

A working paper for the EVALOC project Roles and change strategies of low carbon communities

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Abstract

It is widely recognised that the transition to a low carbon future will require action by distinct actors across different levels and sectors. Yet while there is much analysis about what needs to change there is less clarity in the UK about who is responsible for change or how to achieve the transition. The paper helps to address this limitation by assessing these questions in relation to the change strategies of a number of low carbon communities (LCCs) in the UK. Drawing on emerging findings from the EVALOC¹ research project in the UK, and other relevant sources, it compares the design of three local 'community group' with two local 'partnership' domestic carbon reduction strategies. It assesses their contributions and limits and investigates the extent to which the different change strategies contribute to the multiple influences on energy use identified in the literature. The findings indicate that both local authorities and community groups are making important contributions to domestic carbon reduction. However, LCCs have an uneven spread, capacity and reach, and community groups need to be seen as complements, rather than substitutes to, local authority action. The research also raises questions about the effectiveness and sustainability of a government strategy that relies largely on voluntary and market approaches, shows how local action is constrained by wider structural barriers and points to the need for a stronger and more active role for national government.

Key Words: Low Carbon Communities, Transitions, Domestic Energy Demand

¹ EVALOC is a research collaboration between Oxford Brookes University, Oxford University and six (DECC funded) low carbon communities. It is investigating the effectiveness of six Low Carbon Communities (LCCs) (which have received funding from DECC's Low Carbon Community Challenge) in changing local energy behaviours and reducing local energy use, as well as the communities' success in achieving sustained and systemic change. The project seeks to explore the role played by social learning, energy feedback and monitoring devices, social networks and knowledge transfer in achieving these changes. See Gupta and Darby, (2011), supported by the Economic and Social Research Council (**Grant reference: RES-628-25-0012**). Any views expressed are those of the authors alone and do not necessarily represent the views of the funders.

1. Introduction

1.1 Purpose of the paper

Achieving the UK's carbon reduction target of 80 % target by 2050 (Climate Change Act, 2008) will require action by different actors at different levels and across different sectors (e.g. Parag and Janda, 2010). However, while there is considerable analysis, and some consensus, in the UK energy literature about 'what needs to change' to achieve these targets, there is less clarity about 'who is responsible for change' and/or how change might be achieved (Mayne et al, 2010). This paper seeks to help address this shortfall by assessing the *design* of three 'community group' and two 'local partnership' domestic carbon reduction strategies in the UK and drawing out lessons for practice and policy focussing on the key questions of who is responsible for change and how can change best be achieved.

1.2 Scope and definitions

The paper focuses on *Low Carbon Communities' (LCCs')* which we define as neighbourhood scale carbon reduction initiatives that are led and implemented by local actors. We think they are of particular interest because of their practical and bottom-up understanding of domestic energy reduction. We recognise that a range of actors might be involved in domestic carbon reduction – such as government, regulators, the power generation sectors, network operators, energy utilities, assessors, installers, suppliers - but we focus here on *Local Authorities (LAs)*, and '*Low Carbon Community Groups (LCCGs)*' and the role of government. We define the latter as neighbourhood organisations which might be informal associations or legally constituted charities, cooperatives or social enterprises. We focus on domestic carbon reduction strategies in existing rather than new-build, houses, and consider these to include energy efficiency, renewable energy and/or behavioural interventions. We define '*energy (related) behaviours*' as including the purchase, use, maintenance or lease of energy-using appliances, technologies, goods or services. We recognize that people are often unconscious of their energy use or carbon footprints and that energy (related) behaviours are not just a matter of individual preference but are shaped by a wide range of social, economic, technical, political influences.

1.3 Data sources and methodology

The paper draws on evidence from EVALOC's community level research² with six LCCs in the UK including base line research, the first two waves of focus groups (three per community per year over three years), research at community events, and semi structured interviews with key stakeholders. EVALOC's household level surveys which are still underway at the time of writing - involving energy monitoring, collection of quantitative and qualitative data and social network analysis – will provide further evidence about the effectiveness and impacts of LCC interventions. The paper also draws on the energy literature, international climate justice literature (e.g Ikeme 2003),

² See <http://www.evaloc.org.uk/>

power and social change literature (e.g. Lukes, 2005), as well as the grey literature about LCCs and change strategies.

1.4 Paper structure

Section 2 presents the context for the community and partnership change strategies in the UK drawing on recent relevant studies, government statistics and academic research. Section 3 reviews relevant energy literature and develops a conceptual framework with which to assess LCC's strategies. Section 4 discusses the contributions and limits of the strategies, and section 4 presents our conclusions.

2. The UK context

2.1 UK Government domestic carbon reduction policy

The UK has had a centralised and liberalized energy market since the 1990s which is dominated by six major energy companies. The introduction of the UK Climate Change Act 2008 (DECC 2008) and European Commission Renewable Directives (EC 2009) has prompted the Government to introduce a number of new policy instruments to decarbonise supply and reduce energy demand. These include, among other things the renewables obligation, Contracts for Difference, Feed in Tariffs (FiT) and Renewable Heat Incentive (RHI) to incentivise renewable energy generation, and the recently launched Green Deal and Energy Company Obligation (ECO)³ to improve domestic and business energy efficiency (DECC, 2011a). The UK government also has a statutory duty to eradicate fuel poverty in England where reasonably practical by 2016.

The Green Deal, which we focus on in this paper, seeks to address key financial and technical barriers by providing upfront capital for 'able to pay' households⁴ for low cost measures, and instituting a system of accredited 'Green Deal Providers' responsible for providing energy assessments, finance, and the installation of measures. It is a largely voluntary market-based instrument, which assigns a major delivery role to private sector Green Deal providers. The government has indicated that it also sees local authorities, social housing providers and community groups as playing an important role either as 'providers', 'delivery partners' or 'promoters' of the Green Deal (DECC 2011 (a)), but has not allocated additional revenue funding to enable them carry out many of these roles. The policy places no targets or legal obligations on owner occupiers to improve domestic energy efficiency. There is expected to be comparatively limited uptake of the Green Deal, compared to previous policies, because of its increased reliance on the market mechanism, and because of the predicted high levels of interest rates for loans for the 'able to pay,' among other things (see for example Rosenow and Eyre, 2012).

³ The new ECO replaces the previous Carbon Emissions Reduction Target (CERT) and the Community Energy Saving Programme (CESP).

⁴ The bedrock of the scheme is the provision of 'loans' repaid by savings on fuel bills (the golden rule) and with the 'loan' attached to property rather than the occupant

The Green Deal will be accompanied by the ECO which imposes carbon saving targets on large energy companies in relation to vulnerable groups and high cost – or ‘hard to treat’ - energy efficiency measures. As with previous policies suppliers are expected to achieve their targets by subsidising measures and recouping their costs by increasing consumers’ energy bills. The ECO allocates fewer resources to vulnerable groups than the previous schemes, and the previous publicly funded grant scheme for vulnerable households (Warm Front) has been closed (ibid).

2.2 Local Authority Roles

The Government has indicated that it sees a key role for local authorities in reducing domestic carbon emissions (DECC, 2012). However, there are currently no legal obligations for them to do so. It recently abolished the ‘national performance indicators’ which had previously required local authorities to reduce carbon emissions and fuel poverty. The introduction of new guidance for local authority in the Home Energy Conservation Act ⁵ (DECC, 2012) is seen to be a ‘fairly minor’ requirement (LGIU, 2012, pp. 3). Local authorities are also currently experiencing funding cuts which combined with the lack of statutory obligations and the encouragement of partnership working (Geddes, 2006) , is contributing to ‘load shedding’ in many local authorities (LGIU 2012, pp. 3). While there are a number of exemplar local authorities in the UK (see Fudge, S. et al, 2012), recent research indicates that climate change work has narrowed, is weak or absent in around two thirds of local authorities (Faye, S, 2011), and less than a third (28 per cent) of councils have an effective plan for slashing carbon emissions (Friends of the Earth March, 2011). Another recent survey of 58 local authorities (14% of the total) in the UK showed that while 36% of local authorities said they had a high commitment to fuel poverty the scale of local authority spending on [fuel poverty] measures varies enormously and is not strongly related to level of need (Wade, J. et al, 2012)

2.3 Low Carbon Community Groups Roles

There are at least 700 groups in the UK active on climate change, low carbon and/or energy issues, although there are no formal legal obligations on them to do so. 400 of these are affiliated to the Low Carbon Community Network (LCCN), and around 300-400 are affiliated to the Transition Network, although there may be some overlap between the two networks (Giangrande, N., Transition Network Workshop, March, 2012). LCCGs initially emerged despite, rather than because of, government policy (Moloney et al, 2010) although more recently they have been able to access a growing number of policy initiatives and grant programmes (Seyfang et al., 2012 b).

LCCN’s 2011 survey with 100 of its members showed that 97 % of respondents are involved in running practical local projects aimed at addressing climate change within

⁵ HECA previously set local authorities a target of increasing the energy efficiency in domestic housing within their boundaries of 30% within 10 – 15 years. It has been amended by current government to require local authorities to report on the uptake of energy efficiency measures under the Green Deal and area/street by street in their “energy conservation reports”. (DECC, 2012)

their communities e.g. home energy advice, food transport, domestic and community scale renewables. (LCCN, June 2011). An increasing number also seek to contribute to wider systemic change through: (a) partnership working: in LCCN's 2011 survey 44 % of respondents said they were formally linked into a climate change partnership; and (b) influencing government policy – in LCCN's 2011 survey, 40% of respondents said they were in regular contact with their MP and 15 – 20% were engaged in protests and direct action. Many community groups are also engaged in disseminating innovations and good practice through networking and peer to peer mentoring (Hamilton et al, 2012, forthcoming). Despite this wide range of roles, sporadic and inconsistent funding means that in practice the majority of LCCGs are largely reliant on volunteers (Seyfang et al., 2012 b).

3. Literature review and change framework

In this section we draw on a literature review for the EVALOC project (Mayne et al, 2010) to address the following key questions with respect to domestic carbon reduction: who is responsible for change, what needs to change, and how can change be achieved. We then develop a conceptual framework to assess LCCGs' (and other actors') domestic carbon reduction strategies in relation to these core questions.

3.1 Who is responsible for change?

In principle, national Governments are the main duty bearers for climate change mitigation (and adaptation) as they are obliged under various international agreements and national legislation to protect the environment and human rights, and reduce carbon emissions. At the same time there has been growing acknowledgement that the transition to a low carbon future will require action by a wide of state and non-state actors. In the UK the government has transferred responsibility to energy suppliers for achieving much of its domestic energy efficiency and fuel poverty targets (generating a possible conflict of interest as companies need to maximise sales of energy). In addition wider policies of privatization, sub-contracting, localism and voluntarism in the UK have blurred the traditional roles and responsibilities of government and thrown the role of private sector, individual consumers, and the third sector, including community groups, to the fore. LCCGs, which are a core focus of EVALOC research and this paper, are understood to be more trusted and closer to citizens than the government or private sector (House of Lords 2011); able to engage people as citizens and not just consumers and increase agency through collective action (Heiskanen, 2010); effective at motivating and engaging people, influencing social norms, and changing behaviours (Bunt and Harris, 2010; Cox, J. et al, 2010), and sources of 'niche innovation (Seyfang and Haxeltine, 2012 a). In the international arena there has been considerable discussion, although not full consensus, about how to secure a 'just' and 'efficient' allocation of rights and responsibilities for carbon mitigation between nation states (see for example Ikeme, 2003). There has also a growing discussion about the responsibilities of business to avoid infringing the rights of others (UN Guiding Principles on Business and Human Rights). However, these discussions are only just beginning in the UK (eg Buckeley,

2012), and there is little shared understanding of what constitutes a fair allocation of roles and responsibilities for carbon mitigation.

3.2 What needs to change?

There is some consensus in the energy literature that achieving the needed carbon reduction targets will require: (a) an increase in the energy efficiency of infrastructures, buildings, appliances and vehicles; (b) a reduction in energy demand - both direct and indirect and (c) a de-carbonised energy supply, an approach the UK Low Carbon Strategy has adopted (Whitmarsh, 2011; Willis and Eyre, 2011). There is also growing recognition that achieving these objectives will require changes to people's every day energy related behaviours (or practices) in order to ensure the uptake of the technologies in the first place, to maximize energy savings from their use, and to reduce overall energy demand (Janda, 2009; Schipper et al., 1989; DEFRA, 2008). There is burgeoning literature about the multiple economic, technical, socio-psychological, social, cultural influences on energy-related behaviours and use that might need to be addressed to reduce carbon emissions (Jackson, 2005).

3.3 How to achieve change (change pathways or strategies)?

Change models and theories emphasize the role of different individual, interpersonal/group and structural influences in driving or constraining energy behaviours and use - whether social, economic, technical, political, and/or cultural. We outline some of these in section 3.4 below. They also highlight different change pathways/ processes, types and scales of change. In the energy literature some earlier rational choice models, for example, suggested that changes in 'attitudes' might lead to changes in [energy] 'behaviours', in a linear fashion, but it is now widely recognized that many other influences can intervene to constrain change, sometimes referred to as the value-action gap (Blake, 1999). Other models emphasise the interactions and feedback loops between different (groups of) influences, e.g. between technologies and occupant behaviours (Janda, 2009; Schipper et al, 1989); between different network actors as in social network theory (e.g. Rogers, 2003); or different 'system' levels as in transition theory (e.g. Geels and Schot, 2007). Less researched, and perhaps less understood, in the energy behaviours literature is how the direction of change might be reversed by using government regulation or policy to directly change energy behaviours, and how this can subsequently shape attitudes as happened in the case of the London congestion charge, seat belt regulation and banning drunk driving (Prendergast, 2008; Jackson, 2005, Dorfman et al., 2006).

There is some discussion in the UK energy literature about the 'strategies' needed to achieve change. Transition Management theory, for example, explores how governments can nurture and steer system innovations (e.g. Kemp et al, 2007). The literature on energy demand and behaviour change focuses on government's 'enabling' roles in steering, nurturing and supporting action by other actors (e.g. Thaler and Sunstein, 2008; Kemp, 1998, Geels, 2007). As noted above, there is also a burgeoning literature on how to change individual [energy] behaviours (Jackson 2005), as well as

increasing interest in the role of community groups in carbon mitigation. Yet there appears to be less research about governments' leadership, interventionist or 'doing' energy-related roles and strategies, for example through the use of active technology policy, fiscal instruments, regulation, direct service delivery or infrastructure provision, although there have been some recent calls for a more active role for government (Jacobsson and Berg, 2011; House of Lords, 2011). There is a growing body of research about the effectiveness of LCCs (including grey literature evaluations) but less academic research about the change strategies LCCs use, or might use, to contribute to systemic change whether through networking/dissemination, partnership working movement building and/or policy influencing is, or their limits.

3.4 Change framework

Drawing on the EVALOC literature review, we propose the following conceptual framework for assessing change interventions:

What needs to change: As noted above the literature identifies multiple factors that influence energy use and which might need to be addressed in order to reduce carbon emissions. As our research is interested in the interactions between household, community and external influences we group these as follows:

- *Individual influences*- issues that are within the control of individuals - knowledge and patterns of thinking; values, beliefs and attitudes and intentions; personal agency i.e. a person's belief that they can take meaningful action; perceptions of social norms; routines & behaviour (rational choice theory e.g. Begg et al., 2003; various socio-psychologists e.g. Cialdini, 1993, Schwartz, 1992; and various behavioural economists e.g. Thaler and Sunstein, 2008).
- *Interpersonal/ group/community influences* - related to what goes on within households, groups, social networks and/or (geographical) communities - such as group resources/capacity, standards/rules (e.g. Lewin, 1951, Bandura, 1977; Tajfel, 1982)
- *External/structural influences*- factors beyond the immediate control of individuals and community groups - economic (incomes, prices); availability and access to energy efficient and low carbon technologies, infrastructures, goods and services; socio-economic structures; societal cultural values; societal power relations (e.g. vested interests); and the public policy framework and incentive framework which shapes each of the proceeding influences (e.g. Schumpeter, 1934; Giddens, 1984; Bourdieu, 1990; Spaargaren and van Vliet, 2000; Whitmarsh, 2011).

We recognise that in practice, the importance of any particular influences on energy use, and/or interactions between them, is likely to vary according to the specific context and energy issue/behaviour in question. We also recognize that there are interactions and feedback between the different influences. For example an individual's agency is also affected by socio-economic structures.

Responsibility for change: The international carbon mitigation literature (Ikeme, 2003) suggests a range of possible criteria for allocating rights and responsibility for carbon mitigation. These include: *rights* e.g. to emit a certain level of carbon, to a clean environment, to a fair share of the costs and benefits of climate change mitigation, and/or to participate in the decision making process; the *duty* to mitigate based on the level of emissions e.g. the polluter pays principle; the *capacity* to reduce emissions including the ability to pay. We focus on the following two criteria which we deem are relevant to allocating responsibilities for domestic carbon reduction between community groups and local authorities (as opposed to households) namely (a) *responsibility* for domestic carbon emissions and/or to protect people’s rights and the environment and (b) *capacity* to reduce domestic carbon emissions in a fair and effective way.

How to achieve change: Drawing on evaluations, good practice and guidelines from other sectors we define a *change strategy* as consisting of: (a) change roles and objectives - based on a problem analysis of what needs to change and the various influences driving or constraining energy use, and the change actors distinctive mandate and competencies (b) priority target audiences - based on a stakeholder and power analysis of who is responsible for, and has the power to, make change happen and (c) a mix of mutually reinforcing change interventions aimed at catalysing the enabling influences and minimising or neutralising the constraining factors/actors influencing energy use (e.g see Krznaric, R. 2007).

The EVALOC focus groups identified a wide range of roles and change interventions used by LCCs reduce local energy use which we present in Table 1. We group the change interventions according to whether they are seeking to address individual and group influences on energy use, or external structural influences at local or national level. The table also outlines the change theories, and hence change assumptions, that underpin the LCCs’ interventions.

Table 1: Summary of EVALOC LCC Roles and Change Strategies (Sources: various, see EVALOC literature review (Mayne et al., 2010))

What?	Who?	How?
Examples of LCC’s change roles and objectives	Examples of target audiences	Examples of LCC change interventions and the change theories that underpin them
Downstream Roles: addressing individual and group influences on local energy use		
<i>Community engagement/motivation</i>	<i>Local residents</i>	Change interventions - e.g. Use of trusted messengers; framing information; activating values; norm appeals; group/collective projects Theories of change –e.g. rational choice, socio-psychological, behavioural, social networking
<i>Individual and group empowerment (strengthening agency)</i>	Local residents	Change interventions e.g. critical awareness raising/discussion; action research; peer to peer learning; capacity building; strengthening

		power sources; group/collective action Theories of change – e.g. power relations (various), social learning, critical pedagogy
<i>Changing (energy related) behaviours (voluntarily)</i>	Local residents	Change interventions e.g. information; financial incentives; critical awareness raising/discussion; action research; energy measurement/feedback; peer to peer learning; practical advice/support; peer to peer learning; norm appeals; commitment/goal setting; prompts. Theories of change - e.g. rational choice, economic, social learning, behaviourist, practice, communities of practice
<i>Addressing fuel poverty/generating community and socio economic benefit</i>	Local residents	Change interventions – e.g. inclusive/participatory approaches; distribute responsibilities, benefits and costs fairly; addressing barriers to participation; complementary energy interventions tailored to the motivations and needs of different socio-economic groups. Theories of change – e.g. distributive and procedural justice; participation; empowerment; community development
<i>Encouraging the adoption and/or delivery of socio technical innovations and low carbon technologies</i>	Local residents	Change interventions – e.g. coordinating the installation of; providing practical information, advice, support; and/ or signposting low carbon technologies; learning from peers and experts in group settings; disseminating/diffusing innovations through social networks Theories of change - e.g. innovation, transition, diffusion (market and/or social networks);social learning, communities of practice
Midstream Roles: addressing local structural influences on local energy use		
<i>Catalysing other local actors to take action; scaling up through partnership working; dissemination/diffusion of innovations to other LCCGs, and/or</i>	Other communities, local authorities, business, suppliers/ installers	Change interventions – e.g. dissemination/diffusion through social networking; community to community mentoring; partnership working Theories of change - e.g. innovation, niche innovation, transition; diffusion theories (market and/or social networks); social learning; communities of practice, partnership theory
Upstream Roles: addressing national structural influences on energy use		
<i>Changing policy and widening democratic space (and hence shape energy</i>	Local and national government	Change interventions e.g. Mix of (a) Persuasion (e.g. through evidence, dialogue, lobby, identification/modelling of

<p><i>related behaviours, knowledge/skills, economic incentives, technologies & infrastructures, institutional practices, socio-economic structures, economic growth model/consumerism, cultural values)</i></p>		<p>win-win solutions; social partnership working); &/or (b) Pressure (e.g. through alliance/movement building, public mobilization, media pressure, civil society strengthening) &/or (c) Coercion in extremis (e.g. strikes, direct action) Theories of change: functionalist, liberal democratic, Marxist, institutional, social movement theories, power relations), institutional theory.</p>
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In addition to these roles, some of the EVALOC focus group participants suggested adding another vital, but often invisible, set of external ‘process’ role played by Local Authorities including fundraising; engagement, management, coordination of third party installers and partner agencies, marketing, liaison with landlords, legal advice, administration, maintenance, delivery of integrated advice. LCCGs also have a range of externally facing process roles, and both actors also have to deal with internal processes relating to governance, administration etc.

The EVALOC focus groups showed that the six LCCs were trying to fulfil most of these the roles to a greater or lesser extent. This number of roles reflects the complexity and scale of the task faced by LCCs in seeking to get people to *voluntarily* reduce their energy use and carbon emissions.

4. Findings

In the next two sub-sections of the paper, we first outline and then discuss in detail our assessments of i) three community led and ii) a local authority led and local partnership led domestic carbon reduction strategies in relation to the criteria in change framework.

4.1 Community led domestic carbon reduction strategies

We have selected three examples of ‘community’ domestic carbon reduction strategies, including one which is designed by an EVALOC LCC. We suggest that they represent an important, but still largely unrecognized new generation of ‘bottom up’ domestic carbon reduction programmes which are distinct from the dominant ‘top down’ information and social marketing campaigns, or individually focused behavioural interventions. (The strategies represent one of a range of different domestic carbon reduction strategies developed and implemented by LCCGs, and when implemented by LCCGs are often accompanied by complementary interventions).

The three programmes include: a) Carbon Conversations originally developed by Cambridge Carbon Footprint, now supported by the Climate Outreach and Information Network (Randall, R., 2010); b) the Low Carbon Living Programme (LCLP), originally developed by Low Carbon West Oxford (LCWO, 2010) *is* now available free on line for other communities at the Oxfordshire Low Carbon Hub, and LCWO is now developing a shorter programme to complement the energy assessments and installations which are

likely to be provided by future Green Deal providers; and c) Transition Streets set up and run by Transition Town Totnes used at street level and developed into a package for other communities called Street-wise (<http://www.transitionstreets.org.uk/>; Beetham, H, 2011). The strategies build on the approach pioneered by GAPs eco-team approach (see GAP 2008; Henk et al, 2004).

Change objectives: All three programmes seek to reduce domestic carbon emissions and help people adopt more sustainable lifestyles by increasing energy efficiency, reducing energy consumption and/or generating clean energy. As well as seeking to reduce emissions from household electricity and gas use, the three programmes also seek to reduce emissions from, transport, food, waste and lifestyles. Carbon Conversations and Transition Streets also focus on water use and the LCLP also focuses on renewable energy generation.

Responsibility for change: All three programmes are delivered by local volunteers in a community setting. They can be delivered as stand-alone interventions, or as complements to interventions by local authorities or other local actors. Each of the programmes are open to a range of demographic groups (income, ethnic, age, gender etc.) and tenures, although are more likely to be implemented in areas of low to medium deprivation where there are less likely to be local authority-led or partnership carbon reduction or fuel poverty interventions. To help ensure accessibility the programmes seek to provide small (externally funded) grants and/or sign post government grants where they can. They also seek to provide tailored support to different tenures.

Change interventions: The programmes all seek to activate altruistic pro environmental and social values e.g. relating to climate change, as well as self-interested values/motivations e.g. related to financial savings on energy bills, warmer homes etc. As noted above some of the programmes also provide financial incentives to engage participants. A range of general and targeted engagement activities are used through community wide and school newsletter, meetings with individuals and groups; word of mouth/social networks etc.

All three programmes encourage and support *groups* of people to voluntarily reduce their carbon footprints by engaging them in a participatory change process and providing practical advice to encourage and support them to take action themselves. The programmes involve between six to nine interactive sessions and provide a range of complementary advice/support to participants to address individual and group influences on energy use. They all provide (a) information about climate change and/or energy use (b) practical advice and support (c) energy awareness, measurement & feedback and (d) commitment/goal setting to differing degrees. In addition they all have the following distinct properties: Carbon Conversations emphasizes understanding the psychological, emotional and cultural implications of climate change and behaviour change; Transition Streets emphasizes building local resilience; whereas the LCLP is primarily focused on providing practical advice and support.

Depending on the setting the programmes may be accompanied by a range of other initiatives including: community projects (such as low carbon food and transport projects, tree planting and biodiversity projects, waste reduction); networking/shared learning with other organisations; partnership working with local authorities; and/or policy influencing.

4.1.1 Outputs and Outcomes

Self-reported data shows that Transition Streets in Totnes has been used by over 550 households in 63 groups (of which 38% have low disposable incomes) and is being adapted and delivered in other communities; Carbon Conversations has been used by about 1324 people; and around 90 households have participated in the LCLP in West Oxford to date (of which around 24% of the two cohorts for which demographic data has been analyzed have below average incomes) and it is now being piloted by 3 other communities in Oxford and by the City Council with its employees.

Self-reported data show reductions of an average of 1-2 tonnes of carbon emissions per household over the year for all three programmes. Transition Streets reports an average reduction of £570 on annual household bills, and the LCLP reports an average reduction of around £250. In West Oxford monitoring by the community group indicates that some households are maintaining their reductions over time. EVALOC is currently monitoring reductions in energy use and carbon emissions from LCC funded household renewable measures in West Oxford.

4.1.2 In-depth assessment of one community-led example

In Table 2, we offer an in-depth assessment of one of the *design* of one of community led strategies, in particular the extent to which it addresses the different individual, group and external influences on domestic energy use identified in our conceptual framework. We focus on the LCLP in West Oxford⁶ where it constitutes one strand of the LCCG’s carbon reduction strategy alongside other complementary carbon cutting community projects, as well as dissemination, partnership working and policy influencing strategies.

Table 2: Assessment of the design of Low Carbon Living Programme interventions (LCLP) in West Oxford (Sources: LCWO 2010; EVALOC base line community data collection)

Influences	LCLP intervention	Rating of project design
Individual influences on domestic energy use		
Values/ motivation	The LCCG is a ‘trusted messenger’ and frames messages to activate both altruistic (community, climate change) and self-interested values (financial savings, warm houses)	Strong
Knowledge,	The LCCG conducts awareness raising/critical discussion in	Medium

⁶ One of the authors is involved in a voluntary capacity in West Oxford so the assessment of this project has not been undertaken by her.

beliefs & attitudes about climate change	group settings and provides energy measurement & feedback (see Behaviour Change below) to participants to raises awareness of environmental impacts of behaviours and lifestyles	
Perception of social norms	Perceptions of social norms change through residents' participation in group/community energy action projects; participants energy use & carbon footprints is measured and compared with group aggregate, UK and other countries; feedback is provided about community wide carbon reductions.	Strong
Intentions	Project participants are encouraged to (a) see their involvement as part of a lifelong commitment and (b) make a written commitment about their energy saving goals over the next year, and beyond	Strong
Agency	Participants are empowered through their participation in group/community action projects; collective action increases sense that action is desirable and meaningful; and practical support from peer to peer learning and/or experts builds capacity.	Strong
Energy routines/ behaviours	Participants learn new behaviours through: group discussion; interaction with experts and peers; group based and one-to-one practical support/advice with tailored advice to private tenants; energy/carbon measurement & feedback through a comprehensive automated interactive carbon footprint tool; loans of energy display monitors; monthly prompts to take meter readings; written short term and long term commitments/goals; take home tasks and monthly prompts to take meter readings. Other community projects seek to make low carbon living easier.	Strong
Group influences on domestic energy use		
Social networks	The LCCG: invites the whole community to participate in the LCLP; and diffuses information and engages people, through a range of direct and indirect general and targeted methods (including door knocking); & reduces barriers to participation	Medium
Group standards & behaviours	Groups standards and behaviours are changed through a social learning processes (modelling, observation, and interaction) with other residents in group and community settings.	Strong
External/structural influences on domestic energy use (local and national)		
Availability of and access to energy/efficiency low carbon technologies, goods, service & infrastructures	The LCCG provides residents with information & support about technical options; sign posts government grants; provides small grants to contribute to cost of energy efficient measures; may help with bulk purchase e.g. of solar PVs to reduce costs. Other community projects seek to improve local infrastructures (e.g. bring and takes and swishing parties reduce waste; car clubs reduce car use, food projects increase supply of locally sourced food etc) .	Medium
Socio economic	The LCCG provides tailored information for private tenants and	Weak

structures (e.g. low incomes) and tenures	sign posts other sources of advice/support	
Economic influences (income levels, prices)	The LCCG sign-posts grants; provides one to one advice with independent experts on energy bills; may help with bulk buying to lower prices	Weak
Societal Power relations e.g. fossil fuel companies, advertising	The LCCG is part of a wider movement/coalition which exercises influence on government policy in alliance with other actors, but there are no strategies to influence vested interests directly	Weak
Societal cultural values e.g. consumerism	The programme highlights benefits of low carbon lifestyles and raises awareness of impacts of consumerist lifestyles for local participants and resident, and the growing number of LCCGs signals public support for low carbon/sustainable lifestyles as part of wider movement of LCCs. However, its ability to counter dominant cultural influences more widely is limited.	Weak
Government policy	The LCCG carries out some direct lobby of government in alliance with local actors, and joins some national campaigns	Medium

4.2 Local authority led and partnership area wide strategies

In this section we outline and assess the design of the change strategies of two local partnership strategies, both located in areas of multiple deprivations. We have selected these examples as they are EVALOC communities, and because they represent an important strategic approach that is distinct from either a private sector led approach envisaged in the Green Deal, and the community led strategies.

Change objectives: The Kirklees-Hillhouse and in Eco-Easterside projects both aim to reduce local energy use and carbon emissions, address fuel poverty, promote warmer homes, maximise incomes and improve health. Eco-Easterside has adopted a 'One Planet Living Planet' approach so also has related objectives relating to waste reduction, transport, food, water, happiness. Kirklees local authority has related objectives on waste reduction, training and employment creation.

Responsibility for change: The programme in Kirklees-Hillhouse is implemented by a multi-agency group led by Kirklees council support from local residents. The programme in Easterside is led and implemented by a partnership between local residents, a town wide charity, Middlesbrough Environment City (MEC) and the local authority. In both cases the interventions have been driven by a group of committed individuals, and are delivered mainly by paid council or charity staff, including paid community workers, but also with some voluntary input from local residents. In both cases the programme are open to all residents, but in practice most participants are on benefits or just above the benefit line. The energy efficiency and renewable improvements are either provided free or subsidised to households (using CESP, CERT and/or DECC LCC funding).

Change Interventions and processes:

- *Communications/message and engagement strategies* – communication messages focus mainly on financial savings and warm houses (but Easterside might also use a range of ‘one planet’ messages in complementary community projects). In both areas, community group members, other agencies and/or ‘badged’ installers engage the local community through door knocking, information at community events, schools etc.
- *Change interventions* – the local authority in Kirklees, and MEC in Easterside, coordinate the installation of free energy efficiency and renewable measures to local residents (funded through CESP, CERT and/or DECC funding). This is complemented, in both cases, with the provision of integrated advice on energy saving, fuel poverty, energy bills, recycling, benefit checks, health and safety provided by relevant Council or other front line agencies through a cross referral service. Both strategies also include some behaviour change advice to households. In Easterside MEC provides training 20 households who have received physical measures so they can act as energy champions in the community, and distributed energy display monitors to residents. In Kirklees’s the local authority has distributed energy display monitors to local households, established a handy man schemes to provide energy saving advice and support to households. Kirklees Council has also trained some community leaders so they could act as champions and an advice hub for local people.

4.2.1 Outputs and Outcomes

Outputs: Kirklees Council has provided insulation to virtually all domestic homes (51,000 homes) under its previous successful Warm Zone programme and subsequently installed renewable measures to 54 households in Hillhouse (including many privately rented properties). The Eco-Easterside project has provided free insulation measures to 354 households in Easterside who normally would not have been eligible for grant assistance, and renewable measures to 20 households.

Outcomes: Previous evaluations of the Kirklees Warm Zone insulation programme indicate that the programme resulted in energy savings of just under 106,000 MWh per year, a reduction in CO₂ emission of 23,350 tonnes per year, and a reduction in fuel bills of £3,900,722 per year. Other benefits included local job creation, improved health (measured as savings to the NHS), house value increases and confirmed benefit claims. Overall the programme generated a net social benefit of £250 million from an initial investment of £20.9 million (Butterworth et al, 2011; DECC (b), 2011; Eldrich et al, 2010; EST, 2005). Reductions in household energy use and carbon emissions from recent LCC funded household renewable measures are being calculated by EVALOC.

4.2.2 In-depth assessment of one partnership led example

In table 5 we assess the extent to which the design of the Eco-Easterside project addresses the different individual, group and external influences on domestic energy use identified in our conceptual framework. We focus on Eco-Easterside as it represents a

novel and less well researched partnership approach involving the local authority, a city wide charity and a local community.

Table 3: Assessment of Eco-Easterside project (Sources: Eco-Easterside documentation, EVALOC base line community data collection)

Influences addressed	Eco Easterside interventions	Expected Impact
Individual influences on domestic energy use		
Values/ motivation	The partnership is ‘trusted messenger’ and frames messages to activate both altruistic and self-interested values through One Planet Living messages, social justice, desire to improve quality of life.	Strong
Knowledge, beliefs and attitudes about climate change	The partnership provides energy training for champions; behavioural advice, and supporting activities linked to residents’ interests.	Medium
Perception of social norms	Area and town wide projects promoted by a range of local actors normalises energy saving	Strong
Intentions	Participants are encouraged to value carbon reduction alongside personal benefits, such as reducing bills, and wider interests.	Medium
Agency	Energy champions are trained and supported to motivate and support other residents	Medium
Energy behaviours	Behaviour advice is provided by front-line Council staff and agencies , energy monitors provided free to homes, and presentations and discussions at community meetings.	Weak
Group influences on domestic energy use		
Diffusion of energy messages and behaviours through social networks	The whole community is invited to participate in the programme through a range of communication & engagement methods; messages are diffused through energy champions, paid community workers and social networks.	Medium
Group standards and behaviours	Group’s standards and behaviours change through energy advice, social networks and participation in complementary community projects.	Medium
External/structural influences on energy use (local and national)		
Availability and cost of energy/efficiency low carbon technologies, goods, services and infrastructures	Energy efficiency and low carbon technologies installed free to households, supported by a range of local projects and initiatives such as cycling and food growing. Work with private sector partners to deliver home insulation measures through CERT, CESP and potentially, ECO.	Strong
Socio economic structures (e.g. low incomes) and tenures	MEC negotiates legal issues with private and social landlords on behalf of tenants; advice provided on recycling, damp, benefit checks, health and safety issues. Additional support from local social landlord who is also committed to the One Planet Living agenda.	Strong
Economic influences (income levels,	Advice/support provided on energy bills and benefits etc.	Strong

prices)		
Societal power relations e.g fossil fuel companies, advertising	Partnership forms part of wider movement/coalition which can exercise influence on government, but does not seek to influence vested interests directly	Weak
Societal cultural values e.g consumerism	Programme signals local authority and agency support for low carbon/sustainable lifestyles, and by linking this to other community concerns, such as rising utility and food prices. However its ability to counter dominant societal cultural influences such as consumerism is limited	Weak
Government policy	Some direct advocacy and influencing with DECC.	Medium

5. Discussion of findings: contributions and limits of the different strategies

Below we discuss the contributions and limits of change strategies in relation to the core questions of who should be responsible for change, what needs to change, and change strategy.

Below we assess the *responsibilities* of the different actors in relation to the criteria from the conceptual framework outlined above (i.e. carbon emissions, rights and capacity). The application of these criteria to *local authorities* indicates that they should be assigned the principle *formal* responsibility for reducing domestic carbon emissions at local level and ensuring that low income groups benefit from the interventions. They are responsible for a relatively high level of carbon emissions from their own estate, services, public health and social housing. As the democratically elected arm of government they are also responsible in principle for protecting human rights. They also have a relatively high capacity, through their various powers and services, to reduce domestic carbon emissions and address fuel poverty. As one council officer explained about the DECC funded project: *'we have so much in house expertise - renewable energy experts, marketing and social engagement people, engineering advice, legal teams, contacts in Department for Energy and Climate Change (DECC) and Ofgem, all of which have come into play in this project, and we still have found it tough'* (EVALOC focus groups 2012 and follow up interviews). Contrary to some perceptions about local authorities, Kirklees Council has good community engagement skills evidenced by the uptake of measures and turn-out at community events (EVALOC research at community events). However, not all local authorities have this capacity. In Middlesbrough the local authority sub-contracted some of its carbon reduction and fuel poverty roles to the *city wide charity*, Middlesbrough Environment City, which has a track record in environmental issues and community engagement. More widely, local authorities (and/or city wide third sector bodies) are likely to lack the detailed knowledge of local social networks that community groups have, which is why both Kirklees Council and MEC rely on local residents to help with engagement. EVALOC focus groups also revealed that local authorities do not feel that innovation and/or behavioural change interventions are a strength and hence may rely on local community groups to provide this role (EVALOC focus groups, 2012).

The application of the responsibility criteria to **LCCGs** suggests that, although in practice they can be highly proficient and might play lead roles on some issues, they should be assigned a lower *formal* responsibility for carbon mitigation than local authorities. They are not generally directly responsible for any carbon emissions, and they have an uneven spread, capacity and reach between and within communities. Their local and often voluntary nature also makes it difficult for them to carry out certain roles. For example, some of the EVALOC LCCGs have worked hard to ensure their interventions are inclusive, but their reliance on volunteers makes it difficult for them to coordinate the delivery/installation of measures to people's homes and/or carry out the time intensive outreach and handholding necessary which is necessary to ensure that low income and vulnerable groups can get access to and benefit from technical measures. Neither are LCCGs likely to have the mandate, resources or skills to address the full range of related concerns/issues relating to benefits, health and safety, negotiations with landlords, legal and administration issues, which are better carried out by the local authority and relevant agencies. Locally based community groups are also unlikely to be able to achieve the efficiencies and/or economies of scale that city wide organisations can e.g. in tendering for installers or coordinating installation at scale (Edrich et al 2010). (Charities are also constrained from recommending specific suppliers as this breaches public benefit rules).

Our research shows that the capacity of both local authorities and LCCGs to reduce domestic carbon emissions is constrained by a lack of consistent funding for many of their core roles, a concern echoed by a recent Committee and Climate Change report in relation to local authorities (CCC, 2012). Funding cuts (combined with withdrawal of statutory obligations on local authorities) have meant that some local authorities have scaled back their environmental and community development projects, with voluntary redundancies creating a brain drain of key environmental and/or fuel poverty staff. Lack of funding for LCCG's core roles limits the reach, speed and scale of programme delivery, risks burn out and raises questions about long term sustainability. (EVALOC interviews 2012, Shared learning workshop, 2013).

DECC has provided test bed grant funding to LCCs in recent years, and there is a range of different finance sources they can draw on (DECC, 2013). But lack of consistent revenue funding remains a big constraint for LCCs. There can also be a thin line between governments using test-bed funding to nurture LCC 'niche innovations' and manipulating and exploiting them. The latter may happen when grant implementation deadlines are too short, and/or when capital grant funding lock LCCs into on-going management and maintenance roles without providing revenue funding to cover these costs. (EVALOC interviews, 2012). Thus while some EVALOC LCCs have been able to find other sources of funding to continue the projects, others have had to scale down their interventions. As one focus group participant explained: *'The message [within the council] is that if there is not a legislative obligation to deliver than we won't be doing it anymore'*. Lack of sustained funding for a paid worker in another of the EVALOC LCCs has resulted in the consequent collapse of their active volunteer base. (EVALOC interviews, 2012, Shared Learning Workshop 2013)

Constraints on public finances mean that LCCGs and local authorities have been encouraged to reduce reliance on grant funding and develop social enterprises. Four of the six EVALOC LCCs have attempted to develop independent income streams from community renewable schemes to fund local carbon reduction projects. However, state aid rules (which prevent the receipt of the FiT and grants), the reduction in the FiT and the lack of low interest loans, and running costs means that the net income from community renewable projects can leave little over to pay core workers and/or invest in further community projects. To generate a net return of £30,000 p.a –enough to pay a part time worker and fund small projects - would require an initial investment of £1 million in solar panels after maintenance, interest or dividend payments etc (Personal correspondence on recent financial modelling by the Low Carbon Hub). Moreover, there are no clear markets for some core LCC roles e.g. management/coordination, community development or engagement, motivating people, behaviour change programmes and/or complementary carbon cutting projects relating to waste, transport and food. Community groups have been encouraged under the Green Deal to accept referral fees from private providers, however, this risks undermining residents’ trust in them as independent parties and hence their distinctive competence in engaging and motivating people to take action.

It is not yet clear to what extent it will be possible for Local Authorities (or other providers) to access funding for measures under the ECO carbon savings element. The ECO brokerage framework has been established by DECC to encourage transparency and drive down delivery costs, however as yet it is only open to Green Deal providers. The extent to which providers will be able to use the affordable warmth element of ECO to address pockets of fuel poverty in areas of medium to low deprivation is also unclear (even if cross-subsidised with green deal measures). Experience with the previous supplier obligation (CERT) suggests that the costs of doing so will be high (IPPR 2012) but there is no additional budget line allocated for local authorities (or other actors) to coordinate installation to low income and vulnerable groups whether in deprived or higher income areas. There is a risk that low income and vulnerable groups in higher income areas might not be able to access energy efficiency measures deepening their relative economic disadvantage as energy prices rise.

In relation to ***what needs to change*** the LCCs assessed here all seek to reduce energy use, and hence carbon emissions, by helping households improve their energy efficiency, reduce energy demand and decarbonise supply. Most see strong synergies between carbon reduction, community development and/or regeneration agendas, and also the practical benefits generated for people through savings on bills, improved health from warmer homes, local jobs etc.

The ***LCCGs*** discussed in this paper seek to motivate and enable residents to reduce their energy use and carbon emissions. They address a wide range of *individual* and *group* influences on energy use – such as motivation, knowledge, social norms, intentions, agency, behaviours. They also address some of the local *structural* barriers e.g by changing social norms, helping people access grants, instigating car clubs to reduce car

use etc. However, they have limited direct control over key *economic and technical structural influences* such as financial incentives and/or trusted energy assessors and installers (unless partnering with local authorities or other city wide bodies).

In contrast, the ***multi-agency or partnership area wide strategies*** provide *free* delivery and installation of energy efficiency and/or renewable measures, plus basic energy and related advice, to people's houses. This directly overcomes some of the key *structural technical and economic* barriers facing households outlined above. (EVALOC focus groups 2012). It also reduces the need to address as many of the *individual and group* influences on energy use, even though failure to do so can reduce the efficient use of measures. (EVALOC focus groups 2012).

Thinking about ***change strategies*** the ***LCCG*** interventions assessed in this paper include several novel features that set them apart from government-led information and social marketing campaigns and/or individually focussed behavioural interventions. (e.g see Dorman et al, 2006). They focus on collective rather than individual action; seek to activate both self-transcendent (common good) as well as self-interested (saving money, staying warm) values and cognitive frames; engage people as active citizens in social learning processes rather than as passive consumers; and they use multiple interventions to address a broad range of influences including group and social influences rather than just individual, or economic and/or technical ones.

The ***local authority-led and/or partnership area strategies*** also have important and distinctive features including the direct delivery of free measures, the provision of integrated advice which is important to address fuel poverty (e.g. benefit checks to maximise income), cross referral systems, and the training of front line agencies in basic energy advice.

In general, LCCs generally are well placed to inform and shape government policy because of their practical expertise and local knowledge. They also have considerable 'soft power' derived from their legitimacy from taking practical action on climate change, the trust local people have in them, their representative functions etc. However, they are constrained in this role by limited time, resources and capacity.

In relation to their ***contributions*** to domestic carbon reduction and fuel poverty our findings suggest that ***LCCGs*** can play important roles in innovation, engaging and motivating and empowering people, and changing behaviours, findings which supports existing evidence. Helping households to achieve 10% reductions in carbon emissions in the initial year is a significant contribution (e.g compared to top-down social marketing campaign), and for many participants it marks the first step in a longer term commitment to live more sustainably). However, getting people to reduce emissions voluntarily is a tough call given the multiple influences on energy use. Even with motivated people there is a weak link between attitudes/intentions and actual behaviours. As one community volunteer explained, *'It takes a phenomenal amount of effort to cut through the noise in people's lives just to get messages heard, let alone to*

translate this into action'. (EVALOC focus groups 2012). Helping people understand technologies, and use them efficiently is also complex. As one community group member put it *'You are trying to get people to do projects in their homes that are highly complex... even doing the low energy stuff'*. (EVALOC focus groups 2012), and it remains to be seen to what extent the Green Deal will address these barriers.

Such difficulties are compounded by structural barriers such as lack of revenue funding for LCCGs, inadequate financial incentives for householders (e.g. particularly for people just above the benefit line), lack of independent technical advice and trusted supply chains, perverse market signals and consumerist pressures. All this means that the voluntary uptake of physical measures by households is likely to happen slowly over time in line with people's resources, capabilities and life cycles (LCWO LCLP monitoring data; Fawcett, 2012). As noted above, it is difficult for deprived and/or vulnerable groups to take voluntary action to reduce carbon emissions even if grants are available because of lack of resources, agency, competing priorities, or as one local put it when *'daily survival is their main priority'* (EVALOC focus groups 2011). In addition in each community there is a group of people who will not take action voluntarily e.g. sceptical, commuters, apathetic, non-green (EVALOC focus groups 2011), a finding backed by wider national polls (Ipsos Mori Poll, 2010).

In contrast, ***the local authority led or partnership*** area wide coordination and delivery of free or subsidised energy-efficient or renewable measures can increase the speed, uptake and reach of domestic carbon reduction programmes, generate economies of scale, reduce costs and has in the past improved the quality of the local supply chain etc. (DECC, 2011: Eldrich, B. et al, 2010; EST, 2005). DECC has estimated that strong local authority engagement in the new ECO could bring down costs by 10 per cent by supporting installations of solid wall insulation to owner occupiers and the private rented sector in local areas. (IPPR, 2012). One private contractor estimated that area based schemes can be up to 50% more efficient than scatter gun approaches by energy suppliers due to reduced travel, times between jobs, missed calls, greater team efficiency and bulk buying (Butterworth et al, 2011).

Importantly such approaches also help ensure that low income and vulnerable households, that may otherwise lack the resources and/or agency etc. to take action on their own, can benefit from energy efficiency and/or renewable measures. As one focus group participant explained: *'if we [the council] had not done this project, there was no way the householders would have installed renewable energy or likely energy efficiency measures. Many are unable to access the information and grants that are available to them, and because we took it straight to them it made it much easier for them'* (EVALOC focus group, July 2012). As noted above the provision of integrated advice to households addresses other structural problems such as low incomes as well as generating a range of wider social and economic benefits. (Butterworth, N. et al, 2011; DECC, 2011: Eldrich, B. et al, 2010; EST, 2005).

One limit of area wide approaches is if they fail to devote time and effort to empowerment and behaviour/social learning interventions that are needed to maximise energy savings and achieve sustainable changes. Moreover, recipients may not value or use free measures (EVALOC focus groups 2011) if they are not conditioned on active participation. One focus group participant reflected that *'perhaps they [the LCC] should have conditioned the installation of renewable and energy efficient measures beneficiaries' attendance at a number of community meetings'* to help ensure ownership (EVALOC focus group 2011; follow up interview, 2012).

In relation to their 'upstream' strategies LCCs' congruence with the government's localism & voluntarism agendas, and their multiple sources of 'soft power' outlined above, means that they have some influence over some aspects of government policies for example relating to community energy and the FiT. (EVALOC focus groups, 2012). However, it remains to be seen to what extent government policy, such as the Green Deal, will address wider barriers relating to the availability and cost of carbon-using goods, technologies, and services. Moreover LCCs will need to develop a broad based movement, and a more proactive influencing strategy, if they are to succeed in making climate change an electoral issue for the government and a reputational issue for companies, and hence also begin to influence government's wider economic growth strategy and the cultural values which promote the continued consumption of high carbon-using goods and services.

6. Conclusions

We have shaped the concluding sections of the paper in relation to the implications of our research for three key stakeholder groups: local actors, policymakers and the research community.

6.1 Implications for local actors: roles and strategies

Our case studies indicate that **LCCs** can play vital and distinctive roles in domestic carbon reduction. As the locally elected area body, **local authorities** play important roles in convening, leading and coordinating local partnerships and city wide strategies. They also coordinate city/area wide domestic carbon reduction strategies, identify the fuel poor and vulnerable groups, engage local residents, coordinate area wide installation (particularly vulnerable and deprived groups), recommend/badge installers (even when accredited), negotiate with landlords, enforce existing legislation, and provide integrated advice on related issues (benefits, health and safety etc), technical maintenance, among other things. The case study **LCCGs** play important roles because of their knowledge of local social networks, their ability to innovate, motivate, empower people to take action, to change energy behaviours and encourage the uptake of low carbon technologies.

However, there are also important gaps and limits. Not all **local authorities** have the desire or capacity to reduce area carbon emissions or address fuel poverty, and fuel poverty programmes, where they exist, are likely to be prioritised in the most deprived areas first meaning that the pockets of people living in poverty in higher income areas

may not be able to access to energy efficiency measures. Moreover, while **LCCGs** play important roles, their uneven resourcing, capacities, spread, and reach means they cannot be expected to carry the primary formal responsibility for reducing local emissions or addressing fuel poverty. They are rather best seen as a complement to, rather than a substitute for, local authority action (even though in practice they might be leading or catalysing action in some areas).

Our research indicates that partnership approaches can help increase the scale and reach of domestic carbon reduction by combining the strengths of different local actors, although these benefits depend on the respective capacities of local actors and are not automatic. It also indicates that the area wide delivery of physical measures can provide an efficient and fair way of reducing domestic carbon reductions but that this needs to be complemented by participatory behavioural (social learning) interventions. Area approaches also need to be accompanied by city/county wide cross-referral systems between, and energy training of, front line staff until resources are found to roll them programmes out to all neighbourhoods.

Worryingly, given the urgency of addressing climate change, the combination of funding cuts and the removal of legal requirements on local authorities appears to be constraining local authority action on carbon mitigation. In some instances this appears to be prompting a transfer of responsibilities to community groups without a concomitant transfer of budget or assessment to ensure that they have the capacity to carry out these functions.

These risks, combined with the continued structural constraints on local energy use, both serve to highlight the importance of LCCs potential policy influencing role based on their practical experience of what does and doesn't work on the ground.

6.2 Implications for government policy

Our research raises questions about the effectiveness, fairness and sustainability of relying on a largely voluntary and market approach to domestic carbon reduction – whether for households reducing emissions and/or delivery organisations. Our findings indicate that voluntary approaches do have an important role to play in building support for change and reducing carbon emissions, particularly in the early stages of system change. But persuading households to reduce their energy use voluntarily is a slow and complex task because of the multiple influences on energy use and the numbers of people who will not take action voluntarily. Private sector providers under the Green Deal will have a role to play here but there is considerable uncertainty about whether they will want, or be able to, substitute for the core LCC roles identified in this paper. This might be because there are no existing markets for some of these roles (e.g behaviour change), because private sector actors are less trusted than local actors and/or because they lack the distinctive competencies to carry out these roles.

Our findings suggest that government could accelerate the pace, reach, and effectiveness of domestic carbon reduction, and generate a range of important socio-

economic benefits, by playing a more active 'doing' role itself. This would require public investment in the core roles of LCCs (local authorities, third sector and community groups), financed by carbon taxes, improved tax enforcement, means testing the winter fuel payment, a financial transaction tax or other means. In particular there is need for revenue funding for LCC roles in engaging, motivating and empowering residents to reduce carbon emissions; coordinating the area wide installation of energy efficiency measures (to ensure vulnerable groups benefit); providing behaviour change/social learning interventions (which maximise savings and reduce the rebound effects from energy efficiency measures); and building public support for strong government action on climate change.

The government could also help accelerate and scale up domestic carbon reduction, avoid 'load shedding' and reduce free riding by local authorities, by re-introducing a properly resourced statutory duty on them to reduce carbon emissions and address fuel poverty but with flexibility about the range of organisations, strategies and/or partnerships used to achieve this.

A more active government role could also reduce and streamline the wide range of roles and tasks currently involved in domestic carbon reduction. Government legislation has been successfully used to directly change behaviours in other sectors for example in the case of drink-driving, seat belts and smoking in public places. Hence, the government could, for example, signal its intention to gradually introduce minimum energy efficiency standards for owners-occupiers as it has done for private landlords and tenants. Such a move would need to be supported by equitable differential funding and delivery mechanisms for different socio-economic groups.

Government could also do more to accelerate domestic carbon reduction by providing stronger and more consistent messages about the urgency of action as well speeding up action to address the range of structural barriers that constrain household action including inadequate financial incentives, perverse market signals, consumerist pressures, poverty etc.

Resistance to interventionist approaches is likely to lessen as climate change becomes more salient to people's lives as a result of extreme weather events, as energy prices rise and as social norms begin to change through bottom up approaches. Ensuring a fair distribution of costs and benefits of carbon mitigation including subsidies for low income groups (financed through progressive taxation) and compensation for losers will also reduce the risk of backlash to interventionist approaches.

6.3 Implications for energy research

Our research highlights the need for the focus of energy research to shift beyond problem analysis to also consider the roles and responsibilities and change strategies of both state and non-state change agents. This will require research into the political economy of change, justice issues, how change happens and the purposive change strategies of different change actors (including how to overcome resistance), and hence

reference to a wider range of literature including different theories of change, the power literature, social movements, and grey NGO literature. The government's current voluntary market driven approach to domestic carbon reduction needs to be monitored, and the effectiveness of a range of possible strategies and policy instruments investigated. There is also a need for academics to conduct action research *with* LCCs, and other change agents, to help them monitor and help make their change strategies fit for purpose in the face of the urgent and systemic challenges posed by climate change.

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