Briefing - Social and Distributional Impacts of Decarbonisation and Climate Adaptation in the UK

Aim

This briefing summarises the findings of a **meta-analysis** of the social research landscape associated with decarbonisation strategies across four key areas essential to meeting net zero commitments by 2050: electricity, transport/mobility, heat and adaptation/resilience. The exploratory study, by Dr Duncan Edmondson for Sustainability First, maps research on the distributional impacts of decarbonisation to identify central vulnerability issues, key research gaps and interdependencies which must be considered to ensure companies, regulators and government avoid siloed, ineffective interventions. This **bigger picture** is needed so that equity is central to climate strategies. Without this integration and holistic view, overriding vulnerability concerns may detract from achieving decarbonisation. This will make delivering net zero in a publicly acceptable way more challenging.

A Rapidly Changing Context

The **UK floods in February 2020**, and recent fires in Australia and Brazil, have highlighted that narrow framings of vulnerability, which have typically focused on individuals and households (age, health, income, housing type and ownership) are likely to be inadequate in addressing the response to the climate crisis. Accounting for the full scope of vulnerability issues emerging from decarbonisation and adaptation, will require a move **beyond the regulatory focus on consumer impacts to a wider framing**, which also considers **distributional impacts** related to **regions and communities**. The meta-analysis summarised in this briefing was carried out before the pandemic. **Covid-19** has brought inequality and vulnerability to the fore in an unprecedented way. The stark affordability challenges and degree of uncertainty caused by the corona crisis make the issues covered in the research more acute; with a new imperative that **recovery** from the pandemic is **fair as well as smart and green**.

Delivering Climate Related Goals: Costs, Who Pays & How

The pathways to deliver net zero and resilience, and hence some of the **costs**, remain largely uncertain. Standard econometric modelling can struggle to assess costs (particularly long-term) given the number of variables and assumptions sitting behind the counterfactuals. Some climate impacts are asymmetric and some irreversible. How far both indirect and systems costs are fully factored into the equation alongside direct costs, is fundamental to any realistic assessment of distributional impacts.

There is also a high degree of uncertainty as to **who will pay** for decarbonisation. At a broad scale, how costs are distributed both within and between generations will depend on the **funding mechanisms** implemented and to what **extent costs are socialised**. In this meta-analysis, proposals for fair distribution of decarbonisation costs ranged from **income taxes**, to **exemptions** for low income/targeted groups, to targeted recycling of revenues from a **carbon tax**. However, many of these mechanisms would require principles of equity, fairness and the vision for a just transition to be applied and embedded in policy development, in ways yet to materialise. **On transport**, there is concern that the most vulnerable are likely to suffer disproportionately (through the socialised cost of upgrading grids and developing charging infrastructure), while being unable to participate (due to high upfront costs to access EVs). This in turn depends on how capital costs are spread, especially for those on low incomes. In terms of **geography**, there is a risk that in a world of greater cost-reflection, **rural areas** will pay more for net zero, including for transport, heat and adaptation.

Vulnerability and Decarbonisation: A New Framework

The meta-analysis points to the need for a far broader framing of vulnerability which links to the decarbonisation trends and uncertainties in Table 1. This broader framing should help reveal potential knowledge gaps and issues which could undermine the comprehensive decision-making needed for net-zero. Our proposed new framework for vulnerability and decarbonisation covers four areas:

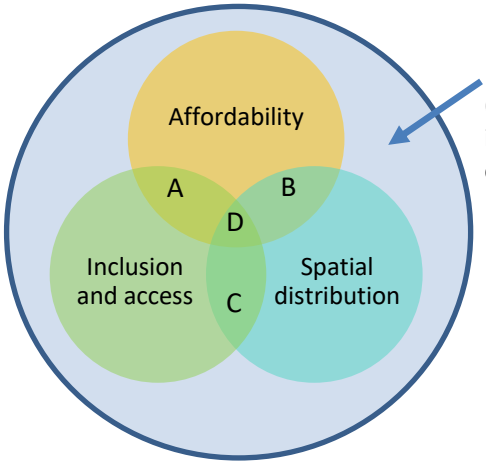
1. **Affordability** – The costs incurred by or resulting from potential decarbonisation strategies, short or long term. It also refers to the distribution and socialisation of costs, personal costs of new technology or lifestyle change and affordability (as determined by absolute incomes and income variability) precluding access.
2. **Inclusion and access** - The ability of a person or household to access the benefits of decarbonisation.

Table.1. Key Decarbonisation Trends and Uncertainties

1	**Decarbonisation of electricity** – move to decentralised renewables, storage and capacity to cope with intermittency of supply and 'smartening' of the grid to flexibly balance supply and demand
2	**Decarbonisation of transport** – electric vehicle (EV) charging infrastructure & expansion of electricity grids to support increased demand. Vehicle2grid charging. Energy mix of public transport & large vehicle fleets (uncertain)
3	**Decarbonisation of Heat** – regional variability in electrification of heat, using heat pumps, (high uncertainty) development of hydrogen networks, or combined heat & power. Need for improvements in heating/energy efficiency of housing stock
4	**Adaptation and resilience** – regional variations of cost in reinforcing networks to cope with extreme weather; storms, flooding and drought. Impacts in terms of urban heating and need for urban cooling (uncertain).

This can relate to personal (eg cognition, mental health) or situational characteristics (eg no internet access, renters v owners) or environmental factors.

3. **Spatial distribution** - Geographical differences between communities and the implications. This includes spatial issues such as access to employment in particular geographies and types of employment.
4. **Intergenerational impacts** - The longer term social and distributional impacts that come about from certain decarbonisation strategies. This captures the implications of locking in solutions and cost recovery mechanisms at a point in time and how adaptation may be influenced by climate change.



Intergenerational (caused over time by the interaction of the other effects).

Figure 1: A Vulnerability & decarbonisation framework
Overlaps and interactions of distributional impacts

A	Costs of participation affecting ability to access. Examples are buying smart kit, cost of EVs etc.
B	Regional differences in employment affecting income distribution and higher instances of low income vulnerability.
C	Availability of certain solutions due to geographic placement, e.g. availability of hydrogen networks
D	Interaction of all three dimensions i.e. lack of access to hydrogen networks (**C**) means having to buy heat pump (**A**), which is a more expensive form of heating, making energy less affordable, contributing to fuel poverty.

A Future Research Agenda - Distributional Impacts of Decarbonisation and Adaptation

The meta-analysis drew on desk-based research and semi-structured interviews to identify key gaps and limitations to take forward in future research:

- **Behavioural response and adaptation of consumers to new technologies** (such as heat pumps). Both Ofgem and HMT note this as a major barrier to addressing different vulnerabilities.
- **Decarbonised transport/mobility and social impacts**. Two active projects (FAIR as part of UK CREDS and EnergyRev) are considering barriers to access, affordability and spatial distribution, though there are few published outputs as yet.
- **Accounting of co-benefits** (benefits may occur as a result of GHG emissions reductions eg to health) within the overall costs/benefits of abatement. HMT's Net Zero Review is explicitly not looking at this.
- **Limited research linking costs associated with decarbonisation and potential impacts, and the costs and impacts of adaptation.** This extends to a lack of research into the costs, as well as social and distributional impacts of climate adaptation in GB, compared to the three other trends in Table 1.
- **Intergenerational impacts** of specific decarbonisation pathways and adaptation. Looking at the long-term implications of strategic choices is essential to mitigate against adverse and unintended consequences of those decisions.

Though outside the scope of this research, safeguarding (of certain groups & of data) also requires attention.

Achieving Decarbonisation Goals – Interdependencies, Sequencing and Distributional Impacts

The meta-analysis highlights a need to identify and address the social impacts of decarbonisation comprehensively. Assessments of key outcomes implied by the CCC's 6th Carbon budget (2033-37), (eg 100% EV uptake, CCUS with hydrogen networks), must take account of the distributional impacts. Also, crucial to **holistic appraisal** of the social impacts of decarbonisation is the consideration that many impacts (though not all) inherently link (see Figure 1). By **systematically** understanding the causal relationships between different vulnerabilities - which may occur simultaneously, or through sequencing - targeted policy interventions can be better designed to cope with the complexity of risk and mitigate against unintended consequences. A long-term view of vulnerability interactions and sequencing issues is key to understanding the intergenerational impacts of certain pathways.

Implications and Conclusions

The **proposed new framework for vulnerability and decarbonisation** outlined in this briefing would help us move beyond unduly technocratic approaches or narrow evaluations of future strategies for decarbonisation. A wider vulnerability framing offers a new conceptual flexibility **to reduce unintended consequences of decarbonisation on increasingly vulnerable groups**. A systematic framing of decarbonisation and vulnerability could also contribute to work on '**Just Transitions'.** We need to develop new approaches to understanding the costs and distributional impacts of net-zero so that policy-makers, regulators and companies can gain a wider and more practical understanding of the many uncertainties, plus the potential for **cumulative disadvantage**. Not least to gain a far better picture of what 'fair' will look like in terms of where and how the costs of net-zero will fall.

Nuffield Foundation

Sustainability First would like to thank the Nuffield Foundation for funding this meta-analysis. The views expressed are those of the authors and not necessarily the Foundation Visit www.nuffieldfoundation.org