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TACKLING FUEL POVERTY IN LONDON HOMES

31 July 2023

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Table of abbreviations

BEIS	Department for Business, Energy, and Industrial Strategy
BRE	Building Research Establishment
CREDS	Centre for Research into Energy Demand Solutions
CUK	Citizens UK
DESNZ	Department for Energy Security & Net Zero
ECO	Energy Company Obligation
ENEX	Energy Expenditure
EP	Energy Poverty
FOI	Freedom Of Information
FP	Fuel Poverty
FPP	Fuel Poverty Partnership
GLA	Greater London Authority
HMO	Houses in Multiple Occupation
IPPR	Institute for Public Policy Research
LBSM	London Building Stock Model
LIHC	Low Income, High Cost
LILEE	Low Income, Low Energy Efficiency
LLW	London Living Wage
MEES	Minimum Energy Efficiency Standards
NGO	Non-Governmental Organisation
PRS	Priority Service Register
NHS	National Health Service
WHO	World Health Organization

Preface

This report is the outcome of phase one of an interdisciplinary research project on fuel poor homes retrofit in London, funded by the University of Westminster Participatory and Policy Research Fund. This work, which took place from May to July 2023, was prompted by the interest of the NGO "Citizens UK" in keeping track of the Mayor of London's progress in upgrading large numbers of fuel poor homes.

An initial understanding of the Mayor's commitment appeared to indicate an intention to upgrade a total of 100,000 fuel poor homes before the end of the current mandate. However, further research revealed that there was no formal commitment to a binding number of residential units but instead a promise to continue working to achieve larger numbers together with the G15 housing association group. As a result, the focus of this research shifted from assessing progress towards a specific pledge to finding out the current state of fuel poverty mitigation work being carried out from the Mayoral office since April 2021.

Executive Summary

The challenge of economic and health inequalities caused by fuel poverty are rooted in the rise in fuel costs which have strong implications affecting the cost of living. Fuel costs and rising inflation due to economic and political reasons threaten individuals and families who are already struggling financially, putting them in/at risk of fuel poverty. The UK is one of the first countries to define the challenge of households living in fuel poverty prompting necessary actions, policies and interventions.

This study presents the results of an empirical investigation following direct enquires to the Greater London Authority (GLA) and all of London boroughs via Freedom of Information (FOI) requests on retrofit interventions, including an overview of financial incentives and planning assessments with an aim to increase the number of home energy upgrades since April 2021.

London adopted its own action plan in 2018 to renew its focus and alleviate more than 350,000 households in fuel poverty (GLA, 2018). The assessment and indicator for fuel poverty has changed over time, from the Low Income High Cost (LIHC) to Low Income Low Energy Efficiency (LILEE) indicator in 2021. However, identifying households in fuel poverty remains challenging and some indicators are somewhat disconnected from what is happening on the ground. The findings suggest that there is a need to establish tools and methodologies that are connected to the national and local context. Fuel poverty is affecting people's health and well-being, particularly those already facing socio-economic and health inequalities. After the COVID pandemic, a political awareness of fuel poverty is found in the Mayoral manifesto, however the Fuel Poverty Action Plan does not have binding targets and is not regularly updated. Current Fuel Poverty Partnership Tasks are focusing on awareness and communication or the urgent support to households already affected, but not in tackling the root causes of fuel poverty in upgrading fuel poor homes.

The uptake on retrofits from 2021 is still low and far from reaching 100k homes and the net zero target in 2030 is approaching fast. The study concludes that while LILEE is decreasing other indicators are increasing with rising energy prices. The London Building Stock Model is not widely used by boroughs, and it only maps the Energy Performance Certificate (EPC) rating which is not sufficient to identify households in fuel poverty. Most schemes such as Energy Companies Obligation (ECO) do not specifically target fuel poverty but have a wider scope of retrofit towards net zero. The Mayor of London should explore a new indicator tool by crossing data from LBSM with socio-economic data to identify fuel poor households more accurately. The indicator could potentially include geographical location, building typology (age, etc), socio-economic / demographics, leading to action plan and retrofit strategies.

Introduction

In the current global socio-economic landscape, the pressing issue of fuel poverty is a significant challenge, having a substantial impact on a large portion of the world's population. The UK has been one of the first countries to define fuel poverty with an Act of Parliament in 2000 and since then through surveys and national statistics (Bouzarovski, 2018). Although different definitions and measures of fuel poverty can lead to different results, recent events such as high inflation and rising energy costs, as well as climate change, have impacted on an increasing number of people exposed to fuel poverty. This has led many local and national governments to consider and start implementing urgent measures to alleviate fuel poverty through a variety of interventions - notably financial assistance to pay bills and maintain a household's quality of life, home retrofit programmes, advice and awareness campaigns (Butler, 2022).

Objectives

The overarching aim of this work is to investigate how fuel poverty is currently addressed in London, in the context of the Mayor's intention and commitments, taking into account the schemes available to both the GLA and the UK central government.

To achieve this aim, the objectives of this research are as follows:

- To provide an overview of the barriers and the complex relationship between the net zero and climate change targets, rising energy prices, Indoor Environmental Quality, and wider socio-economic inequalities that drive current levels of fuel poverty in the UK.
- To provide an overview of the governance arrangements and policy frameworks in London for tackling fuel poverty.
- To assess official definitions, indicators as well as local (London) and country-wide programs and assessment frameworks on fuel poverty and energy retrofitting.
- To map the methods used in London to identify households in fuel poverty and to gather evidence on the number of upgraded households since April 2021.
- To make recommendations to policy makers and practitioners about the effectiveness of current policies addressing fuel poverty and recommendations on reforms of some of the key Mayoral and UK Government polices, plans and assessment frameworks.

In all the above objectives, the report also assesses the impact of the Covid-19 pandemic in highlighting health and social inequalities, followed by an overview of the London Fuel Poverty Action Plan.

Research Methodology

The research project was initiated by a request from Citizens UK to ascertain the outcomes of the Mayor of London's commitment to retrofit 100k fuel-poor homes since 2021. However, no binding evidence was found, and the overall aim of the research project was then shifted to investigate how fuel poverty is addressed in the context of energy retrofits in London. The research team concentrated on analysing the current policies and mechanisms for addressing fuel poverty in London and developing an evidence base of the number of households upgraded since 2021.The research design followed the following steps to achieve the research aim and objectives.

Firstly, a **thorough thematic literature review** was undertaken covering the areas of fuel poverty, energy efficiency, policy framework in London and wider UK. Academic publications (mostly post 2016) were reviewed together with policy documents such as the GLA's "Fuel Poverty Action Plan" (GLA, 2018), Sadiq Khan's electoral manifestos (London Labour Party, 2016 and 2021) and declarations, statistics, documents and sources from the UK government. This desk-based overview provided an understanding of the specific targets, policies and commitments on fuel poverty and energy retrofits at both local and national levels.

Secondly, the **research team identified and attended available training courses** on fuel poverty and the role of energy efficiency and retrofits.

Thirdly, **empirical data** were collected in the form of Freedom of Information (FOI) requests. The data pertaining to the number of retrofitted fuel poor homes are not easily accessible online, therefore FOI requests were sent to all 33 boroughs in London including the GLA to identify the figures and get a clear picture of the current status of upgrading the domestic stock since 2021. Follow up discussions were arranged with GLA.

Lastly, **preliminary findings were dissemination in a multistakeholder focus group workshop** on 26th July 2023 at the University of Westminster. The audience included academics, local authority officers (London Boroughs), GLA representatives and practitioners working in the areas of architecture, construction, building energy performance, environmental design, governance, and social sustainability for feedback and discussions to validate the findings, conclusions, and recommendations from Phase I and inform the next Phase of this research.

A significant limitation in the empirical research via the FOI is that London boroughs are independent entities and most councils do not have information about the private stock. The housing associations are independent from GLA with limited duty to monitor or make public information on their stock. This fragmentation of responsibilities was evident in the limited data gathered for both private and public housing stock, as presented in the Analysis and Findings section.

Governance and Policy Context

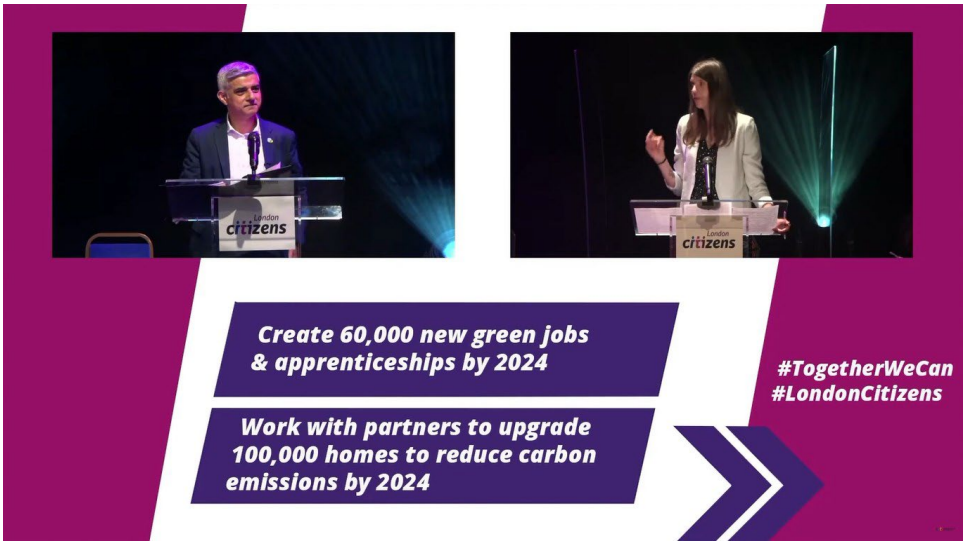
Upgrading 100k fuel poor homes: a call from Citizen UK

In February 2021, the report “London, a just transition city” was published by the Institute for Public Policy Research (IPPR) and London Citizens, the local branch of Citizens UK (CUK).

Built on the concept of a 'just transition', originally developed by US trade unions in the 1990s (Smith, 2017), this campaign aims to motivate politics to reconcile economic and social justice with climate action. Cycles of listening campaigns permitted to learn from the communities and to define a plan of actions. Creating 60,000 green jobs and working to end fuel poverty by 2030 were the two priorities highlighted in this work (Murphy et al, 2021).

Following this report, the Mayor of London, Sadiq Khan, was called to upgrade 100,000 fuel poor homes over the next Mayoral term at the Mayoral Accountability Assembly in April 2021. During this event, which was broadcasted in an online video, the Mayor committed to “build that progress to retrofit even more homes in London”.

The video shows that the mayoral candidate did not, however, explicitly pledge to improve a binding number of homes, nor did he commit to any particular method or framework for this. Moreover, London Citizens mentioned at this event that the G15, the group of leading housing associations, committed to upgrading 60,000 homes already, and stated that “we are looking for the next Mayor’s leadership in getting the remaining 40,000 done (CUK, 2021).”.



Screenshot of the video recording of the Mayoral Accountability Assembly
Source: Citizens UK (2021)

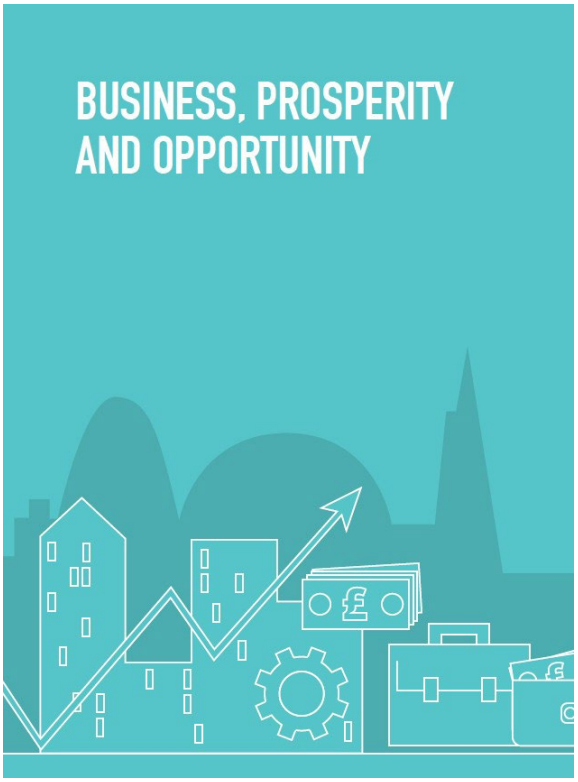
The Covid-19 pandemic: a political awareness of inequalities

The financial difficulties caused by the Covid-19 pandemic have been severe. "Eat or Heat", a local food bank in Waltham Forest, reported on its website 103% increase of first referrals in 2020, that were not known to them before. While vulnerabilities were highlighted, it was also an opportunity to spread awareness on these pre-existing situations and urge politicians to take immediate action. The review of Sadiq Khan's manifestos reveals a shift of vocabulary and goals between 2016 and 2021 elections.

In "A Manifesto for all Londoners" in 2016, Khan describes his ambitions for London after ten years of experience as a Member of Parliament. Tackling the housing crisis is recognised as the first priority: *"The housing crisis is the single biggest barrier to prosperity, growth and fairness facing Londoners today"* (2016, p. 20). Substantial growth of population, slow housing supply, growth of inequality, and increase of land price driven by private market development are a few examples that illustrate the situation at the time (Edwards, 2015). However, the Mayor plans to tackle the problem by boosting the economy, and building new homes with energy efficiency, low carbon and sustainability standards: *"That's why, if I am elected Mayor, my single biggest priority will be to build thousands more homes every year, for you, your family and your friends (...)"* (2016, p.20). In this first manifesto, there is no mention of the word "retrofit". After the 2015 Paris Agreement called to limit global warming to 1.5°C above pre-industrial levels, the Mayoral candidate manifesto sets a net-zero target for 2050: *"I want to be the Mayor who makes London one of the world's greenest cities."* (2016, p.64). However, the strategies defined to reach the target are clearly oriented towards energy (e.g., developing "clean energy", implementing "smart-meters") rather than the improvement of the performance of the building itself. To people struggling with their finances, the candidate's solution is to keep private rent and fees down and improve the London Living Wage (LLW). There is no mention of reducing the energy prices or strategies to cut the costs of housing. Finally, while a link is established between air pollution and health, *"I know from personal experience that the city's air is damaging people's health, as I suffer from adult-onset asthma"* (2016, p. 64), the candidate pledged to improve the outdoor air, but did not mention the indoor air quality.

In "Sadiq for London" in 2021, there has been a clear change in the rhetoric. Post-pandemic, it's time for recovery: the word "health" is mentioned 94 times in the document (including healthier, healthy, healthiest, healthily). A *"recovery board"* is proposed to be set up with five aims, including the aim *to "narrow social, economic and health inequalities"* and to *"accelerate delivery of a cleaner, greener London"* (2021, p. 21). The candidate recognised the existence of unsuitable housing, low life expectancy for unhealthiest Londoners and aims to tackle social inequalities: *"London has had the most tragic of wake-up calls — a devastating reminder that the inequality and deprivation that the city has tolerated for too long were the conditions in which a killer virus thrived"* (2021, p. 10). The agenda is therefore oriented towards building a healthier future: *"So I'll work with others to establish a new measure of wellbeing in London as the core indicator of our city's success as a place to work and live for all its residents"* (2021, p. 70). The words "fuel poverty" appear, but the document does not set binding targets or action plans: *"London has more households and children living in*

relative poverty than anywhere else in the country. One in nine households is in fuel poverty in London, unable to meet the cost of heating their home" (2021, p. 69). The *"Green New Deal"* is presented for London, and the net zero target set in the previous manifesto is amended: "*First, London will have the right level of ambition and urgency for the scale of the problems we face. That's why I'm aiming for London to be carbon-neutral by 2030"* (2021, p.54). Clean and affordable energy and a cleaner outdoor air are still the two main focuses of its campaign. Retrofit is acknowledged as a solution, but the mechanism to take action is clearly not defined yet, as funds from the government are mentioned: "*I want to go further, exploring opportunities to set up a leading centre which will accelerate the piloting of innovative and deep approaches to retrofitting properties to meet our climate targets, and making sure housing on GLA land is of the highest standards. I'll lobby the government for the funds London needs to retrofit millions of homes, ensuring a targeted approach for those residents who need warm, healthy houses the most. I'll fight for the powers to mandate minimum energy efficiency standards in existing homes — essential in meeting London's 2030 carbon-neutral target*" (2021, p. 58) extract of "A Manifesto for all Londoners".



Source: London Labour Party (2016).

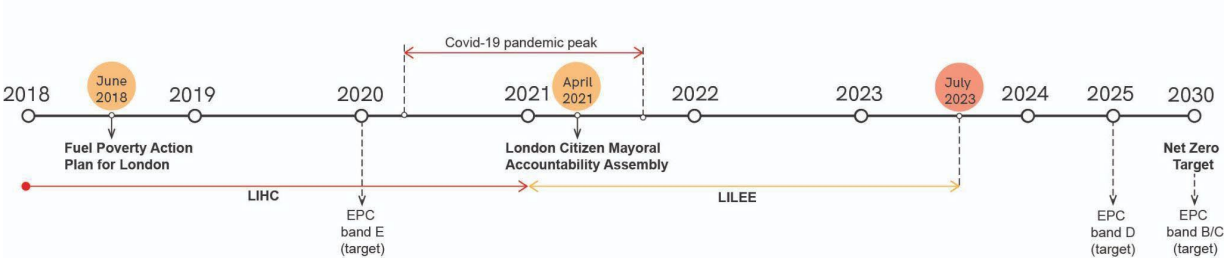
Extract of "Sadiq For London"

Source: London Labour Party (2021)

Policy framework and financial incentives

The fuel poverty crisis has impacted millions of households in the UK, and London has experienced an alarming number of households living in fuel poverty particularly vulnerable groups that have been also disadvantaged by the high costs of living.

In the fuel poverty statistics report published by the Department for Business, Energy and Industry (BEIS), there was an estimated 30,000 increase in homes in fuel poverty in England between 2013 and 2014, with 69% of these happening in London (cited in GLA, 2018). Additionally, there were more than 330,000 households in London living in fuel poverty in 2015 prompting an urgent and strategic action to take. London adopted its own strategy through the creation of the London Fuel Poverty Action Plan in 2018 as a consequence of the insufficient national plan to tackle fuel-poor households (GLA, 2018). Many different schemes and programmes, ranging from economic help to retrofit schemes and advice, have been promoted and implemented since 2018, with an end goal to tackle fuel poverty and make London a net zero carbon city by 2030. The figure below represents a summary timeline (as of July 2023) of policies and targets affecting fuel poor households since 2018, seeking to explain the role of public and private sector in relation to domestic energy retrofits.



Summary Timeline of Policies and Targets

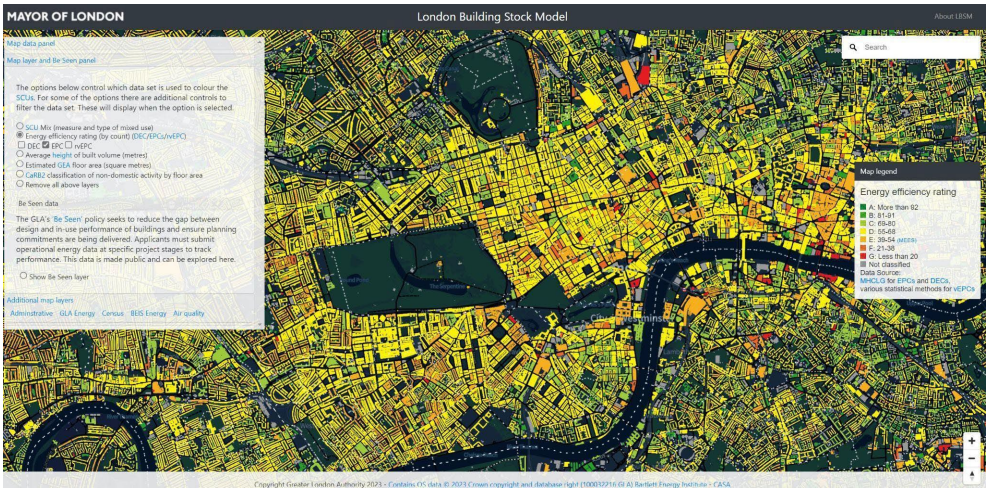
Source: The research team (July 2023)

The **Minimum Energy Efficiency Standards (MEES)** sets a target particularly in the private rented sector to improve the energy efficiency of the property and reach an **EPC rating of C** by 2030. The current administration lobbied the government to target 70% of homes to reach EPC C (or equivalent) by 2030 in response to a Q&A assembly held last May 2021 (GLA Q&A, 2021). This is the goal towards the net zero approach by 2030 to decarbonise the building sector and improve the energy efficiency of the building stock.

The Low Income High Cost (LIHC) indicator was initially adopted from the national plan to define fuel poverty in the **London Fuel Poverty Action Plan**; and it is also an indicator to assess households in fuel poor conditions. The action plan sets its goal to alleviate fuel poverty and reduce fuel poverty gaps by tackling: energy efficiency, low income, and high energy tariffs. In 2021, the definition was amended to Low Income Low Energy Efficiency (LILEE) (DESNZ, 2023a).

The action plan is part of the Mayor's Energy for Londoners (EfL) programme that seeks to renew the focus of fuel poverty in London, to help Londoners who could not heat their homes and overcome the health effects of cold, damp, and draughty living conditions. This gives

priority to fuel poor homes to improve the energy efficiency of homes, particularly in the private rented sector living in properties with EPC rated F and G. Whole-house approach retrofit was recommended as the plan of action to improve the building fabric which can positively impact the energy performance of homes. The creation of an accessible database such as the **London Building Stock Model (LBSM)** (UCL, 2020), created by UCL Energy Institute, which maps out households and their EPC rating can quickly determine the energy performance of properties. (https://maps.london.gov.uk/lbsm-map/public.html)



Screenshot of the LBSM on the GLA website
Source: GLA, 2023a

Another focus of the action plan is to target the problems with high energy prices with many Londoners who do not have access to more affordable energy tariffs. It highlights the unfair share of funding that London received from **Energy Company Obligations (ECO).** It seeks to protect fuel poor Londoners from disconnection and debt from energy companies through the Priority Services Register (PSR) (GLA, 2018). The roll-out of smart meters could give Londoners access to better deals as compared to the prepayment system which offers high energy prices in the market.

The **Warmer Homes programme** provides grants between £5,000 to £25,000 to eligible low income homeowners and private tenants to introduce a variety of full funded energy efficiency improvements, such as: insulation (solid wall, room-in-roof, cavity wall, loft), air source heat pumps, high heat retention storage heaters, solar photovoltaic panels, and heating controls (GLA, 2023a). A number of other schemes are also targeted to low-income Londoners especially those that are long-term ill and disabled to have income support access from the different GLA schemes and grants: Benefits Entitlement Checks, London Affordable Rent, and London Living Wage. There is also the Fuel Poverty Support Fund which is currently known as Warm Homes Advice Service delivers support from home visits and advice to the different available schemes and referrals to other support services (GLA, 2023a).

The Mayor has also instituted a London **Fuel Poverty Partnership** (GLA, 2023a). This Partnership brings together various stakeholders from local government, social housing, landlords, tenants, health, social care, academic, charities, energy suppliers and the energy efficiency industry and encourage change and act as advocates for improvements in local policy targets and their delivery. More recently, in July 2023, the Mayor announced the

following updates in relation to the 2023-2025 fuel poverty and retrofit programmes in London (GLA, 2023b):

- expenditure of £2,600,000 of Warmer Homes funding on London homes in the owner-occupied and private rented sectors
- expenditure of up to £370,000 on a fifth round of the Warmer Homes Advice Service
- GLA successfully bid to the Department for Energy Security and Net Zero for £12,006,000 from the Home Upgrade Grant 2 competition for use in London in 2023-24 and 2024-25. This funding will support specifically low income households living in energy inefficient homes off the gas network by installing insulation and low carbon heating upgrades.

Finally, expenditure of £950,000 is sought for a new Retrofit London programme, current awaiting formal approval. This new delivery framework will include projects to develop future energy advice provision and increase London's share of retrofit funding (GLA, 2023b).

Increasing cost of fuels, rising inflation and climate change

In recent years, the world has witnessed a convergence of factors affecting the demand and supply of energy that have had a profound impact on our daily lives and the global economy. Three major critical issues causing this are the increasing cost of fuels, rising inflation and the various climate change effects (Butler, 2022; Halkos and Aslanidis, 2023; IPCC, 2022). These interconnected challenges have created a complex web of consequences that affect individuals, communities, and nations at multiple levels.

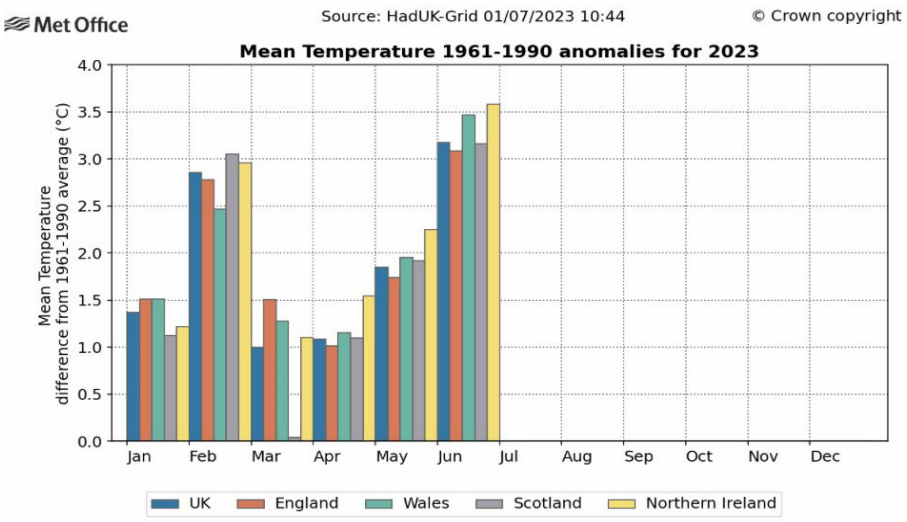
As fuel prices surge, the burden on individuals and families deepens, especially for those already struggling with financial constraints (Guan et al., 2023). The effects are experienced not only at the petrol stations or when paying household bills, but also in various sectors, such as agriculture, manufacturing, and services, where transportation costs are a significant component.

UK Natural gas price in the last ~10 years. *Source: Trading Economics, https://tradingeconomics.com/united-kingdom/electricity-price*

Increasing fuel costs lead to higher prices for goods and services, exacerbating the broader issue of rising inflation that has become a pressing challenge worldwide. In the UK, the effects

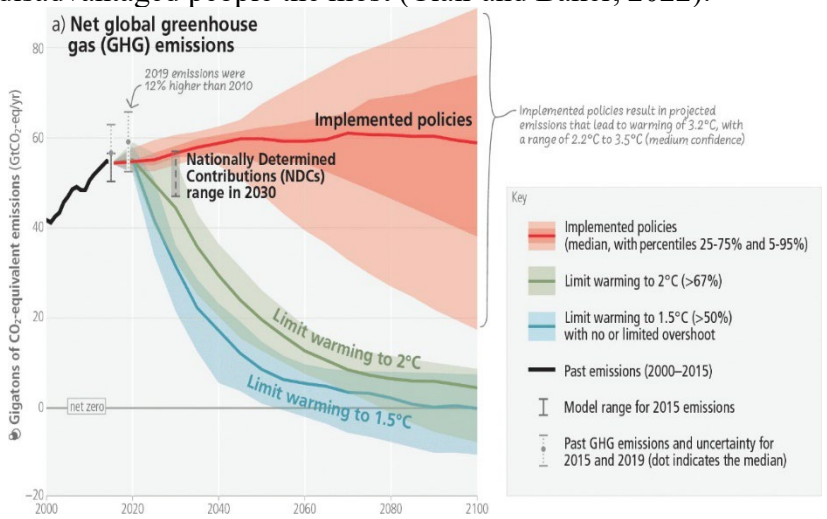
of inflation are acutely felt due to various economic and political reasons (including the consequences of Brexit), with the cost of living steadily outpacing the growth of wages (Breinlich et al., 2022). Rising prices for essentials such as housing, food, and utilities squeeze household budgets, leaving many struggling. As inflation erodes purchasing power, it exacerbates the issue of fuel poverty, defined as the *"inability to afford adequate energy for a comfortable and healthy life"* (Halkos and Aslanidis, 2023).

As society faces the challenges of expensive fuel and rising prices, we must not ignore the pressing issue of climate change. The evidence of global warming and its effects is becoming more apparent across the UK. We are witnessing an increase in extreme weather events like heat waves, drought, wildfires and heavy rainfall, which disrupt transportation, damage infrastructure, and pose risks to public health (IPCC, 2023).



Mean temperature 1961 - 1990 anomalies for 2023: peaks of +3.5°C have already been reached in June. *Source: Met Office "UK temperature, rainfall and sunshine anomaly graphs", https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-temperature-rainfall-and-sunshine-anomaly-graphs*

While dealing with the increasing cost of fuel, rising prices, and changes in our climate, it's important to understand how these issues are connected and how they affect vulnerable and disadvantaged people the most (Clair and Baker, 2022).



Net global greenhouse gas emissions: strong reduction across all sectors is necessary.

Source: Extract from IPCC (2023) AR6 Synthesis Report figures

Fuel poverty: Definitions and Indicators

Energy or Fuel Poverty is the condition that *"occurs when a household is unable to secure a level and quality of domestic energy services [...] sufficient for its social and material needs"* (Bouzarowski, 2018). This definition refers, more technically, to the phenomenon of "energy expenditure poverty": another form of fuel poverty is "energy access poverty" which refers to some developing countries' situations where actual access to an energy service network is hard to obtain. Historically, this topic was born and mainly studied in the context of the UK, where the most important (and therefore considered) energy expenditure (ENEX) is the one required for heating. After gathering representative data through surveys, energy poverty can be assessed with multiple methods, defined as "indicators".

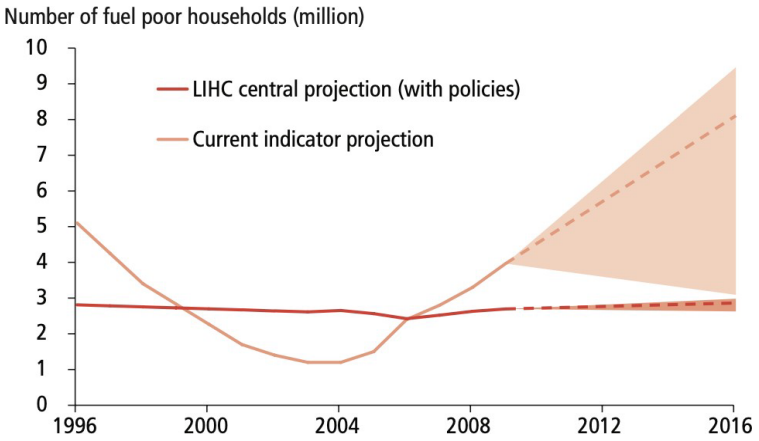
One of the simplest, intuitive but also subjective indicators is the **IAAW** (Inability to Afford Adequate Warmth in the Home). This 'inability' is a condition that is self-assessed by the occupants, with younger households more likely to report an inability to achieve adequate warmth (Deller et al., 2021). The other main indicators are based on more objective methodologies, usually considering the relationship between individual characteristics and external conditions, as illustrated below.

A simple but effective indicator is the **"10%" indicator,** according to which a household is fuel-poor if the ENEX are more than 10% of the income, mostly defined as net of tax and benefits (Deller et al., 2021). Therefore, a household is fuel-poor if:

$$FP\ Ratio = \text{Required Fuel Cost} / \text{Income} > 0.1$$

This was the former official UK indicator used by the Department of Energy and Climate Change (DECC), used in studies up to 2014. Official analyses conducted in Wales and Scotland still apply this method (Mahoney et al., 2020). Many scholars argue that a common disadvantage of using this method is its *"overly narrow assessment and excessive dependence on energy prices"* (Siksnelyte-Butkiene et al., 2021; Legendre and Ricci, 2015; Liddell et al., 2012; Moore, 2012). In the UK, and other developed economies, this definition is focusing on expenditure-based measures which is very different to how energy poverty is measured in developing and emerging settings (Deller et al., 2021). One therefore needs to understand whether there is an absolute or relative expenditure threshold; how to quantify energy needs; and how to measure household income (Thomson et al., 2017).

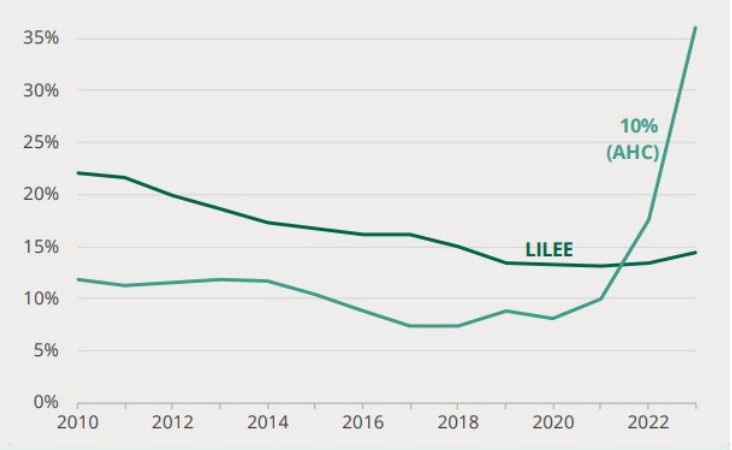
According to the **LIHC ("Low Income, High Cost")** indicator, a household is deemed fuel-poor if the following conditions are true: ENEX is more than the national median and the income remaining *after* the deduction of required fuel costs is below the official poverty line.



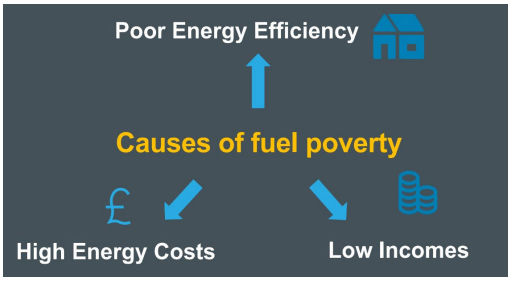
Projected fuel poverty headcount under LIHC and the 10% indicator, relative to England. *Source: Hills, 2012.*

One issue of this method is that the LIHC results tend to be *"associated with a specific set of socio-demographic and housing characteristics"* since, following this scheme, *"income, housing or energy-related support can focus on households whose primary earner is unemployed or in full-time education, followed by households in part-time work or retired households"*. This is due to a subdivision of the target population in arbitrary groups with different weight in determining fuel poverty. In fact, "the income-poor and housing-cost-induced-poor groups are less active in the labour market and tend to be of non-white ethnicity, relative to the fuel-cost-induced-poverty group. The household representative person is more likely to be young, male and a homeowner or tenant in the income-poor group, whereas households in the housing-cost-induced-poverty group are concentrated in the private rental sector" (Burlinson et al., 2018).

Finally, one of the most recent indicators used on a large scale is the **LILEE ("Low Income, Low Energy Efficiency"),** following which a household is considered fuel-poor if they are living in a property with an Energy Efficiency Rating of band D or below and the income remaining *after* the deduction of required fuel costs is below the official poverty line. Thus, LILEE is one of the few indicators taking environmental dimensions into consideration as well, rather than just the economical ones. This is the current official indicator used in UK studies since 2014. Notably, this does not consider the cost of energy, leading to vastly different results compared to other methods. The fact that the energy performance of the building and the income are the only parameters considered makes this a tool that leads to results even slower to change than LIHC.



Fuel poverty gap: proportion of fuel poor households under the LILEE and 10% indicators
Source: House of Commons (2023) Fuel poverty p.20, from DESNZ (2023) Annual fuel poverty statistics report



Causes of fuel poverty.
Source: Severn Wye (2023) 'Staying Warm and Well: Introduction to Energy Use in The Home and Fuel Poverty Awareness' (p.12). Unpublished.

The choice of an indicator to be considered will lead to very different results compared to other indicators. This is due to the fact that several factors can be chosen to be considered or not. For example, if ENEX is not taken into account, the Energy Poverty (EP) results will be slow to change and more in line with recent years' data. If, on the other hand, the cost of energy is considered, the results will show a sharp increase in energy poverty due to increased bills over the last three years. Moreover, subjective factors can also have an influence on the results of the study: older households are *"more likely to be classified as energy poor according to the 10% and LIHC indicators but are less likely to report IAAW", "because they perceive lower temperatures as adequate, or feel less comfortable admitting to 'problems'"* (Deller et al., 2021). The definition of the scope plays an important role in an energy poverty survey: the current UK indicators system *"ignores the fact that some households fall below the poverty threshold before and after housing and energy costs are considered [...] As fuel-cost-induced poverty is far less widespread than housing-cost-induced-poverty and income-poverty, the primary responsibility of the Government regarding fuel poverty should be the alleviation of the impact of high energy costs for the households below the poverty threshold before accounting for their energy costs. However, targeting strictly those groups under this threshold would still miss out vulnerable groups, who might not be effectively supported by measures aimed at households with different socio-economic characteristics"* (Burlinson et al., 2018).

The UN Sustainable Development Goal number 7 ("Affordable and clean energy"; United Nations, 2015) aims to both reduce the carbon impact of energy and alleviate fuel poverty - the objective is to find a "win-win" solution. In this regard, electricity generated by renewable sources makes a significant contribution to reducing energy poverty due to the high availability and affordability of the sources (Kocac et al., 2023; Vandyck et al., 2023). Energy poverty is often directly related to Carbon Lock-In (CLI), a condition when a group of people find themselves tied to carbon-intensive practices. In this case, *"citizens suffering from energy poverty have to rely on traditional low-efficiency and high-carbon energy, such as firewood and biomass energy and equipment, to satisfy their energy demands for cooking and heating in daily life"* (Zhao et al., 2023).

Comparisons between the UK and other European countries are difficult to make due to vastly different approaches to surveys and policies, as *"policy solutions are often inextricably linked to other problems and political issues"*, making comparisons impractical (Kerr, 2019). Many countries do not have an official definition of energy poverty nor policies specifically dedicated to abating it, although this does not mean that action is not taken or energy poverty levels are higher than the countries paying explicit attention to it. The recent pandemic, conflict events and some energy transition policies are, indeed, drawing the attention of more countries towards the energy poverty issue (Stojilovska et al., 2022).

Moreover, Brexit has opened the possibility of devolved administrations in the UK taking different directions to reflect individual characteristics in the assessment of energy poverty. Political unity fosters the development of comparable datasets, consistent measures and policies. Proposals for a common energy poverty approach are remarkably hard to deliver, due to differences in datasets and methodologies used across the UK. Decision making is not based on a sound understanding of how energy poverty manifests across England, Wales, Scotland and Norther Ireland but instead based on how the issue manifests in the separate administrations. This has led to the devolution of energy policy, with the result that energy and fuel poverty is not measured in a consistent way across the country (Mahoney et al., 2019). This inconsistent assessment of energy poverty risks decisions being based on information which is misrepresentative. *"England is the UK country with the lowest level of fuel poverty and the most regular reporting on this matter […] The value of a high-resolution spatial scale multidimensional approach is the opportunity to apply a common UK standard, highlighting inequalities and introducing consistent monitoring"* (Mahoney et al., 2019).

Fuel poverty in England: socio-economic complexity and impact on health

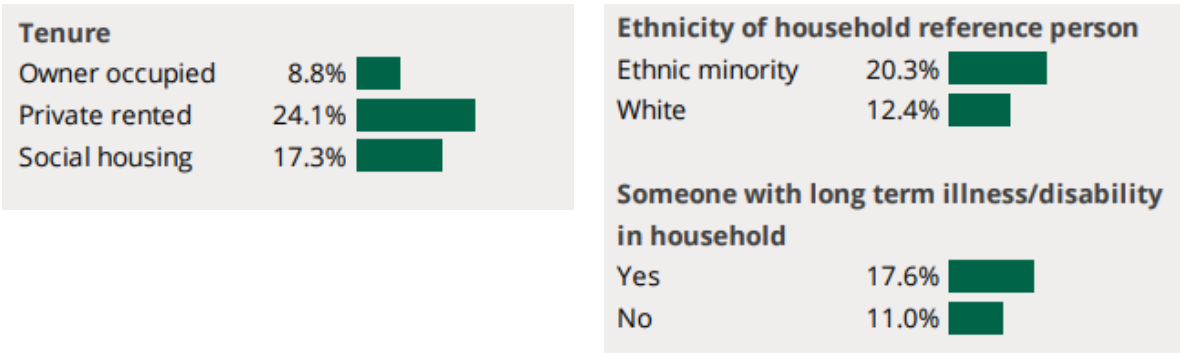
As shown in the last section, individuals with higher energy bills, lower incomes and less energy efficient homes are at greater risk of experiencing fuel poverty. However, behind this global figure, it is important to understand the individual situations of the people affected, their living conditions and the impact on their health and well-being.

The list of individuals at risk of fuel poverty is long and diverse (e.g., families, elderly, unemployed, young adults). However, fuel poverty does not affect everyone equally. Proportion of households in fuel poverty and average fuel poverty gap (the reduction in fuel bill that a fuel poor household needs to not be classed as fuel poor) are two indicators that were used by the government to describe the issue in England in 2022. According to the Department for Energy Security & Net Zero, the single parents' category had the highest proportion of fuel poor households (26 %) with the lower average fuel poverty gap (£255), while couples under 60 years old without children had the highest average gap (£430) in the smallest proportion (7 %) (DESNZ, 2023). This example illustrates the complexity of the issue: while some categories are largely hit, others are unnoticed but are hit much harder. This diverse socio-economic reality, result of multiple drivers, makes government action even more difficult.

Behind these statistics, people's homes and living conditions are affected (e.g., draughts in the house, ventilation and radiators switched off, condensation on windows, mould on walls, etc.). The efficiency of the building is one of the main drivers of fuel poverty. About 78.4 % of all fuel poor homes in England are rated band D, 16.6 % band E and 5.0 % lower. Alongside the diversity of household types, fuel poverty also affects different types of housing: 24.8 % of households in fuel poverty are living in converted flat and 19.8 % are living in end terrace houses, while the smallest proportion (7.6%) living in detached house is hit by the highest gap (£702) (DESNZ, 2023). In addition to the typology of the building which, by its very nature, has characteristics that could compromise the efficiency (e.g., high window-to-wall ratio, high exposed walls area), the age of the property is another risk factor. According to the same source, 40% of households in fuel poverty in 2022 were living in older properties built before 1945. Private rented households are more likely to live in poor quality homes compared to those in the social renting and owner-occupied categories. It is estimated that 14% of UK households (3.5 million) live in a property that does not meet the Decent Homes Standard, while 10% of households (2.3. million) live in a property with a Category 1 hazard present (UK Government, 2023).

"Health" or "well-being" are not mentioned in the government annual report. Recent research shows however that tackling cold homes would save the NHS £540m per year (BRE, 2023). Financial struggles push people to choose between "eating" and "heating", which shows how severe their situation is. Respiratory problems and circulatory problems are two main health problems related to cold homes (PHE, 2014). The same report reminds us that children living in cold homes are 1.5 to 3 times more likely to develop symptoms of asthma. Furthermore, the impact on mental health should be given more attention: situations endured by people in fuel poverty can lead to being socially isolated (e.g., eating cold food to save energy, staying in bed to stay warm, being anxious of the next energy bill, being embarrassed by financial difficulties).

Other research shows that extensive exposure to damp and mould in the home is associated with depression (WHO, 2007). While impacts on occupant's comfort in winter is well known, the effects of climate change on summer conditions is less discussed in the field of fuel poverty.



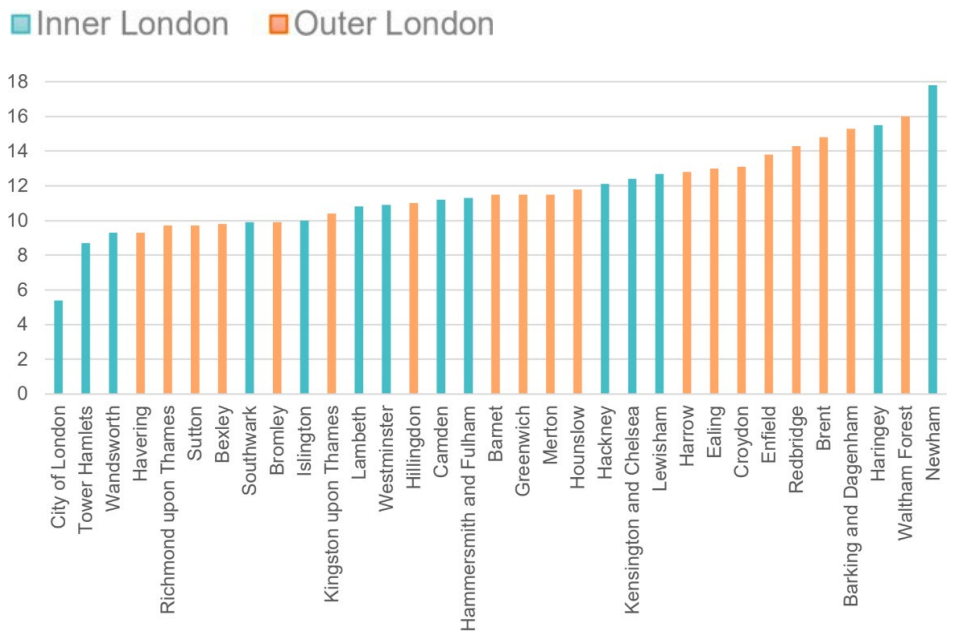
Property and household characteristics of fuel poor households in England (2022, LILEE)
Source:Hinson, S. and Bolton, P. (2023) Fuel Poverty. House of Commons Library: London. 8730 from DESNZ (2023) Annual fuel poverty statistics report Fuel poverty detailed tables (2022 data)

Analysis and Findings

Review of the London Fuel Poverty Action Plan

Although the method of assessing households in fuel poverty has changed from LIHC to LILEE as discussed previously, identifying households in or at risk of fuel poverty remains challenging. The LBSM only maps the EPC rating and it requires cross referencing with the socio-economic data to identify homes in fuel poverty. Eighteen out of the 21 actions have been completed in a statement from the Q&A assembly dated 17 November 2022 but the number of households in fuel poverty remains high (GLA Q&A, 2021) Some of the actions have been lobbied to the government, which causes delay to implementations. Such actions are: the national roll-out of smart meters, access to sensitive data that may be useful to integrate into the LBSM, reducing the exemptions for private landlords to fully comply with the MEES, and consistent property licensing for Houses on Multiple Occupations (HMO) in London (GLA Q&A, 2021).

Map: Proportion of fuel poor households in London boroughs, LILEE definition in 2021
Source: Data from DESNZ (2023) Sub-regional fuel poverty data (2021 data)



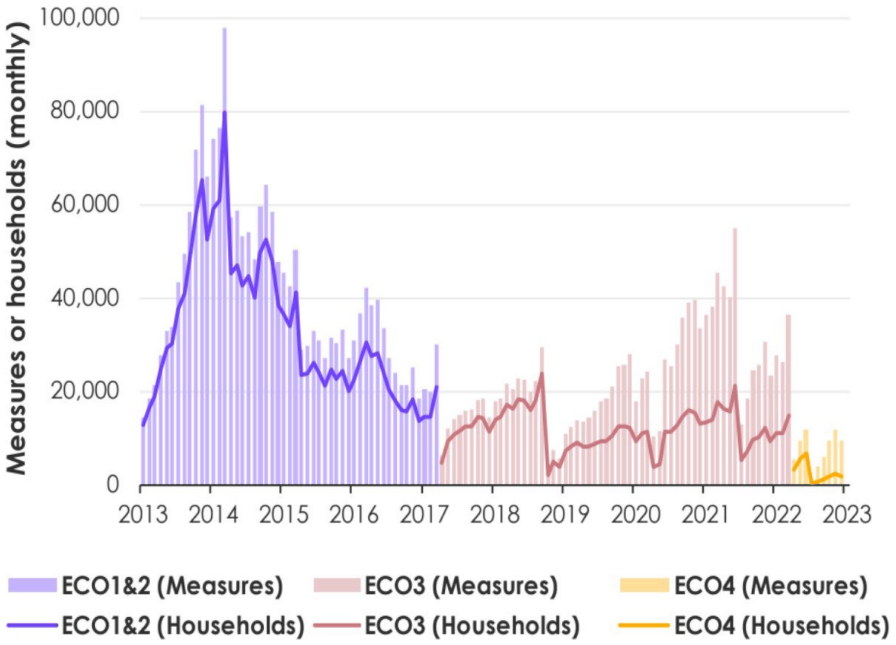
Graph: Proportion of fuel poor households in London boroughs, LILEE definition in 2021
Source: Data from DESNZ (2023) Sub-regional fuel poverty data (2021 data)

Retrofitted homes and fuel poor households: the missing link

Improving the energy efficiency of homes through retrofitting could ease fuel poor homes. The implementation of various programmes such as the Retrofit Revolution addresses some of the issues on fuel poverty and is also a pathway to decarbonise the London building stock with a target aiming in 2030 to be net zero. In a Q&A assembly held last March 2021, the Mayor of London was asked if there are enough skilled workers to deliver his Retrofit Revolution. The current administration acknowledges that there are not enough skilled workers in London which is also reflected across the country. A statement from the Q&A in March 2023 refers to the UK needing an increase of 230,000 skilled workers to retrofit every building in the UK by 2030. Additionally, London needs around 56,000 jobs in 2025 to stay on the path to net zero by 2030 but only 4,000 skilled workers in 2021 worked on retrofit projects in London (GLA Q&A, 2021).

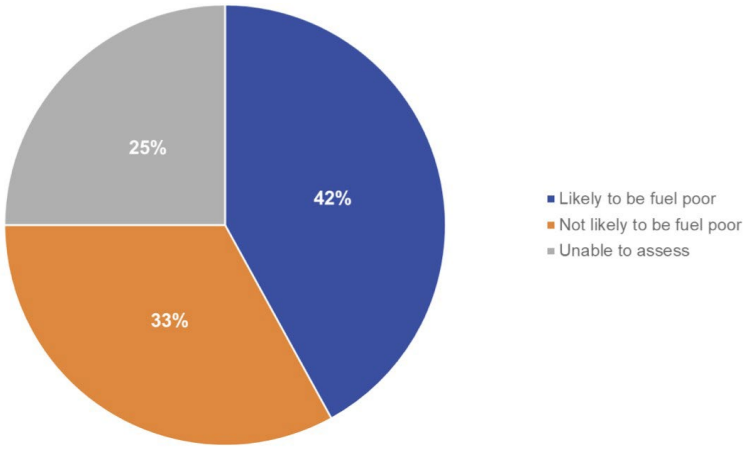
The low supply chain of skilled workers to deliver the retrofit programme means that there is an opportunity to fill in the green job sector. Those job opportunities require to upskill and train people first to acquire the necessary green skills to successfully deliver the retrofit programmes. However, challenges are financing both the uptake of green skills upgrading and the creation of green jobs where the funding from the national government is already insufficient.

In contrast to the 4,000 skilled workers involved in retrofit projects back in 2021, the mayor's green skills hub and academies would increase and upgrade the supply of skilled workers which then could aid in decarbonising London on the path to 2030 net zero. According to the Mayor in response to the same Q&A assembly in March 2023, over £33 million worth of budget towards green skills were allocated but still need long-term national plan support from the government and delivery at regional level should be targeted. The shortage of skilled workers is clear and recognised during the Q&A assembly and the mayor reiterated that although skills upgrading is necessary, there should be available jobs instead of having people finish the courses and then not being able to utilise the acquired skill set, which happened in the past. Additionally, employers are not yet prepared to take on a large number of skilled workers due to uncertainties in the demand of work. This represents a contradiction to previous statements highlighting the need for retrofitting existing building stock, which in turn generate job opportunities.



Decreasing measures delivered through four rounds of the Energy Company Obligation (ECO) scheme.
Source: CCC (2023) from DESNZ (2023) Household Energy Efficiency Statistics

A relative problem with public programmes that support the retrofitting of houses with a low energy efficiency is that in most cases low income is not a requirement of the household to access the funding, nor is it a factor in the decision whether or not to grant them. The only exception to this was found to be the Green Homes Grant scheme, a UK-wide programme partially delivered by local authorities, where low income together with low energy efficiency are explicitly mentioned as the main requirement a household for access to the programme. Since the two points of the LILEE methodology, 'low income' and 'low energy efficiency', are the main prerequisites, it could be said that the Green Homes Grant scheme is actively designed to address fuel poverty.



Source: Green Homes Grant Voucher Scheme Applicant Survey
Base: all occupants (applied for voucher for property in which they live) 3365.

Fuel poverty status of households that have benefited from the GHG LAD.

Source: Ipsos with Energy Saving Trust, Building Research Establishment, and UCL (2022), Evaluation of the Green Homes Grant Voucher Scheme (GHGV) - Process Evaluation Report

Analysis of FOIs requests

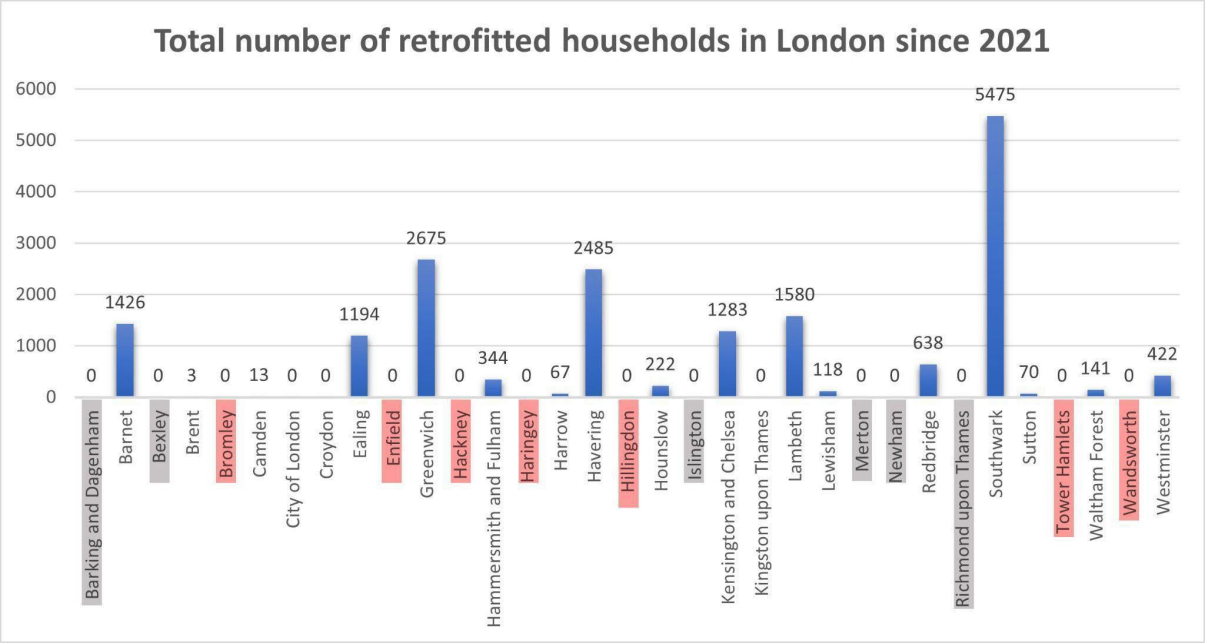
The initial discussion with CUK in the project brief was to investigate the progress made by the current administration and determine how many fuel-poor homes have been upgraded. The definition of upgrading homes could be too simplistic and may not weigh much value when dealing with the improvements of fuel poor homes. Instead, retrofitting homes presents more robustness to deliver rectification geared towards low emissions and climate change.

The number of retrofitted homes, public and private stock, and the usage of the London Building Stock Model (LBSM) were the subject of FOI requests sent on the 9th of June 2023 through email to all London boroughs and the GLA. Twenty-six out of the 33 boroughs responded in the given period between 10-27 July 2023 and many of them did not hold information pertaining to the number of retrofitted homes in the private stock. Additionally, this study considers those retrofitted homes from 2021 onwards which is rooted in the Mayoral Accountability Assembly in 2021.

According to the answers received, there are **17,250** homes in the public stock and **983** in the private stock that have benefited either from retrofitting and/or from schemes or grants, such as the Warmer Homes Programme. Some of the boroughs were specific with the type of grants and retrofits received while other boroughs did not specify the details. To be eligible for the Warmer Homes Programme a household needs to meet specific criteria; namely (GLA, 2023a):

- an EPC rating of D, E, F or G *and*
    - criteria related to total annual housing income (before housing costs and bills); or
    - total household annual income after housing costs (mortgage/ rent and council tax);
    - household members receiving a means-tested benefit; or
    - details of the geographical location of the property (e.g. the property is within a Lower Super Output Area).

Deep or whole house retrofit is one of the main goals stated in the Fuel Poverty Action Plan for London to improve energy efficiency with a focus on addressing solid-walled insulations (GLA, 2018). Havering, Lambeth and Sutton are the only 3 boroughs from the respondents that provided figures on deep or whole house retrofit with a combined total of **117** homes in public stock. Boroughs that specified the type of retrofit installations in the public stock are as follows: **4,914** homes for boiler replacement; **1,099** homes for windows and doors upgrades; **1,190** homes for loft insulation, roof insulation, and cavity wall insulation; **2,023** homes received energy savings measures. The complete breakdown is shown in the tabulation chart (pp. 27-28). The uptake of various schemes such as ECO, the previous Green Homes Grant Local Authority Delivery are visible in the private stock homes but it is unclear if some of the measures delivered in the public stock homes were from one of these schemes mentioned in the Policy Framework and Incentives section.



Combined figure of retrofit in the private and public stock in every borough

Source: FOI result 10 July 2023

In the Fuel Poverty Action Plan, the Mayor highlights that there are no sufficient levels of national funding to implement the energy efficiency improvements for all households in fuel poverty. He also commented that ECO funding has not been utilised to its full potential (GLA, 2018). As previously mentioned, grant funding schemes such as Energy for Londoners' or Warmer Homes programme have specific eligibility criteria for tackling fuel poverty and climate change which do not cover all households in fuel poverty depending on income and location of the property (GLA, 2023a). Some boroughs have established carbon offset funds to meet the Mayor's net zero carbon targets, and a small number is using those funds to retrofit low-income households. Boroughs need clear guidance on how they can most effectively use carbon offsets funds to deliver home energy improvements that will help tackle fuel poverty. In addition to grant funding, the Fuel Poverty Action Plan emphasizes the need to unlock private capital to increase investment in energy efficiency, particularly to households in fuel poverty in London (GLA, 2018).

Inner London		Public	Private
	Camden	**13**	*DO NOT HOLD INFO*
	City of London	0	0
	Hackney	*NO ANSWER*	*NO ANSWER*
	Hammersmith and Fulham	0	**13 (LAD)** **331 (ECO)**
	Haringey	*NO ANSWER*	*NO ANSWER*
	Islington	*DO NOT HOLD INFO*	*DO NOT HOLD INFO*
	Kensington and Chelsea	**595 (new boilers)** **447 (external doors)** **186 (windows)** **16 blocks (roof insulation)** **39 (communal windows)**	*DO NOT HOLD INFO*
	Lambeth	**30 (Deep retrofits)** **970 (Energy savings measures)** **570 (Metropolitan Thames Valley Housing)** **10 (LAD 2)**	*DO NOT HOLD INFO*
	Lewisham	*DO NOT HOLD INFO*	**118**
	Newham	*DO NOT HOLD INFO*	*DO NOT HOLD INFO*
	Southwark	**2175 (heat pumps)** **c. 2800 (boiler upgrade)** **500 (insulation)**	*DO NOT HOLD INFO*
	Tower Hamlets	*NO ANSWER*	*NO ANSWER*
	Wandsworth	*NO ANSWER*	*NO ANSWER*
	Westminster	**422**	

Tabulation of the breakdown and type of retrofit in the public and private stock

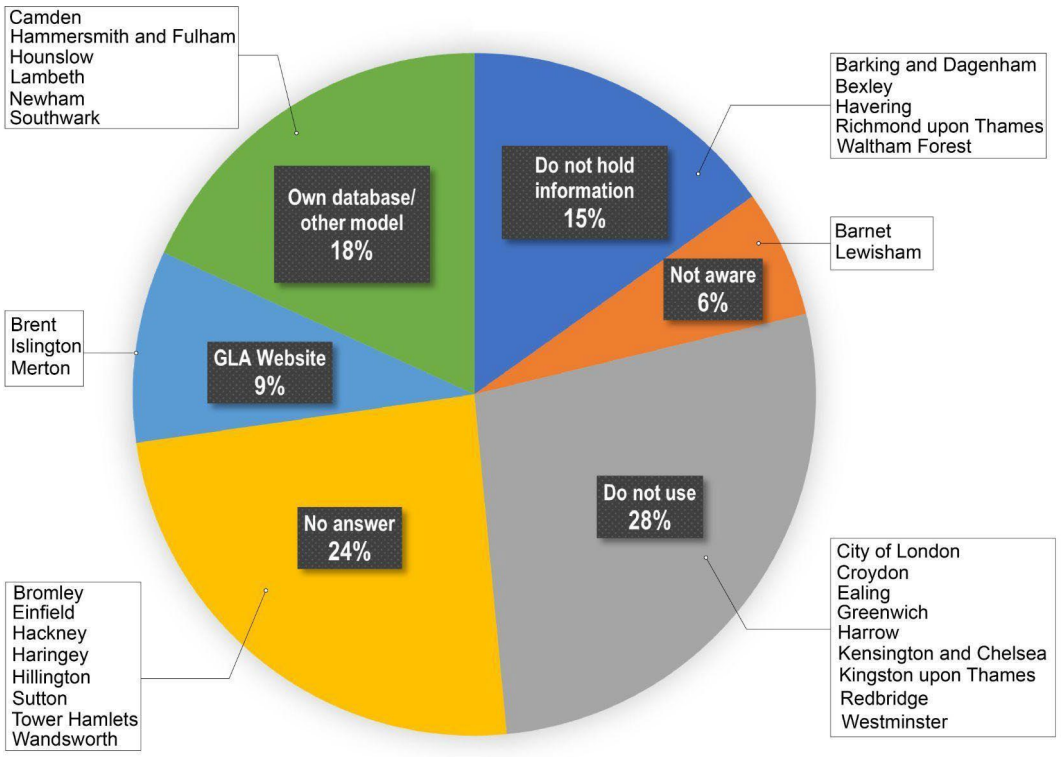
Outer London		Public	Private
	Barking and Dagenham	*DO NOT HOLD INFO*	*DO NOT HOLD INFO*
	Barnet	**68 (loft insulation) 100 (windows) 178 (roof insulation) 27 (GHG) 1053 (Energy Savings pack))**	**77 (GHG)**
	Bexley	*DO NOT HOLD INFO*	*DO NOT HOLD INFO*
	Brent	**3**	*DO NOT HOLD INFO*
	Bromley	*NO ANSWER*	*NO ANSWER*
	Croydon	**0**	**0**
	Ealing	**PSDS 3: 161 HRA: 811**	**GREEN HOMES PHASE 1: 72 GREEN HOMES PHASE 2: 33 GREEN HOMES PHASE 3: 113 HOME UPGRADE GRANT: 4**
	Enfield	*NO ANSWER*	*NO ANSWER*
	Greenwich	***Windows: 327 Boilers: 1,519 EWI: 132 Loft Insulation: 296 Photo Voltaics: 132 Communal boiler upgraded to communal heat pump at 4 estates: • Ernest Dence Estate (95 homes) – some retrofit work to building fabric was also undertaken here • Bill Walden (42 homes) • Tom Smith Close (72 homes) • Strand Court (60 homes)***	*DO NOT HOLD INFO*
	Harrow	**67**	*DO NOT HOLD INFO*
	Havering	**79 (Whole House retrofit) 2406 (Boilers, windows, doors, loft insulation, cavity wall insulation)**	*DO NOT HOLD INFO*
	Hillingdon	*NO ANSWER*	*NO ANSWER*
	Hounslow	**Request Refused**	**222, GHG LAD Scheme (exact number in September 2023 "when all works will be completed")**
	Kingston upon Thames	**0**	*DO NOT HOLD INFO*
	Merton	*DO NOT HOLD INFO*	*DO NOT HOLD INFO*
	Redbridge	**638**	*DO NOT HOLD INFO*
	Richmond upon Thames	*DO NOT HOLD INFO*	*DO NOT HOLD INFO*
	Sutton	**13 homes (LAD 1A). 8 homes (deep retrofit) 49 homes (Underway, SHDF)**	*DO NOT HOLD INFO*
	Waltham Forest	**141**	*DO NOT HOLD INFO*

Tabulation of the breakdown and type of retrofit in the public and private stock

Source: FOI result 10 July 2023

The LBSM could be a vital tool for identifying fuel poor homes in London as stated in the London Fuel Poor Home Action Plan in 2018. It was developed by the UCL Energy Institute and delivered to GLA in 2020 (GLA, 2020; UCL, 2020). Since its implementation, the LBSM maps the EPC rating of every building in London and it is accessible online to the public. Although it can quickly identify the energy performance or EPC rating, the fuel poverty aspect needs the socio-economic data and cross-reference it to be able to identify buildings/homes that are in fuel poor condition.

The Centre for Research into Energy Demand Solution (CREDS) reported that there are two versions of the LBSM, one for public and the other version is for the GLA/borough usage (CREDS, 2020; Steadman et al., 2020). The GLA/borough version is considered a more powerful tool with data that is not present in the public version. To verify the existence of the GLA/borough version, FOI requests were then sent to all the boroughs and to determine the implementation of this tool in identifying fuel poor homes.



LBSM utilisation per borough

Source: FOI result July 2023

As mentioned previously that 26 boroughs responded to the FOIs, 9 boroughs responded they are not using the LBSM; 5 boroughs do not hold any information; 2 boroughs are not aware of the LBSM, 6 boroughs (Camden, Hammersmith and Fulham, Hounslow, Lambeth, Newham, and Southwark) are using their in-house database or other models such as Pathway and Parity's Portfolio. Hounslow is the only borough that stated the usage of LBSM to check the EPC rating, which is contrary to the report outlining the delivery of the stock model (CREDS, 2020). The delivery of LBSM is one piece of the puzzle and it is insufficient to identify homes in fuel poor condition. As indicated in the London action plan, the objective is not entirely met for the LBSM which could encourage individual local authorities to independently identify 'fuel poor homes'. If the LBSM could quickly identify fuel poor homes then it could also assist in the delivery of retrofitted units or other measures to aid those occupying fuel poor households. However, obvious challenges related to the dynamic nature of household status and continuous change in occupancy and ownership will require accurate and frequently updated datasets and sources.

The uptake on deep or whole-house approach retrofit is low based on the FOI result. This could be linked to the evidence of a low supply chain of skilled workers as discussed earlier. The number of home insulation that was delivered from 2021 is also low with a correlation to the low supply chain. The low delivery of deep and/or wall insulation retrofit can also be associated with the fact that 60% of London homes are solid-walled and this type of building fabric is difficult to insulate (GLA, 2018). It is also difficult to correlate the usage of LBSM on the delivery of retrofitting homes due to the information mostly unavailable by some boroughs. In the case of Newham, it has the highest percentage of fuel poor homes at 17.8% in 2021 (DESNZ, 2023b) but they do not hold the information on retrofits despite using a different model that may be similar to the LBSM. The Southwark council recently worked with Parity Projects to analyse the energy efficiency of their building stock instead of the LBSM and they have the highest number of retrofit measures since 2021. It is unclear from the results of the FOI how many homes that have been retrofitted are specifically in fuel poverty since the data gathered was mostly a response to domestic energy retrofits and not explicitly to "fuel poor homes". The results are still valid and the uptake on retrofit is still low whether the target is net zero by 2030 or improving fuel poor homes, but emphasis should be directed to fuel poor homes as set in the Fuel Poverty Action Plan for London (GLA, 2018).

Discussion

On 26 July 2023, the Centre for the Study of the Production of the Built Environment (ProBE) in collaboration with London Citizens held a workshop event at the University of Westminster. It was an opportunity for the research team to share preliminary results, and to seek feedback and inputs from key stakeholders. Participants coming from official public authorities, academics and professionals engaged in interactive discussions on available data on fuel poverty retrofit, the scale and effectiveness of the action, lessons learned and way forward. The key messages are summarised below:

- **Strengths**

  This research is based not only on the review of statistical tools but also on FOI requests to understand the reality of the policy implementation. The Workshop acts as a focus group

discussion, which is a meaningful way to engage different stakeholders (often with conflicting interests) to address this issue.

- **Limitations**

  This research is based on the data available, as there is a lack of publicly available empirical databases on upgraded fuel poor homes. This research was limited to the London context from April 2021, and focused primarily on actions taken to address the root causes of fuel poverty in relation to the built environment. Much more could be said about the economic dynamics, energy management, social and health strategies. We understand that another important source of data is from the G15 consortium of housing associations, which hold a large percentage of the housing stock previously managed by the boroughs. Although G15 were repeatedly contacted for information and data on the retrofit of their housing portfolio, the data was not provided and not included in this report (as of July 2023).

- **The need of a reference unit**

  Some councils have data regarding individual measures (windows, doors, insulation), some others have various categories of homes and households. Databases on retrofit and fuel poverty should have access to comparable numbers between boroughs so that any compilation of data should not lead to double counting households or number of interventions.

- **Fuel poverty is a dynamic issue**

  The identification of fuel poor homes is a challenge, as the identification and improvement of low energy performance properties is already difficult. Furthermore, fuel poverty is not systematically linked to a property as a tenant could move.

- **Retrofit is a vast and complex concept**

  Retrofit could be misunderstood by different councils, and its definition could be developed further. The reality of the implementation of retrofit is complex, as it needs availability of supply chain, trained professionals and accredited companies. The skill gap should be further understood. GLA works on an exemplary basis to show what could be done but does not aim to reach a specific number of retrofitted households.

- **Lack of investment and action**

  The diminishing uptake of the ECO schemes shows a lack of investment by the central government. The local government should prioritise a periodic review of the Fuel Poverty Action Plan with binding targets, impact assessment of actions, and introducing more schemes that target fuel poor households like the Green Homes Grant Local Authorities Delivery (GHG LAD).

Conclusions and Recommendations

On a national scale:

- Fuel poverty is assessed by a statistical tool, often disconnected to the reality of local and regional contexts. While the Low Income Low Energy Efficiency indicator (LILEE) is decreasing, other indicators are increasing with rising energy prices.
- Fuel poverty affects people's health and wellbeing and makes life worse for those already facing challenging socio-economic conditions.
- ECO schemes do not always target fuel poor homes specifically. The number of measures is reducing, while the number of actions needed to reach net zero is increasing.
- Actions are focused on heating demand in winter, but cooling in summer is less discussed, as the existing building stock is not adapted to the heat waves projected as a result of climate change.
- There are complexities in identifying the parties responsible and the mechanism for tackling fuel poverty, between national and local government, between the private rented sector and housing associations.

On a local scale:

- After the COVID-19 pandemic, a political awareness of fuel poverty is found in the mayoral manifesto, however the Fuel Poverty Action Plan does not have binding targets and is not updated.
- Current Fuel Poverty Partnership Tasks are focusing on awareness and communication or on the urgent support to households already affected, but not in tackling the root causes of fuel poverty and in upgrading fuel poor homes.
- LBSM is not used by the majority of boroughs who answered the FO requests. When it is used, it informs about energy efficiency of the building stock, but does not permit to target fuel poor households.
- The majority of boroughs that answered the FOI requests do not hold information on private sector retrofit. Home improvements are not always holistic retrofits, but individual interventions.
- From the few answers received to the FOI requests, a very small number of upgraded households appear to have been completed since April 2021, a long way from 100k (or 40k).

Directions for future research:

- To explore a new indicator tool by crossing data from LBSM with socio-economic data to identify fuel poor households more accurately. Indicator could potentially include geographical location, building typology (age, etc), socio-economic / demographics, leading to action plan and retrofit strategies.
- To undertake in-depth primary research using case studies of fuel poor homes in London and carry out interviews and focus groups with policy makers, housing

associations, fuel poverty charities and fuel poor households to identify the barriers and the drivers of tackling the issue at the core.

- Future research should also analyse the fundings available, to identify where they are coming from, who is able to secure them, what can it be used for (which measure, property, user profile).
- The research focused on whole retrofit but could also take into account the systems improvement and technological innovation in heating, cooling and control systems (e.g. metering). Further studies should investigate the potential of new technologies to inform the occupant on their energy behaviours, the energy performance of their property, the cost of retrofitting and the schemes available.

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