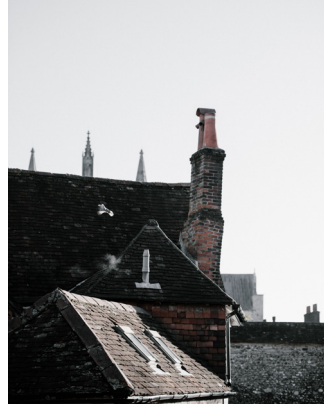


Complex to decarbonise homes

In 2023, DG Cities and University College London partnered to deliver research for the Department for Energy Security and Net Zero. The project defined and outlined an approach for identifying the most challenging housing stock to decarbonise.

This work, detailed in the recent publication *'Defining and identifying complex-to-decarbonise homes and retrofit solutions'* is summarised here, along with the practical applications of the framework developed to help councils meet their net zero targets for housing.



The decarbonisation of heat in buildings is vital if the UK is to meet its target of achieving net zero by 2050. In 2019, the UK Climate Change Committee noted that over a third (37%) of Britain's annual greenhouse gas emissions come from building energy and heat.

Local government plays a central role in achieving net zero. Councils across the country own a significant amount of social housing that requires retrofit and modernisation to improve efficiency and decarbonise heating. Councils across the UK are taking action through various means: standards, providing incentives, supporting innovation, fostering community engagement, and integrating decarbonisation approaches into planning and infrastructure development.

The UK government recognises this key role local authorities play. Interventions such as the Social Housing Decarbonisation Fund (SHDF) have been developed to provide £3.8 billion to local authorities for improving the energy efficiency of social housing in England. Over four waves, the SHDF will help authorities to transform their stock and take tangible steps to achieving net zero.

A key challenge, however, is the nature and quality of the housing stock that local authorities are working with. The UK is home to some of the most diverse and challenging housing in Europe. Materials, build quality, space, and history of use are just some of the factors that mean achieving net zero can become hugely challenging. Beyond these factors, our research identified the **occupant demographic, behavioural** and **system-level** factors that can make decarbonising these properties more complex.

It is these complex to decarbonise properties that we believe require attention, and a clear and detailed methodology. Innovative approaches are important across the project lifecycle, including addressing occupant engagement and knowledge building, supplier capabilities, neighbourhood-level approaches, in ensuring effective delivery that limits disruption and realises wider benefits, and for effective monitoring and evaluation.

What are complex-to-decarbonise homes?

Properties that are challenging to decarbonise and transition to net zero can be defined as 'complex to decarbonise' (CTD). Understanding the nature of these properties, and the context in which they are situated, is critical to being able to deliver decarbonisation. CTD is not binary, but rather an index:

- CTD homes are those with either one, or a combination of, certain **physical, locational, occupant demographic, or behavioural** attributes that prevent the effective decarbonisation of that home until they are addressed. These attributes might constrain the design and delivery of measures to improve energy efficiency, decarbonise heating, or realise occupant benefits (e.g. increased comfort and affordability of domestic heat and energy).
- These effects may be amplified by one or a combination of numerous system-level factors including **financial** (e.g. feasibility and affordability of measures), **economic** (e.g. supply chain and materials availability), and/or **organisational capacity and capability** (e.g. workforce skills).



How can our team help?

DG Cities and UCL developed this definition with the Department for Energy Security and Net Zero (DESNZ) through evidence review, sector engagement and qualitative analysis. We are now in a position to support knowledge building of this definition in practice, and identify the data and evidence that can support the identification of these homes for local authorities and clients.

How to identify complex-to-decarbonise homes

CTD properties can be challenging to identify given the variety of attributes and characteristics that make them complex to decarbonise. The framework DG Cities developed with UCL for the Department for Energy Security and Net Zero can be utilised to draw together the data needed to identify properties and support retrofit and heat decarbonisation.

Developed to support the design of policy, the *Complex to Decarbonise Identification Framework* brings together the attributes referred to in the definition (physical, locational, occupant demographic, and behavioural) and approaches to analyse CTD properties.

The framework enables analysis at both the individual dwelling level (how CTD is this property?), and across geographic levels (how many CTD properties are there in this neighbourhood/ local authority/ region/ nationally?) The framework provides users with a CTD index (between 0 and 1), combining measures for each attribute. The framework itself is data agnostic and users can set the appropriate weightings for different attributes to use for their own purposes. In this way, the framework provides a multi-attribute lens to identify and understand CTD homes.

Asset Management for the Royal Borough of Greenwich

DG Cities is supporting the Royal Borough of Greenwich in understanding in detail the type and quality of its housing stock to aid progress against net zero objectives. Our work is helping to:

- Identify a property-by-property plan of works within the Royal Borough of Greenwich's housing portfolio.
- Develop clear approaches for each property to define what works need to be undertaken and when.
- Estimate clear costs, timescales and understand impacts on relevant targets.
- Develop clear work packages against which contractors can effectively deliver work.

Through this work we are able to apply the CTD approach to define specific activities that support decarbonisation of challenging housing stock.

What works?

Our research identified that key challenges to retrofitting CTD homes remain under-evidenced and that more solutions are needed. However, it also identified successful approaches to decarbonise these homes: in listed buildings, mixed tenure properties, with residents in fuel poverty, and remote rural to high-density high-rise urban properties, each accompanied by detailed case studies demonstrating what works.

We identified, for example, that the unique characteristics and challenges of CTD homes need to be recognised to deliver effective retrofit; that social barriers can be addressed through occupant-centric approaches and utilising co-benefits; and that some technical interventions, introduced cost-effectively and in a timely way, can mean homes are no longer CTD. Get in touch to find how we can help you understand your housing stock and develop realistic and deliverable plans for improvement works.

Our experts



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Ed is a thought leader in systems-thinking, system resilience, and service design. He is a mixed-methods researcher who specialises in evidence-based policy and practice development.



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Balazs leads the delivery of our innovation projects, solving challenges through the integration of new technologies and holistic thinking. His approach is founded in strategy consultancy with technical expertise in the electric vehicle, connected and autonomous mobility and smart cities sectors.



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Leanne brings experience in socio-economic planning, assessment, business cases and evaluation across infrastructure. She has an MSc in Behavioural Economics, including research on commuting changes and subjective wellbeing, and draws on both economic and behavioural insights to design and deliver successful urban interventions.



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As a specialist in Net Zero, Rasheed is involved in a range of decarbonisation projects, in Greenwich and beyond. Previously, he worked for one of UK's largest housing associations as an energy advisor, where he gained exposure to district and communal heating systems, and for a sustainable energy consulting firm, managing retrofit meter exchange projects.

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