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HOUSEHOLDS IN PLACE: SOCIO-SPATIAL (DIS)ADVANTAGE IN ENERGY-CARBON RESTRUCTURING

Abstract

This paper advances a households-in-place perspective to understanding socio-spatial disadvantage in energy-carbon restructuring. This reflects evidence that the costs and benefits of low carbon restructuring will not be distributed evenly or fairly between people and places. Some households and localities will benefit from decarbonisation but others will be disproportionately affected by rising energy costs and job loss. In this paper we use the example of England to explore different dimensions of advantage and disadvantage in low carbon restructuring and how they might be reinforced or mediated by intervention by governments, NGOs and citizens. The paper makes a distinctive contribution by linking different sites and policy areas in the distributional politics of decarbonisation from the perspective of individuals and households. Emphasis is placed on understanding just energy-carbon transitions from a *households-in-place* perspective. The analytical framework is exemplified through case studies of the coming to ground of different strands of energy-carbon restructuring in England.

Keywords: Low carbon, restructuring, social justice, rebalancing, households, UK

Word count (including abstract and references) 10,470

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1. Introduction

Selective strategies of decarbonisation and energy restructuring are now being progressed around the world in support of broader economic, social and environmental goals. Much of the literature on low carbon transitions has focused on the differential commitments and capacities of national and local governments to support meaningful decarbonisation strategies (Bulkeley et al, 2010; Hodson and Marvin, 2012; Kern et al, 2014). However the need for action to mitigate for future climate change (and its profound and uneven social impacts) is only part of the issue. One pressing concern is that low carbon energy policies have the potential to reinforce socio-economic divides unless there are countervailing measures for social and spatial justice (Newell et al, 2015; Newell and Mulvaney, 2015). Wealthier households and places will have more resources to invest in low carbon and renewable energy infrastructure that help to offset increased energy costs. Equally, the places that lose jobs because of decarbonisation will not necessarily be net beneficiaries of work and investment in the low carbon economy (Rutherford and Coutard, 2014; Hodson and Marvin, 2012; 2013). Governments can use their regulatory powers and fiscal resources to help equalise the economic and social impacts of low carbon energy transition but that sits uneasily with hollowing out of the state's role in social protection and the primacy given to market logics in service provision and social policy (Peck and Theodore, 2015).

Existing literature has focused on the inequalities of energy-carbon restructuring in particular policy domains or sites of restructuring (for instance there is a large body of work on fuel

poverty, some emerging work on employment impacts at a broad level of analysis and to some degree the differential abilities of cities to attract investment in decentralised energy). However this work has tended not to explore the interaction and overlap between multiple domains of intervention across different spatial scales. This paper therefore seeks to develop better understanding of the multiple uneven economic and social dimensions of energy-carbon restructuring and what this might mean for interventions to rebalance those uneven social and economic impacts. We do this first by examining in more detail arguments about the potential distributional impacts of decarbonisation. Second, we examine the opportunities and challenges in supporting effective action for low carbon justice. Following on from this, we explore these issues through a case study of the distributional modalities of energy-carbon restructuring in England[1]. A key argument of the paper is that just transitions need to be seen from the perspective of household impacts, shaped and mediated by intervention at international, national and sub-national scales of intervention.

England is an interesting case to explore the distribution spatial and social impacts of decarbonisation. The UK national government has embarked on a programme of energy restructuring and decarbonisation intended to reduce dependence on imported fuels and significantly reduce carbon emissions. The costs of state investment are being passed to consumers through levies on energy bills, concurrent with increased energy costs largely caused by rises in wholesale costs in international energy markets. However the UK government has also introduced a raft of fiscal measures to incentivise energy efficiency and decentralised generation in support of energy-carbon restructuring and to help protect consumers against future price rises. Some of the measures have an explicit social justice

[1] Within the UK there are now marked differences in policies and politics related to low-carbon energy within the devolved nations of England, Scotland, Wales and Northern Ireland (Cowell et al, 2015). We focus solely on England.

concern with addressing significant rises in fuel poverty, but others would appear to reinforce the inequalities of energy-carbon restructuring by privileging more affluent socio-economic groups. Moreover, there are concerns that less affluent groups and communities are further disadvantaged if they lack the time, resources, specialist knowledge and commitment needed to draw down support or invest in decentralised generation.

We are particularly interested in questions of whether social and spatial justice outcomes of energy-carbon restructuring are influenced by the capacity of sub-national organisations to rebalance the costs and opportunities of low-carbon energy transition. The paper explores constraints on the capacity of English sub-national government (local authorities, city-regions and regional agencies) to develop a strategic framework for energy-carbon restructuring. However we also explore how, in some places and for a period of time, the individualised incentive logic of national policy created opportunities for a significant 'expanded field' of social justice intervention in low carbon energy by the private sector, third sector and community organisations. Each of these can be seen to come ground at the household level as social and economic process and policy interact to produce particular effects on households embedded within places (households-in-place) and as such our interest is in how policy patterns and the various sites of intervention and mediating actors shape these outcomes.–This paper makes a distinctive contribution to understanding of energy transition and decarbonisation by thinking more carefully about the different dimensions through which energy-carbon inequalities might be produced and reproduced. That perspective is important in opening up a broader perspective on the meaning of just transition as it plays out in different policy, spatial and household contexts.

2. Energy-carbon restructuring and just transitions

There will be significant economic and social benefits for some people (and some places) from the employment creation in low carbon economic growth sectors and the opportunities to maximise sites for renewable energy generation (Fankhaeser et al, 2011; Bridge et al, 2013). However there will also be economic costs in terms of threats to jobs in sectors dependent on fossil fuels, competitive pressures to relocate energy intensive jobs to regions with lower prices or lower carbon energy infrastructure and the direct and indirect costs of investing in low carbon energy infrastructure. As carbon is increasingly taxed and priced, there are additional costs for individuals, organisations and places that are unable to invest in low-carbon infrastructure. Energy-carbon restructuring has implications for the price that households and organisations pay for energy, and also for the spatial distribution of economic activity, affecting jobs, tax revenue and household income (Bridge et al, 2013).

The issue for social and spatial justice is that the costs and benefits of low carbon energy restructuring are not necessarily evenly distributed across society and space. New low carbon jobs do not automatically replace employment loss from decarbonisation in the nature of work or its geographical locations. Moreover if the costs of energy restructuring are evenly distributed they will impact disproportionately on those with low incomes. It is now well-established that the poor and powerless will be most exposed to the negative impacts of climate adaptation because they have fewer resources to climate proof or rebuild their lives elsewhere (Adger, 2001). Originating in concern for employment impacts of low carbon transitions the term just transition is increasingly used to capture broader concerns for these justice and equity concerns in transitions. For Newell and Mulvaney (2013 p132) this concern centres on 'the ways in which uneven exposure to environmental benefits and harm is often not accidental and unintentional, but rather a product of a particular way of

organising production and its constitutive social relations'. Work on just energy and low-carbon transitions starts from the basis that the costs and benefits associated with energy-carbon restructuring will not be evenly distributed socially or spatially, and moreover, if left to competitive market forces, transition has the potential to impact disproportionately on the less affluent (Newell and Mulvaney, 2013). A just transitions approach needs to deal with social justice but also the potential for double disadvantage affecting poorer residents in cities and regions that are disadvantaged in terms of employment and income profile or tax revenue (Bridge et al, 2013).

From a just transitions perspective, the need to provide subsidies and incentives to help drive low-carbon transition should not excessively benefit wealthier residents on the basis of their assets, ability to pay or their consumption practices (for instance, consumption based subsidies reward consumers with money to invest). Increased energy costs might need to reflect the ability of citizens to pay. The role of the state adjustment looms large in terms of either its role as a direct provider of services and infrastructure, or its role in regulating privatised collective provision. All governments can adjust tax and subsidy regimes. There is a role for higher levels of government in determining investment and redistribution of tax income in relation to energy-carbon restructuring and its social and spatial impacts.

Just transitions may not be easily implemented for many reasons. First, attempts to soften the impact of subsidies and incentives sit uneasily with the dominant market based approach to energy-carbon transitions in many countries and the challenge of integrating climate policy within existing policy domains (Kuzemko, 2013). Second, the prevailing political context is one in which governments are moving away from previous commitments to addressing

poverty, inequality and uneven spatial development (Graham and Marvin, 2001) exacerbated since 2008 in many countries by state fiscal deficits and austerity policies (Peet, 2011).

3. State spaces and sites of just energy-carbon transitions: towards households-in-place

Governments can influence, regulate and offset the costs and benefits of energy-carbon restructuring through various policy and regulatory instruments (subsidies, taxes, controls and so on). Any regulatory framework has an inherent territorial (or anti-territorial) logic whether this is implicit or explicit. For example, government strategy might support or facilitate collective action by sub-national governments or favour a scale neutral strategy of creating incentive structures to encourage action by individuals, civil society or sub-national governments on the basis of their willingness or capacity to respond (Bassi et al, 2013; Hodson and Marvin, 2012).

This raises questions about the different distributional modalities and impacts of energy-carbon restructuring, where they are generated and how they might be mediated at different levels of intervention (international, national, regional, urban, neighbourhood, household). For example there have been strong and recurring arguments in academic and policy literature on energy-carbon transitions for municipal scale intervention (Alber and Kern, 2008; Platt et al; 2014). The argument is that cities are well placed to identify opportunities and build support for decentralised renewable energy generation, household energy retrofit and low-carbon behaviour change. There is a suggestion that municipal actors have greater incentive to lead the energy-carbon agenda because the economic and social impacts are

more immediate, or because municipal governance is more amenable to environmental politics (Becker et al, 2015).

In principle, national government and supra-national institutions could use sub-national intervention to rebalance the uneven distribution of costs and benefits of market-led energy-carbon restructuring. In a context of uneven and spatially differentiated development, municipal government exists in part to provide the necessary geographical nuance that is not possible in one size fits all national regulation (Duncan and Goodwin, 1988). Where there are countervailing 'justice' mechanisms the onus is often on individuals and local governments to drawn down funding. Empowered cities may choose to pursue actions in support of just transition above and beyond national policies, providing the scaffolding needed to ensure that those who are disadvantaged and disempowered are able to benefit from energy-carbon restructuring and minimise the costs. Arguments for 'remunicipalisation' of energy have an explicit pro-social (as opposed to pro-market) focus (Cumbers, 2012 and 2013; Angel, 2016). The premise is that municipal action is driven by a progressive agenda that includes commitment to addressing disadvantage. In this respect, a further dimension of the urban approach is the potential it offers to align distributional concerns with procedural fairness and recognition. These elements represent a 'trivalent' approach to justice (Walker, 2011), with the argument being that concerns with decision-making and recognition are necessary to achieve meaningful distributional justice. In other words, issues of poverty and disadvantage need to be visible and explicit in decision-making. In this respect it is possible that an urban politics of urban-energy restructuring will be different to a regional or national politics in terms of what is enabled or constrained around a just transitions framework.

The argument is that energy-carbon transitions in general, and just energy-carbon transitions in particular, necessitate certain modes of governing (Bulkeley et al, 2007) and capacities at more or less the urban scale. In Polanyian terms, there is an argument that the urban is important as a scale or site at which markets can be socially and spatially (re-)embedded (Polanyi, 2001). However as a range of literature has demonstrated, there are dangers in falling into the 'local trap' (Purcell, 2006) where it is assumed that local scale intervention is inherently preferable to action at other scales or across spatial scales. In short, 'it is critical to think carefully and strategically about scale' (Purcell, 2006). We would also suggest that there is a danger of falling into a statist trap whereby government intervention is privileged over actions by civil society. To be clear it is far from guaranteed that city governments will devote time and resources to social protection, even if they are able. Transitions are therefore multi-scaled (or multi-level) but also emanate from multiple territorial and agential sources (Hodson and Marvin, 2012). Pathways to change are not always easily traceable but observable action can be seen to emerge from across the urban 'field', within and outwith the state. Yet action beyond the state is dependent on access to resources, meaning that wealthier places and communities have more capacity to act.

However there are dangers in restricting analysis of spatial justice and energy-carbon to questions of municipal capacity if that says little about the differential impact on individuals. For example, what households within different localities are advantaged or disadvantaged by energy-carbon restructuring and in what ways? This might be called a households-in-place (and perhaps households-in-place and policy) perspective on just transitions that gives more weight to the diverse ways in which households are selectively privileged or disadvantaged by changes in pricing structures and policy. In the following sections these ideas are

explored through the specific example of state support for energy-carbon restructuring in England.

3.1. Methods

The material presented draws on a number of academic and policy-oriented research projects funded by a range of organisations from 2010-15, including a two year research council funded research project [**details omitted**], government funded research on municipal energy investment **[details omitted]** and three funded research projects on energy efficiency and fuel poverty initiatives **[details omitted].** Data from these projects was supplemented by a documentary review of local and English low carbon energy policy. In total this dataset amounts to over 100 interviews with urban policy stakeholders and national policy stakeholders. Interviews included representatives of each of the eight English core cities (the largest cities outside of London) as well as eight other large urban areas. Interviews were professionally transcribed and then coded using NVivo qualitative data software. In the analysis below we have tried to capture the national picture with examples from a range of cities rather than present individual city case studies.

4. The distributional sites of energy-carbon restructuring in England

Since the early 2000s there have been social and economic incentives for UK governments, citizens and firms to invest in low-carbon infrastructure to offset rising energy costs and carbon pricing (Platt et al, 2014). From 2007-2013 there was an average increase of 41% in consumer gas bills and 20% in electricity bills because of increased wholesale and supplier costs/margins and low carbon and energy efficiency policy, with energy security and climate policies accounting for 9% of household energy bills (DECC, 2013b). The UK government

has also introduced a statutory Carbon Price Floor (CPF) to ensure that carbon taxes increase until at least 2025 in support of a committed 80% reduction in Greenhouse Gas Emissions by 2050 on 1990s levels (UK Government, 2008). Prior to 2010 local authorities reported on progress in reducing local carbon emissions and the mandatory CRC Energy Efficiency Scheme requires large public and private sector organisations to pay for carbon emitted from their property estate (Scott, 2011). In 2016 some 11 per cent of households in England were experiencing fuel poverty under the UK government's 'Low Income High Cost' definition (BEIS, 2018). Energy prices are set to increase in the future (DECC, 2013b).

Over the same period the UK government introduced grant and subsidy regimes to support low carbon energy transitions. A feed-in-tariff (FIT) for renewable electricity generation producing up to 5MW was introduced in 2010. Initial FIT rates were generous - up to 43.3p/kWh – providing guaranteed revenue streams over 25 years, leading to dramatic increases in installed solar PV capacity (DECC, 2012). A similar incentive scheme for renewable heat generation followed: the Renewable Heat Incentive (RHI). The costs of these programmes are passed on to consumers through energy bills, and as a result poorer households are made proportionately worse-off by these programmes – even if some low income households also benefit (see Fuel Poverty Advisory Group, 2013). There are also opportunities for cost effective investment in decentralised energy networks because of the rising price of gas and electricity supplied through the national grid.

The capacity and willingness of municipal authorities and households to invest in low carbon energy infrastructure has significant implications for the distributional impacts of low carbon energy restructuring. Indeed, there are concerns that the mixed economy of UK low carbon energy regulation disadvantages certain constituencies because of the strategically selective

nature of incentives (e.g. FITs are not available to those who rent property) and the time, knowledge and commitment required to access support (Sherriff, 2014). This is an issue of social justice at the household scale, but also of spatial justice as places are differentially exposed to energy and carbon re-pricing because of the nature of the local economy or socio-economic profile. Often the two will combine because places with higher economic dependence on energy intensive industries are also more likely to have higher levels of fuel poverty. Many grants and subsidies to offset rising bills are funded at no net cost to national government by 'energy and climate policy' levies on energy bills. In general, policy and incentives for decarbonisation increased under Labour governments from 1997-2010 but were scaled back under the Coalition and Conservative governments from June 2010 onwards (Cowell, 2013).

In England there are important constraints on the capacity and capability of state and non-state interests to influence investment or regulation across the urban energy metabolism (Kern and Bulkeley, 2006). Multi-level government in England is highly centralised. Local authorities have limited autonomy to generate taxes or borrow for investment in low-carbon infrastructure, or to provide or regulate key services such as public transport or rented housing. Moreover, energy generation and supply was centralised and regionalised in the late 1940s, followed by privatisation and liberalisation of electricity and gas sectors in the 1980s and 1990s (Jamasb and Pollitt, 2008).

In the following sections we explore five different modalities of uneven economic and social impact and potential implications for governmental action in terms of factors influencing the capacity and capability of UK firms, households and local agencies to access resources needed to support low carbon energy restructuring. We use five key sites where energy-

carbon restructuring raises issues of just transition in order to do so. We emphasise how the combination of national policy and variegated levels of sub-national state and non-state capacity interact to produce household level effects that are affected by but not always reducible to spatial difference: rather the overlap of social outcomes with the differing mediating capabilities of sub-national actors is seen to be an important point of analysis. The sites are:

- Distributed heat networks
- Low carbon energy generation
- Domestic energy efficiency
- Low carbon planning
- Low carbon economic development and employment

The sites, the key characteristics of intervention, actors involved and implications for distributional inequalities are summarised in Table 1.

4.1 Selective urban municipal empowerment and distributed heat supply

Space heating is responsible for around 60 per cent of energy use in homes and the cost of heating is an important cause of fuel poverty (Hills et al, 2014). Modelling by the UK Committee on Climate Change (2010) places heat networks using low carbon fuel as one of the most cost-effective carbon abatement measures. Heat networks (also often called district heating) have proven to supply cheaper energy to consumers in the UK than average costs for alternative supply (BEIS, 2017). However historically there have been low rates of heat network construction in England and since the 1990s it has been a growing policy agenda (DECC, 2013). The problem is that district heat (DH) networks require significant upfront investment with carbon and cost savings made over a longer period of time. That is difficult

in a context where the UK framework of energy liberalisation is designed to give consumers and firms the freedom to select their energy supplier, which would create uncertainty about future income for potential investors in district heating.

Energy price rises, carbon pricing and carbon control have created fiscal and political space nationally and locally for renewed interest in decentralised or distributed generation of heat in the UK (IPPR, 2014), including the creation of a number of local Energy Service Companies in partnership with the private sector (Hawkey et al. 2014), often driven by concerns about fuel poverty:

> we wanted to think we've got the carbon target, that's the strategy but what does it mean to people on the ground, what are the political objectives and the important one for us was taking as many people as we can out of fuel poverty. (Local council cabinet member, interview, 4/11/14)

Despite centrally imposed constraints on local authority borrowing, district heating is eligible for relaxed rules on prudential borrowing for capital expenditure without government consent if debt is serviced from revenue resources (DECC, 2015). Funding is also available through EU initiatives, the UK Green Investment Bank and a number of other low interest funding sources. Local governments also work with companies on joint ventures to generate finance and share investment risks.

As of mid-2016 118 local authorities had been granted small amounts of funding (up to £300,000) from the government to help kickstart DH developments. However scaling up that activity has been restricted by the challenge of persuading individual organisations and domestic customers to sign up to longer term contracts needed to cover initial investment:

> if you're trying to sign long term energy supply contracts it's the conservatism of business that you don't really want to commit to longer than three to five years and you're asking someone to sign a fifteen years energy contract, it's potentially a big ask. Particularly with the uncertainties around where energy costs are going to be going. (Interview, local authority officer, 12.2.12)

It is worth noting here that DH can have risks for some citizens as well as benefits. Households connected to DH are essentially committed to a monopoly supplier and there is no regulated customer protection scheme for DH. Conversely, those not in a position to be connected to a heat network potentially miss out on cheaper energy.

The time, resources and financial risk involved in developing local low carbon heat projects have been challenging for many local authorities, despite support available from national government, intermediary organisations and potential private sector investment:

> One of the big barriers is around having the financial capacity and skills to do the necessary work on putting it out to market … We can do some of the engineering work in-house, but doing the financial side of it is difficult. Conversations we have with bankers, [lists several international banks] the list goes on; it's the financial model which is important. (Interview, policy manager, local authority, 09.03.12).

After 2010 scope for UK authorities to exercise powers and capabilities was weakened by cuts in local government budgets and reduced staffing. Local authorities in England lost 27%

spending power between 2010/11 and 2015/16 in real terms (Hastings et al., 2015) and discretionary activity such as environmental and energy work has suffered:

> I think it's against the backdrop of the scale of the financial challenges for the council and how it's going to change in the future that no-one's really willing to say at the moment what we'll definitely be doing in the future. (Interview, policy manager, local authority, 22.10.14)

Smaller, peripheral urban areas are particularly disadvantaged under current policy arrangements. Such places often lack significant levels of concentrated demand (in the form of large energy users) to make heat networks technically and financially viable, and also often have fewer internal resources to effect change. Huddersfield (population 163,000) in northern England is one example, where several attempts to establish town centre DH have previously been constrained by combined issues of urban form, lack of stable anchor loads and investment. Cuts to local authority budgets after 2008 meant that the council's environment and energy team was disbanded leaving only one member of staff with partial responsibility for delivering energy projects.

In summary, municipal intervention on low carbon heat has potential to ameliorate some of the socio-economic impacts of energy-carbon restructuring through interventions that place social goals alongside environmental and economic outcomes. However, moves towards a distributed heat system through selective municipal engagements overlay and potentially extend existing spatial inequalities. Cities with an amenable urban form, internal skills and resources, and a working relationship with central government (for instance through the Core

Cities group in England[2]) or ability to successfully bid for government funding packages and who can coordinate these resources together in a way that produces a business case for inward investment can move forward on goals for decentralised heat generation. Others will struggle to do so. From a household-in-place perspective, agency is constrained, dependent on the ability of urban policy and private sector actors to invest. On the one hand access to district heating provides opportunity for cheaper energy for some (while others are excluded), on the other it creates lock-in to long-term contracts and vulnerability to future price change and quality of service provision.

4.2 Decentralised electricity generation and the expanded field of energy-carbon restructuring

Action on just transitions is not only about municipal responses. Firms, households and communities could invest in renewable energy retrofit without municipal government support (Aylett, 2013; Monstadt, 20007 Seyfang and Haxeltine 2012; Rydin et al, 2013). This might be termed the 'expanded field' of energy-carbon restructuring with scope for new entrants and business models being opened up by fiscal incentives from central government and rising energy prices. This has been particularly the case for investment in decentralised electricity generation.

Inward investment from private and non-UK investors is an important part of this expanded field, creating opportunities for cities with insufficient municipal resource to invest in new low carbon infrastructure. Local authorities also seek to influence private sector investment decisions to fund new infrastructure or bend existing investment programmes to urban

[2] The Core Cities Group is a network and lobbying group consisting of the local authorities of England's 8 largest cities outside London

advantage (Hodson and Marvin, 2012). In early 2016, for example, Swindon Borough Council joined with a private firm to launch a solar bond scheme to lever £1.8m from investors to match a £3m investment by the local authority on council owned land, and a second site is planned.

Across England the initially generous FIT payments created conditions for a large 'rent a roof' market, with private companies offering free solar panels (and power generated) in exchange for the FIT payments. This could be particularly attractive for households unable to afford upfront costs of installation, though the household would receive significantly less than if they installed the solar panels themselves. One concern is that private firms might help reduce energy costs, but they operate at a profit which takes resources out of local areas and communities. However, FIT rates were cut by over 50% for smaller installations from 2011 onwards because of changing government priorities, funding cuts and reductions of some 50% in the cost of installing PV panels. The initial changes led to the postponement and cancellation of schemes, as outlined by one stakeholder:

> We had a good strong business model set up with the housing providers with a massive [social housing] PV programme and the whole model has just gone pop as a consequence so we've had to rethink the whole lot. I don't know what the numbers where, certainly 10,000 properties and just gone. I don't think we should be too glum about it. I had a good conversation with [Commercial Finance Provider] about it and they've seen this sort of stuff happen before but I think the price of PV will come down and energy prices going up, insulation will come down, it'll pick up, return rates will come up again. I think its time will come. (City-regional stakeholder, Interview 09.03.12)

The quote suggests that the falling market price for PV would eventually make such projects became feasible again, although further reductions announced in 2015 led to further crisis in the PV industry and indicative data showed a more than 50% reduction in new installed PV capacity over the first year following introduction of the changes (DECC, 2016). FITs will be phased out entirely from April 2019.

Opportunities for private sector investment are matched by community and individual investment in energy generation and energy efficiency measures. In this respect, individuals and households are not so much being enrolled within city strategies as taking the initiative in ways that are beyond and potentially bypass the local state. Whilst aspects of community energy might be underpinned by moral-ethical commitment (Kern and Bulkeley, 2013), the extension of decarbonisation policy beyond the local state is underwritten by national grants and subsidies for low-carbon energy and lifestyle choices. The overwhelming beneficiaries of policies like FITs and RHI have been individual households with over 96% of FITs claimed by domestic properties (DECC, 2014a). Grover (2013) showed that there were 50 per cent fewer FIT installations in the most deprived LSOAs[3] than there in least deprived areas. A central concern here is that the incentive scheme is more suited to homeowners with resources to afford up-front costs: Grover (*ibid.*) also found that there were 60 per cent more installations in areas where the most households owned their property outright, compared to areas where least number of households own their own property. From a social justice perspective the groups likely to miss out were likely to be private renters or homeowners on low incomes.

[3] Lower Layer Super Output Area: for spatial analysis purposes the UK Office for National Statistics disaggregates England and Wales into small geographic areas containing (on average) 1,500 residents.

However, as Rydin et al. (2013) demonstrate, collective non-state mechanisms can be important in extending the scope and scale of household and community energy schemes. This can be particularly important in enabling poorer households and communities to benefit from subsidies. The expanded urban field of investment in distributed energy infrastructure reflects and benefits from the logic of the central system and its weak support for municipal coordination. The strength of collective non-state endeavours (such as through the voluntary and community sector; VCS) varies significantly between places, particularly the role of those able to provide some elements of the urban scaffolding by providing coordination and intermediation between residents, other VCS organisations, private sector interests and local government. Again, the effects of austerity have been felt among the VCS, endangering the existence of local 'umbrella' organisations as well as smaller organisations (Dayson et al, 2017).

One example of an expanded field of energy-carbon restructuring is the city of Bristol. Bristol has some of England's largest non-profit energy enterprises, including the Centre for Sustainable Energy and Bristol Energy Co-operative (BEC). BEC was set up in 2011 as a 'people owned power station' for renewable energy and energy efficiency projects funded through investor members. Since 2011 BEC has generated in excess of £9 million investment, and has developed projects with combined generation of over 9MWh per year (BEC website) . BEC has developed community ownership of renewable energy by funding solar PV on buildings and retaining but sharing the income from the government FIT: the same business model as companies that offer to supply PV for free in exchange for all or some of the FIT income ('rent-a-roof' schemes), but with the additional benefit that profits are reinvested into the community. Bristol has benefited from relatively strong, coherent intermediary support networks in particular through the Bristol Energy Network, which was

initially set up in 2010 by Bristol City Council, Centre for Sustainable Energy and Bristol University. The network coordinated the development of a Bristol Community Energy Strategy in 2013, and was seen as a key driver of the development and maintenance of grassroots energy action in the city (evidence from across qualitative interviews; see also Bird and Barnes, 2014; Lacey-Barnacle and Bird, 2018). Community energy schemes of all kinds proliferated across the UK from the early 2000s onward (Seyfang and Haxeltine, 2012). However a recurring concern is that these schemes depend on social and knowledge relations that prioritise schemes in more affluent places. Institutional frameworks for social justice initiatives such as those in Bristol have been difficult to develop and sustain, especially given the impacts of austerity on VCS action and cuts to FIT (Community Energy England, 2015). The next section takes forward that theme by highlighting some of the tensions and difficulties in realising the social and environmental benefits of domestic housing retrofit.

4.3 Domestic energy efficiency: urban fragmentation and intermediation

Energy efficiency measures can produce significant cost savings in the UK and reduce overall demand for imported fuel and new generation capacity. Since 1995 there has been a statutory duty on UK local government to report on energy efficiency uptake and there is a long history of local and national support across different social policy domains (NEA and Energy Action Scotland, 2016) which has included focus on vulnerable and low income groups, highlighted by a series of national fuel poverty strategies beginning from 2001. From 1997 the Labour government introduced a range of measures to fund domestic energy efficiency improvements and retrofit. Most notably, the Carbon Emissions Reduction Target (CERT) scheme (2008-2012) required larger gas and electricity suppliers to achieve targets for reducing carbon emissions from domestic premises, whilst the Community Energy Saving

Programme (CESP) (2009-2012) required those companies to deliver energy saving measures for low income households, mostly home insulation and replacement boilers.

The problem from a social equity perspective is that there were potential barriers of trust and knowledge that potentially limited take-up of CERT and CESP for lower income groups, even if the initiatives were well publicised. There were also limited incentives for private landlords to draw down funding because energy costs were not a key element in rental transactions (social landlords would have more incentive). Local authorities were therefore seen as critical to the delivery of the area-based CESP (DECC, 2014b) and additional resources through government grant and energy supplier schemes allowed many local authorities to maintain in-house energy efficiency teams. CESP was seen as successful in transforming its target areas (*ibid.*) and those living in social housing also benefited from rolled-out schemes such as Decent Homes, which led to improved conditions for 1.4 million households (NAO, 2010). Private rented sector (PRS) tenants were particularly disadvantaged, however, with low levels of take up for different schemes. PRS tenants are disempowered by reluctance of landlords to invest, partly because energy efficiency is not seen as a driver of market demand and because government regulation has tended not to incentivise investment, existing regulation has been poorly and unevenly enforced, and tenants have tended not to challenge landlords based on fear of eviction (CRESR, 2016).

The VCS has become a preferred government intermediary for housing retrofit and energy savings. The UK government's Community Energy Strategy (2014) explicitly places VCS organisations at the forefront of local action, seeing frontline community actors as critical for reaching the hard-to-reach and gaining the trust of residents to take part in government-funded and energy supplier schemes. In addition, VCS organisations were a major recipient

of fines placed on energy companies by the energy regulator as a result of previous market practices: this amounted to around £20 million in 2015/16 (Ofgem, 2016). This 'redress' money focused on domestic energy efficiency, and providing support to vulnerable energy users. This has created opportunities for the VCS but in the context of weakened strategic links with local authorities. Many local authorities have virtually withdrawn from energy efficiency action. In many places this means that the landscape for socially just urban retrofit has become fragmented and difficult to coordinate. Individual organisations and residents find it difficult to navigate this complex landscape with organisations regularly dropping in and out of energy efficiency provision, and short-term funding streams leading to confusion about what support might be available.

After 2010 existing energy efficiency grants were phased out and replaced by the Green Deal, a domestic energy efficiency loan scheme aimed at individual households, and ECO, a linked subsidy programme with emphasis on hard-to-treat and fuel poor households. These changes led to greater emphasis on individual action and private sector delivery and support for local government scaffolding was scaled back, with local authorities having to become registered Green Deal providers to access ECO funding. Some local authorities developed their own Green Deal offer using initial borrowing financed by Green Deal revenues (NFLA, 2014). Others decided to partner private sector providers to coordinate delivery or take a more arms-length advisory role – signposting households to potential support – but many felt that they did not have the capacity to engage or take on the risk. For many local authorities the changes, combined with local authority cuts greatly reduced the capacity to deliver on energy efficiency retrofit. The shift from a regime of direct provision to loans through the Green Deal led sharp reduction in the implementation of energy efficiency measures nationally (Respublica, 2015).

In 2015, the Coalition government's Green Deal scheme was abolished by the new Conservative government. It was also announced that ECO would be reduced in size and then replaced in 2017 by a new supplier obligation around half the size of the original ECO scheme. Continual policy churn has made it hard for local authorities, housing providers and charities to develop long-term strategic plans for urban retrofit. By 2016 it was clear that there had been a distinct 'shift away from co-ordinated action on fuel poverty across the UK' (NEA, 2016 p32). For example, as one local authority representative explained in relation to ECO:

> It is complicated. There are different groups of people who are involved in its delivery, there are the energy companies who are legally obligated to collect the money and spend it, they need to use that money to install in people's home via very prescribed rules set out by Ofgem who oversee it and then there's partners like ourselves who are trying to get the money where it needs to be and get households engaged to it. It's not a perfect scheme by any means, I think everyone recognises that. (Interview, 29.3.17)

Meanwhile there continues to be a problem of weak regulation in the PRS. Regulation was introduced in 2011 giving tenants greater rights to request energy efficiency improvements, but that right is difficult to exercise for most tenants (CRESR, 2013). Some local authorities have set up PRS licensing schemes to promote improved housing quality, but many do not have the capacity to do so, struggling even to continue with existing enforcement regimes on the very worst properties.

In summary, national domestic energy efficiency has included focus on tackling inefficient housing for those most exposed to the costs of heating, including the fuel poor and those with health conditions. This has varied over time and in recent years the overall sums of money available have reduced, meaning less support for improving domestic energy efficiency among the poor and vulnerable. In addition, fragmentation of delivery combined with policy flux and short-term projects has led to difficulties for support providers and individual households navigating the terrain of energy efficiency support. Once again the PRS is worst hit: fuel poverty as a result of poor housing quality is highest among this group (Tinson et al, 2016).

4.4 Urban planning and the mediation of just transitions

Alongside governing through investment in provision and enabling, local governments can steer development and consumption through traditional forms of 'authority' via regulatory powers, sanctions, spatial planning and initiatives such as congestion charging (Bulkeley and Kern, 2006). Yet European local governments tend not to exploit their full authoritative powers because of public opposition and competitive pressures on local governments to minimise the regulatory burden on developers and businesses (Kern and Alber, 2008). In the UK, the possibilities of a local regulatory race to the bottom on energy and climate regulation are minimised because emissions reduction, energy efficiency and support for renewable energy have become increasingly important in national planning policy, building regulations and local procurement. However the overriding emphasis in national planning policy on facilitating development has led to the downgrading of the more demanding dimensions of low carbon and energy planning in national policy (Cowell, 2013).

Interventions to reduce CO2 emissions can be risky politics (Rutland and Aylett, 2008) when intervention is perceived to impose new costs, inconvenience or infringe on what are seen as established urban rights and privileges. This might include resistance to the rolling out of low-carbon infrastructure such as new CHP plants, wind turbines, or the enclosure of urban hinterlands to help meet renewable energy needs. In 2008 the Greater Manchester electorate rejected a £3bn package of investment in public transport because of resistance to a congestion charge needed to partially fund the initiative. The initiative by the Association of Greater Manchester Authorities exemplifies the logic of supporting economic growth and enabling lower carbon urbanism. It also represents an attempt to extend powers of governing by authority. The decision to work through a vote reflected the complex politics of congestion charging, including political tensions between the central City Council and surrounding municipal authorities that would bear the main costs of the charge, with three of the twelve authorities opposing the proposal (Sherriff, 2014). There was powerful resistance to perceived infringements on private mobility from citizen groups and business but also strong campaigns of support. After two years of debate and campaigning 78.8% of the electorate voted against the package and the initiative was withdrawn. Authoritative intervention was limited in this case not just by political fragmentation, but also the uneven distribution of costs and benefits from energy-carbon restructuring and the difficulty for the local state in challenging ingrained habits. There can be a challenge to convince citizens of the long-term benefits of projects that will directly impact on their everyday lives. The inability or reluctance of urban governments to use authoritative powers therefore ensures that the ingrained injustice of a prevailing focus on non-redistributive policy at a national level – with costs skewed towards poorer citizens– are not easily addressed locally.

4.5. Low carbon economic development and the fair distribution of (good) jobs

There has been growing recognition in recent years that green technologies and services offer considerable economic development potential. Policy-makers around the world now see the green economy as a source of growth and jobs and the potential basis for a new round of capital accumulation (Bowen et al, 2016). By 2016, the UK low carbon and renewable energy (LCRE) sector had an estimated turnover of £42.6bn, accounting for 1% of UK GDP and employing 208,000 people directly, with a further 183,500 employed in the supply chain (ONS, 2018). Medium-term employment trend estimates are hard to establish owing to changes in methodology, but figures from 2010-13 (BIS, 2015) and from 2014-16 (ONS, 2018) suggest an average increase in employment of 4-5% per year. Investment and jobs growth will continue to expand as decarbonisation continues to work its way through economic and social life (Bowen et al, 2016).

However it is also necessary to recognise that although there will be new green jobs and green business opportunities, the overall pattern will be of a churn in jobs and economic activity as employment and investment declines in sectors dependent on fossil fuels and rising energy that are unable to diversify. There might be some insourcing of production because of increased energy costs but energy-intensive sectors may gravitate to locations with lower carbon costs or better low carbon infrastructure. The key issue is that the low carbon economy is unlikely to be evenly distributed across or within countries and new jobs will not necessarily replace jobs that are lost because of decarbonisation both in terms of quantity, quality and the target workforce. Less wealthy places have significant potential to benefit from low carbon job creation, but that might depend on low carbon resource advantages (offshore wind sites, fracking, biomass production potential), the resources available to invest in low carbon infrastructure (retrofit, district heating), the commitment and resources for

inclusive employment strategies (training that helps less advantages groups and communities access jobs, as well as more traditional dimensions of economic competitiveness (transport infrastructure, industrial sites)). In emerging spatial divisions of labour, higher value R&D and innovation is likely to be located in or close to existing R&D centres, though in England wind power firms such as Siemens have invested in R&D facilities in peripheral coastal locations near their offshore facilities. Lower value, lower skilled jobs such as in recycling plants locate to points of low labour costs and often recruit marginalised residents (see Gregson et al, 2014), potentially reproducing existing inequalities.

There is already intense competition to nurture, attract and hold down the more mobile innovation and production centres of the emerging low carbon economy. At international levels (Cedefop, 2014; UNEP 2016) and in some countries there is discussion about the need for economic development, skills and training strategies that help balance the social and spatial economic and employment impacts of decarbonisation. However in the UK that approach is limited by a general scaling back of policy to direct economic activity to less privileged regions or facilitate more inclusive access to jobs through work and training. Inevitably both strategies are needed, a supply-side focus on job creation and a demand-side focus on enabling target communities and individuals to access jobs (Crisp et al, 2015), but national strategy is largely passive in seeking to build capacity in particular regions or localities. Much of that activity in the UK depends on local initiative in a context where local authorities and employment agencies have limited resources and autonomy. Studies such as the Leeds Mini-Stern (Gouldson et al, 2012) – with similar studies in Hull, Liverpool, Manchester and Sheffield – have mapped out the specific employment as well as economic development benefits of proactive investment in low carbon and energy infrastructure such as

retrofitting, district heating and so on, especially as employment benefits can be built into local contracting. However the response to that has so far been limited.

Older industrial areas across the North of England have already been negatively impacted by previous rounds of economic restructuring and the potential loss or restructuring of energy-intensive industries as a result of pressures to dercarbonise potentially creates further risks. Some of the work on balancing the employment costs and deficits of energy-carbon restructuring has declined following the abolition of Regional Development Agencies (RDAs) in 2010. Many RDAs had ambitious sector strategies for energy and low carbon at a scale to make a difference. In the Yorkshire and Humber region in the north of England there was a strategy to invest in carbon capture and storage and industrial ecology at a sub-regional scale to help energy-intensive industries adapt to energy-carbon restructuring. Abolition of the RDAs removed the organisational and funding structures needed to support that initiative.

Most city-regions across England have at least produced plans to harness the benefits of a low carbon economy as part of broader economic strategies but the level of ambition has been variable across England and focus on just transition has been limited (Britton and Woodman, 2014). Overall resources for sub-national investment in economic growth has been reduced since 2010 and more heavily directed by national government through negotiated deals and specific programmes (Etherington and Jones, 2016). Meanwhile government economic growth strategies such as the UK Industrial Strategy (BEIS, 2017) channel low carbon R&D investment towards established centres of growth, disproportionately located in London and the South East of England (CRESR, 2017). The social and spatial implications of the heavily centralised nature of English government and fiscal resources is perhaps most acutely seen when viewing the capacity of individual places

to respond to the impacts of economic restructuring restructuring energy-carbon restructuring. Very little scaffolding currently exists to protect disadvantaged citizens from the impacts of potential job losses or enable uptake of jobs in new industries, exacerbated in particular by a lack of strategic intervention at supra-local levels of government (regions, city-regions).

5. Conclusions

The differential capacity of people and places to invest in energy efficiency and low-carbon technologies has important implications for social justice in energy-carbon transitions. This paper has examined how the distributional politics of low-carbon restructuring are unfolding in the UK through selected key sites of distributional impact. In the period studied the UK government has been relatively proactive in facilitating investment in energy-carbon restructuring through pricing mechanisms, regulations, grants and financial incentives. Some of the mechanisms have explicitly or implicitly sought to address concerns about social justice in relation to household fuel poverty and have created opportunities for collective action by municipal governments and the community and voluntary sector. What our research maps, however, is the strategic privileging of homeowner interests in the national incentive-grant regime. That strategic privileging has become more rather than less entrenched over time as support for decentralized initiatives has been scaled back because of a combination of post-recession austerity, the falling costs of PVs and reduced government commitment to decentralized options for energy restructuring. The UK mode of governing low-carbon energy largely relies on individuals (municipalities, households and firms) to access support on offer through disconnected policy measures. In this respect forms of urban

scaffolding are needed to provide platforms for assembling the knowledge and resources for decentralized generation, but also for enabling citizens and communities to draw down state investment funding that they contribute to and which can help offset rising household fuel bills. Indeed, there is now a 'proliferation of pathways' to low-carbon energy restructuring within and across UK cities (Rydin et al, 2013). The relative weakness of the urban scale of coordination in the UK is therefore a particular issue for just transitions, with municipal authorities weakly placed to act even where there is strong local political support and opportunities for cost-effective investment and mediation between citizens and grant funding. It should be noted that the paper covers a particularly period of time, shaped to a large extent by national fiscal austerity after 2010 and the scaling back of support for sub-national energy experiments. It might be that future governments will be more supportive of measures to rebalance the uneven social and geographical impact of energy and carbon pricing.

More broadly, this paper uses the UK example to make a conceptual contribution to research on urban energy-carbon restructuring. First, the paper reiterates the importance of situating work on the politics of energy-carbon restructuring within a multi-dimensional, multi-scalar framework that captures the complex ways that the costs and benefits of energy-carbon restructuring are being distributed to places, firms and citizens and becoming embedded in place-based activities (cf. Hodson and Marvin, 2012). The UK example reflects a particular landscape for low-carbon energy policy but the broader issue is to highlight the range of ways energy-carbon restructuring comes to ground and its unevenness for places and households. Second, the paper develops the specific idea of a *households-in-place* perspective to help understand the full and nuanced socio-economic implications of energy-carbon restructuring, highlighting the importance of asking questions about the role of collective social scaffolding

for energy-carbon restructuring at different sub-national scales. An integral part of that approach is to move beyond a narrow concern with the role of the state in modes of governing to think about the presence and absence and potential limits of support in the expanded field of intervention. Finally in exploring the expanded urban dimension of energy-carbon restructuring we have drawn attention to the overlaps between questions of spatial justice (e.g. equality of distributional outcomes and opportunities between places) and social justice (distribution between individuals and groups). Social justice is unlikely to be achieved without a commitment to fair distribution of the costs and benefits of energy-carbon restructuring between municipal authority areas, and that includes the resources needed to support investment in energy efficiency and lower-carbon technology across the multiple sites of social and spatial justice associated with low carbon energy transitions.

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