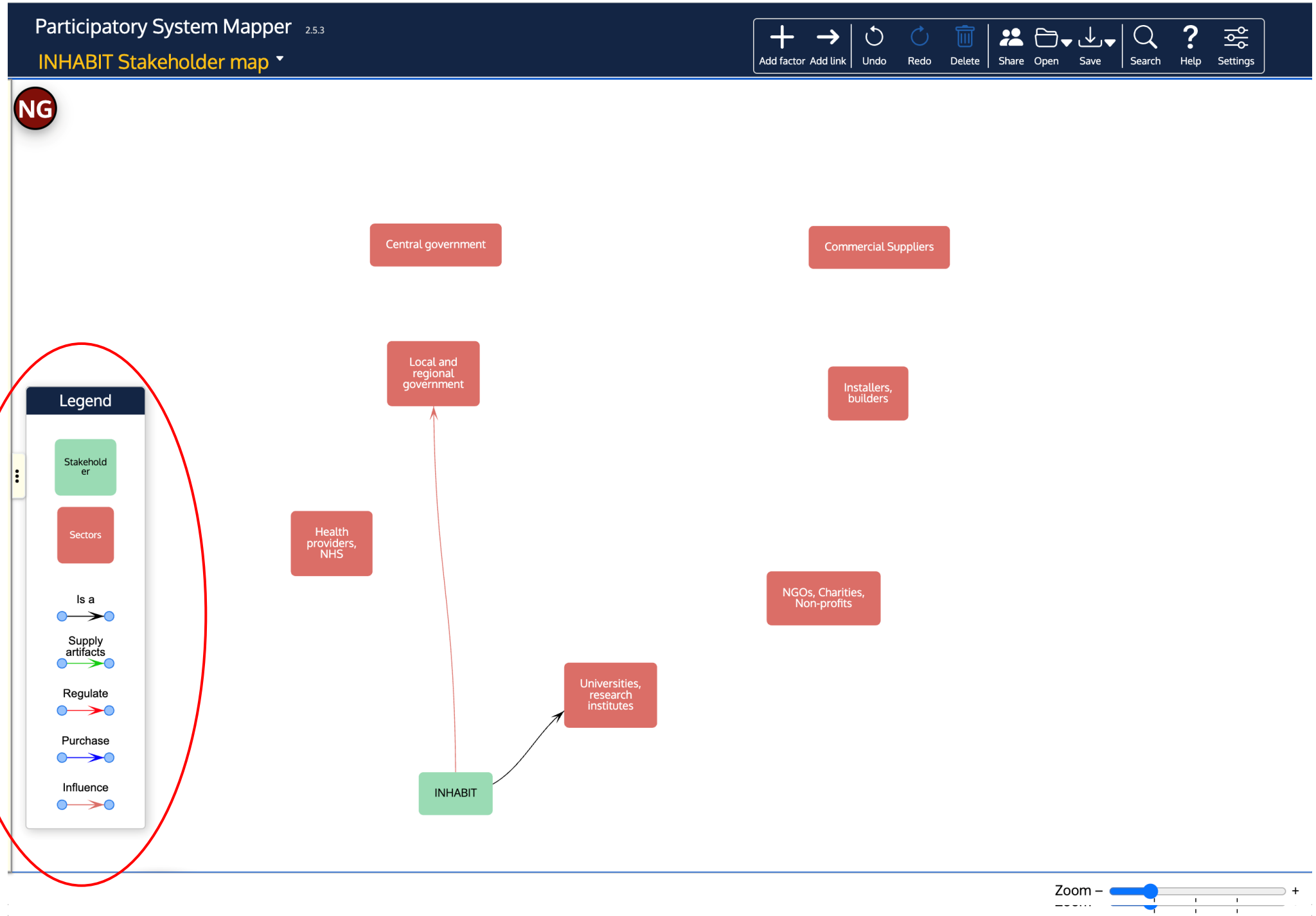

https://prsm.uk
New Chrome available
Participatory System Mapper
About
Our Story
Examples
Help Centre
Community
Start now
PRSM
The Participatory System Mapper (PRSM) is a free, open-source
and secure tool for mind-mapping and system visualisation

PR


Participatory System Mapper 2.5.3
INHABIT Stakeholder map
Add factor
Add link
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Central government
Commercial Suppliers
Local and regional government
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NGOs, Charities, Non-profits
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INHABIT
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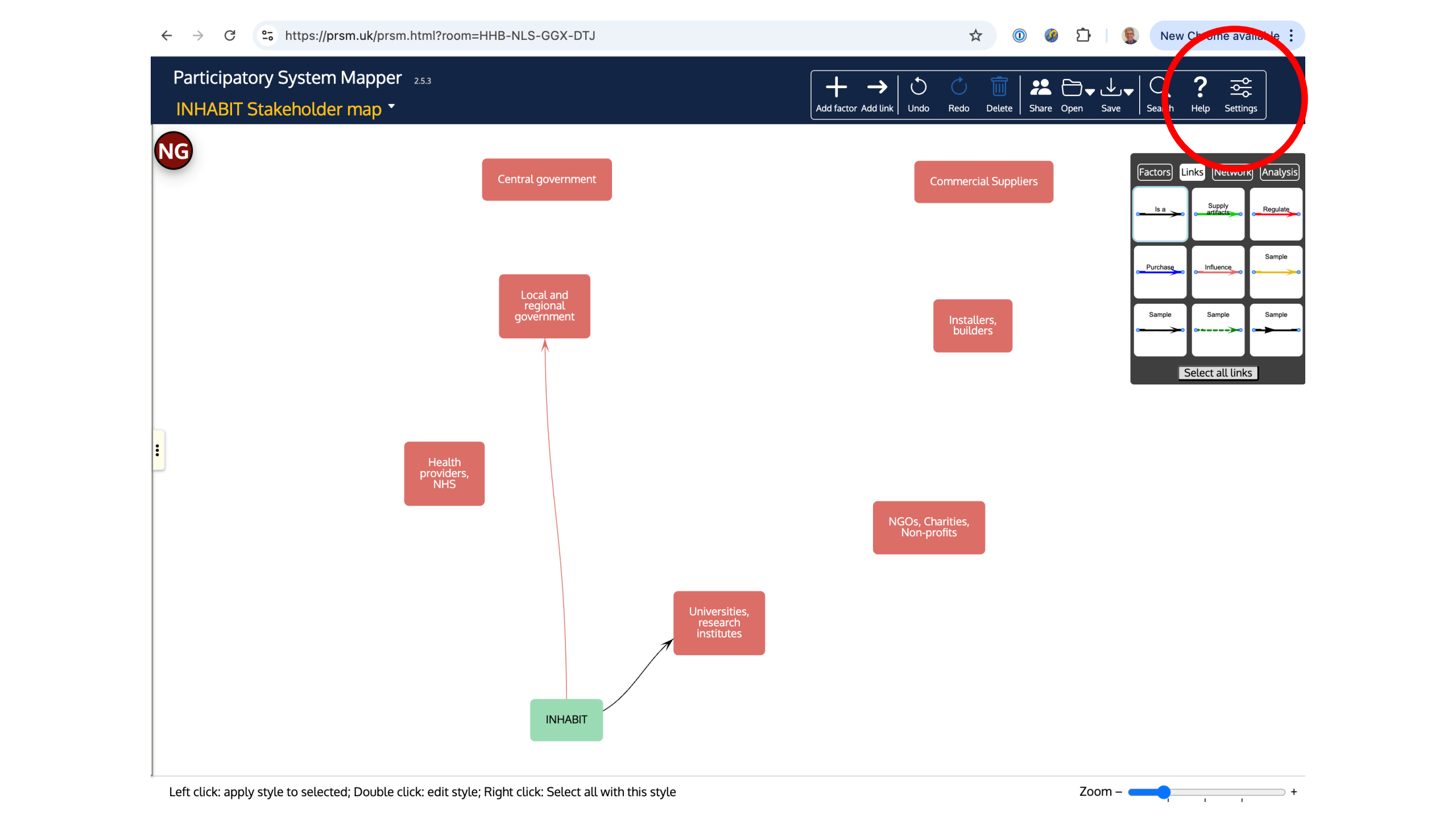
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Select all links
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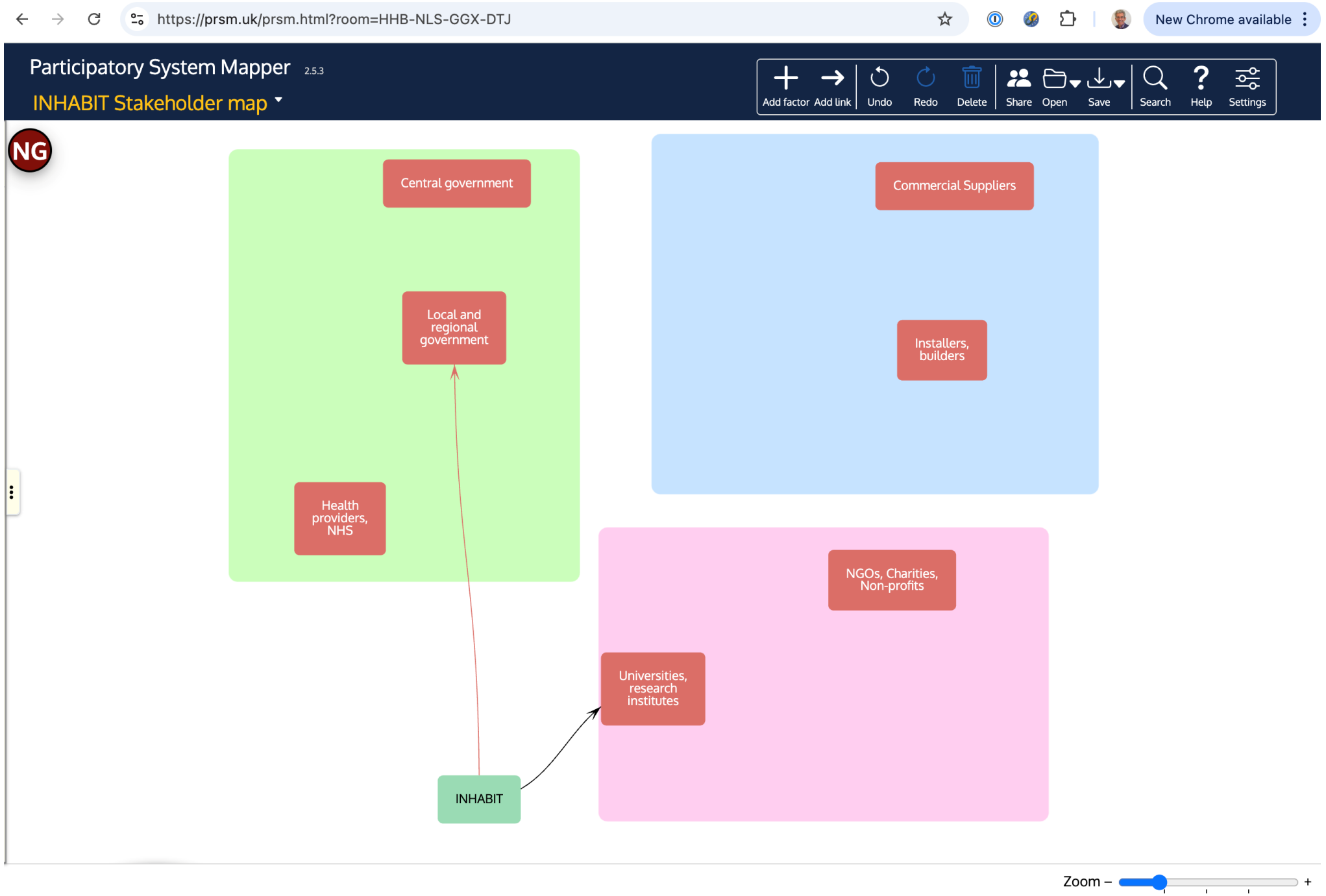
Universities, research institutes
INHABIT
Left click: apply style to selected; Double click: edit style; Right click: Select all with this style
Zoom –
+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INHABIT
Zoom –
+

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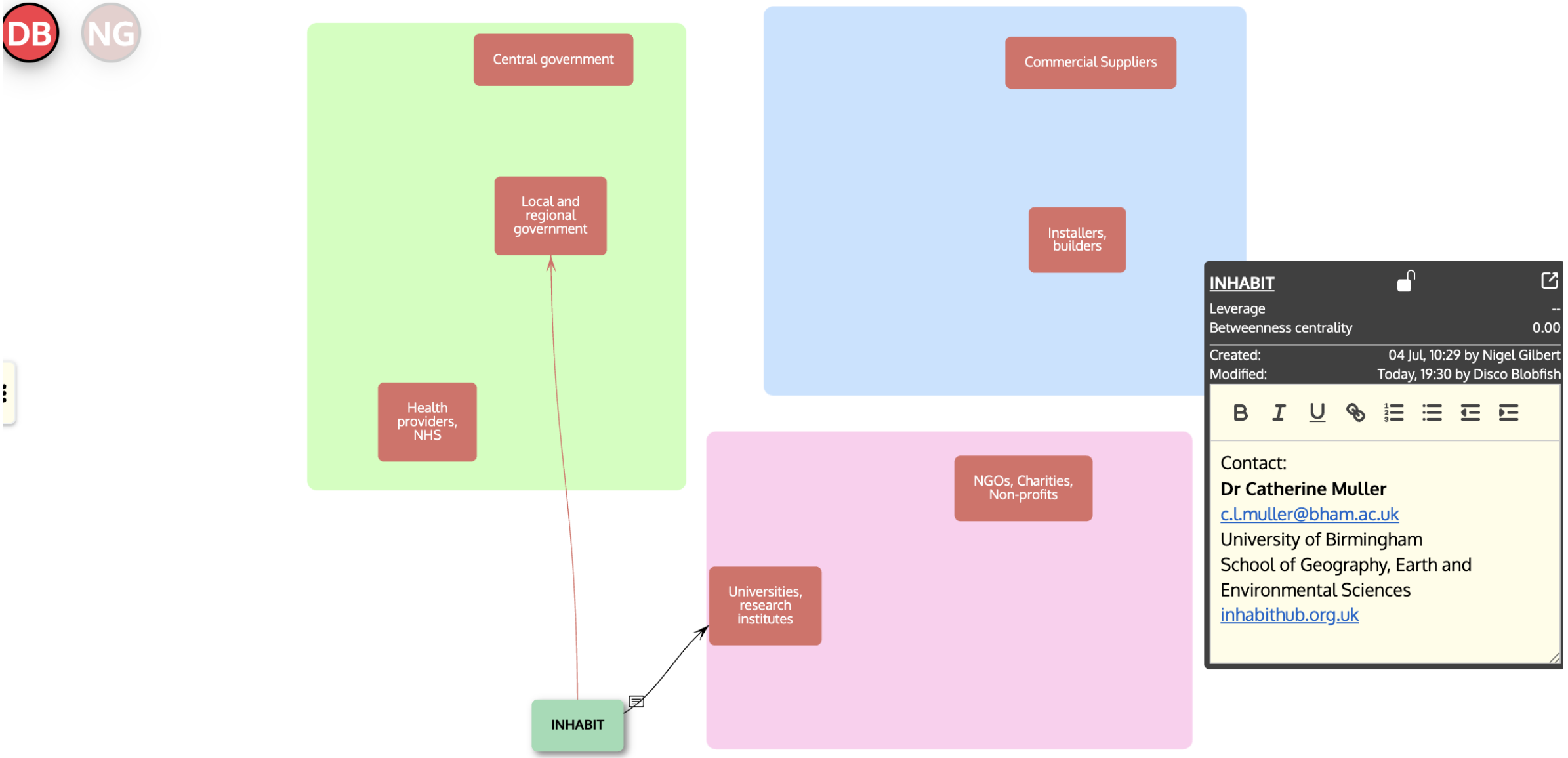
INHABIT Stakeholder map

Add factor | Add link | Undo | Redo | Delete | Share | Open | Save | Search | Help | Settings

DB NG



INHABIT

Leverage --

Betweenness centrality 0.00

Created: 04 Jul, 10:29 by Nigel Gilbert

Modified: Today, 19:30 by Disco Blobfish

Contact:
Dr Catherine Muller
c.l.muller@bham.ac.uk
University of Birmingham
School of Geography, Earth and Environmental Sciences
inhabithub.org.uk

Factor: "INHABIT" selected

Zoom – +

Session 2. Stakeholder mapping

- Breakout into 8 groups (30 mins)
- Each group will use PRSM to develop a map of stakeholders (those organisations that have an interest in the outcomes and impacts of the Hub)
- Each group elects one member to be the scribe. That person adds boxes to represent stakeholder organisations and links them to stakeholder categories and to other stakeholders. If possible, also add contact or other details as a note.
- Each group should focus on one area of the map (green, blue, or pink)

The Institution of Environmental Sciences

https://prsm.uk/prsm.html?room=hhb-nls-ggx-dtj

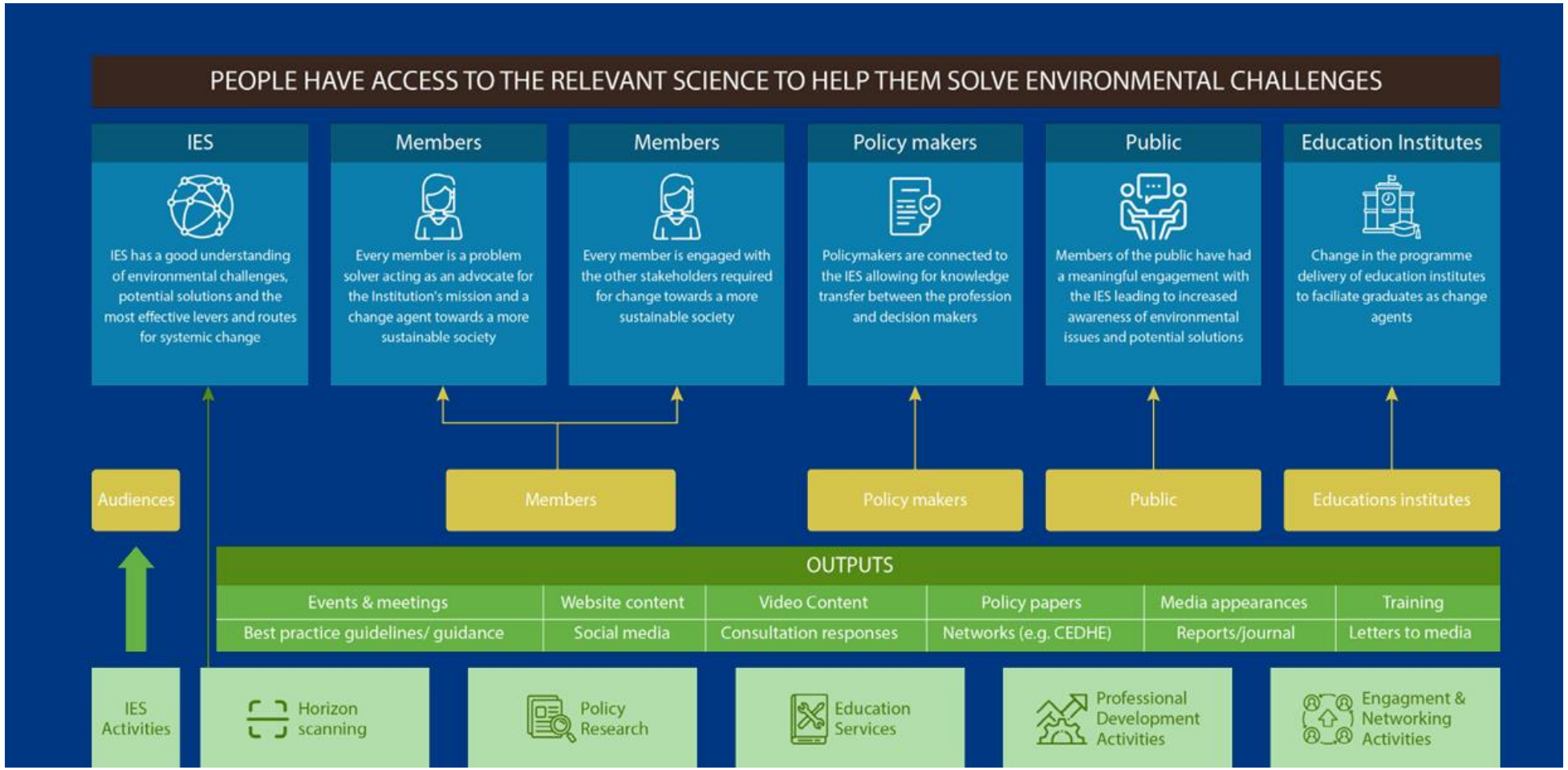
Session 3. Defining key outcomes

How are outcomes different from impact?

- These are short to medium/long term changes that occur as a **direct** result of the project.
- Outcomes are what are needed to achieve the ultimate impact (the necessary pre-conditions)– **note** that there may be many outcomes needed for the impact that may fall out of scope of the project.
- Outcomes should be written in a certain way so that they are measurable
- An outcome may represent a change in a group of people, organizations, or places. Outcomes are the building blocks of your Theory of Change.

The Institution of Environmental Sciences

Example ToC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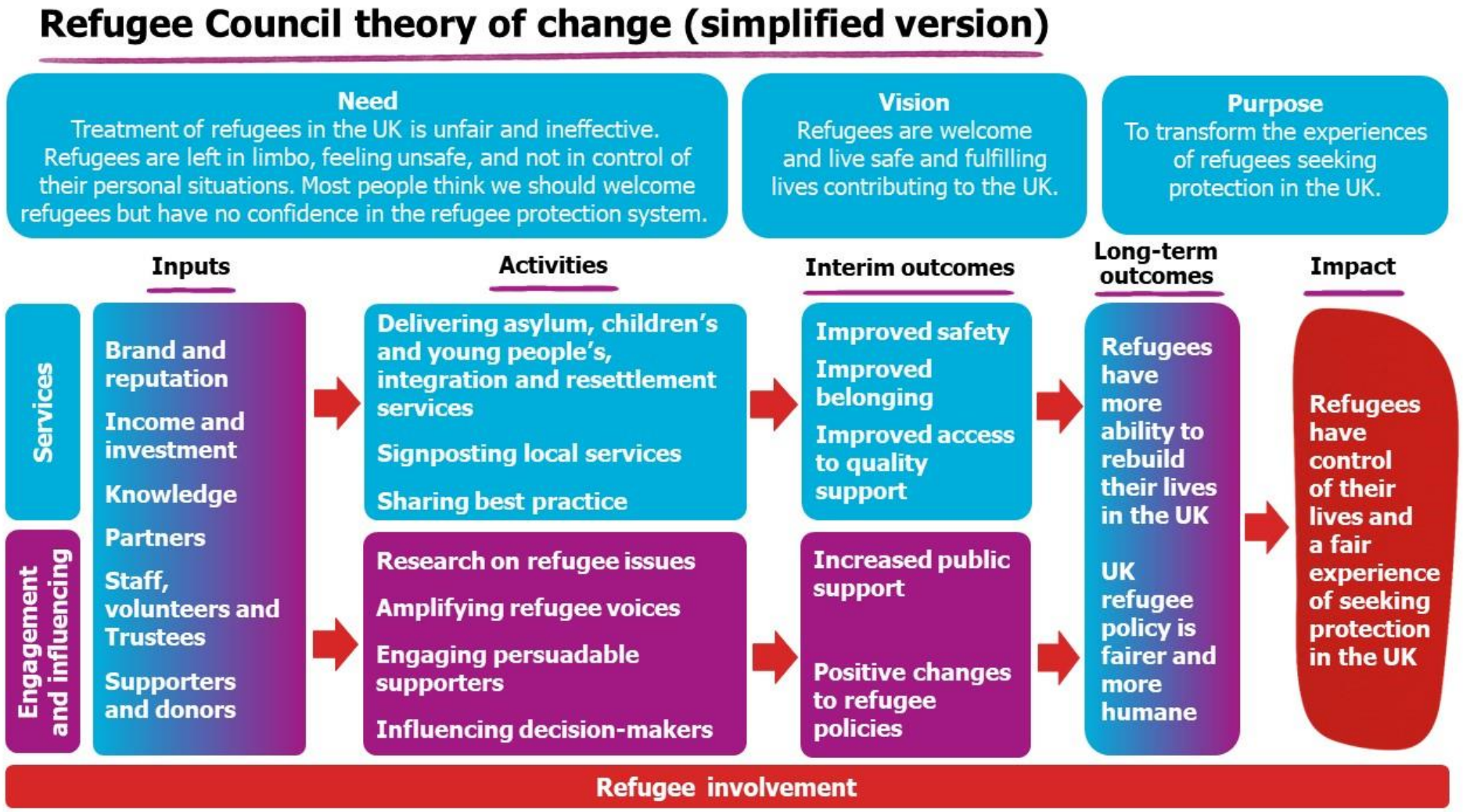
Letters to media
IES Activities
Horizon scanning
Policy Research
Education Services
Professional Development Activities
Engagment & Networking Activities

Example ToC


Refugee Council theory of change (simplified version)
Need
Treatment of refugees in the UK is unfair and ineffective. Refugees are left in limbo, feeling unsafe, and not in control of their personal situations. Most people think we should welcome refugees but have no confidence in the refugee protection system.
Vision
Refugees are welcome and live safe and fulfilling lives contributing to the UK.
Purpose
To transform the experiences of refugees seeking protection in the UK.
Inputs
Activities
Interim outcomes
Long-term outcomes
Impact
Services
Engagement and influencing
Brand and reputation
Income and investment
Knowledge
Partners
Staff, volunteers and Trustees
Supporters and donors
Delivering asylum, children's and young people's, integration and resettlement services
Signposting local services
Sharing best practice
Research on refugee issues
Amplifying refugee voices
Engaging persuadable supporters
Influencing decision-makers
Improved safety
Improved belonging
Improved access to quality support
Increased public support
Positive changes to refugee policies
Refugees have more ability to rebuild their lives in the UK
UK refugee policy is fairer and more humane
Refugees have control of their lives and a fair experience of seeking protection in the UK
Refugee involvement

Outputs and mechanisms of change

- Outputs are the next stage after outcomes to consider in a Theory of Change. These are the direct products or deliverables of INHABIT activities.
- Action is often needed to translate project outputs to the outcomes
- These are called mechanisms of change
- They can include a broad number of activities, but they are the enablers needed to effectively support an output in delivering an outcome
- They can include activities like engagement activities, training, resourcing (i.e. funding etc).
- Mechanisms of change are **crucial** to achieving a project's impact.

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Session 3. Outcomes

- Discuss in breakout groups for 35 minutes
- We will then come back together to feedback and discuss as a group
- We will highlight where there are common outcomes across stakeholder types

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Where have we got to so far?

- Articulated the impact – the change in society that INHABIT wants to achieve
- Mapped the key stakeholders for INHABIT
- Identified some key outcomes

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Potential next steps

- Identify project outputs and link to outcomes with mechanisms of change
- Gap analysis – where are there gaps in delivering the impact pathway?
- Prioritisation of action
- Develop indicator framework

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Session 3. The impact pathway

Inputs and activities	Outputs	Change mechanism	Outcomes (short term)	Outcomes (long term)
Inputs	What tangible results, products, lessons, inspections or improvements will be produced?			
Activities				

Thank you!

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Let’s work together…

- **Co-create** research agenda and co-deliver research
- **Co-develop** policy scenarios, action plans, strategies etc.
- **Collaborate** on real-world measurements
- **Contribute to** Systems mapping workshops
- **Collaborate** on behaviour change assessment
- **Co-develop** real-world exemplar NZN or retrofitting programmes
- Joint funding **applications**

Get involved and stay connected:
Email: inhabit@contacts.bham.ac.uk
Website: inhabithub.org.uk
LinkedIn: linkedin.com/company/inhabit-hub/

INHABIT
Indoor HABItability during the Transition to Net Zero Housing Hub

Thank you for your time and contributions

Get involved and stay connected:
Email: inhabit@contacts.bham.ac.uk
Website: inhabithub.org.uk
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