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Community Innovation for Sustainable Energy

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Centre for Social and Economic Research on the Global Environment

COMMUNITY INNOVATION FOR SUSTAINABLE ENERGY

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ASBSTRACT
As in other countries, there is a growing public, policy and business interest in the UK in the roles and potential of community-led initiatives for sustainable energy consumption and production. Such initiatives include green lifestyle-based activities to reduce energy consumption (e.g. Transition Towns, and Carbon Reduction Action Groups), more traditional behaviour change initiatives such as neighbourhood insulation projects and energy-saving campaigns, as well as renewable energy generation projects such as community-owned windfarms and biofuel projects.

Case studies of specific projects identify a variety of rationales amongst participants, whilst policy interest suggests a more instrumental concern for facilitating additional, larger-scale sustainable energy transitions. Amongst participant rationales are ideas that bottom-up, community-based projects deliver energy savings and behaviour changes that top-down policy instruments cannot achieve, due to the greater local knowledge and engagement they embody, the sense of common ownership and empowerment, and the social capital and trust that is generated among local actors.

These resources provide organisational and values-based 'grassroots innovations' which experiment with new consumption practices based on alternative 'new economics' values. However, previous research shows 'grassroots innovations' face a series of critical challenges requiring support to overcome, in order to achieve their potential benefits more widely. This includes developing 'niche' networks for mobilising reforms both to highly centralised energy institutions and infrastructures, as well as deeply ingrained social practices of 'normal' energy consumption and everyday life.

What makes this experience fascinating for the purposes of the SCORAI workshop is the way these community-based initiatives are trying to develop new energy-related consumption *practices* with a view to the socio-technical *transition* to local, renewable or lower carbon energy systems. Understandably, many projects remain practically focused on securing early successes and resourcing their long-term survival. However, the institutional and infrastructure reforms that will help in this endeavour require strategies for addressing the wider (national and international) *political economy of consumption* which adopts an ecological modernisation approach to sustainability. In surveying the community energy scene in the UK, our paper pays particular attention to this last issue.

KEYWORDS
sustainability transitions, energy, community, consumption, innovation

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COMMUNITY INNOVATION FOR SUSTAINABLE ENERGY

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INTRODUCTION

Community-led sustainable energy projects have flourished lately in the UK. The most substantial research to-date identified (in 2005) over 500 community renewable energy projects alone (Walker et al 2007). On the consumption side, community energy demand projects are likely to be of a similar or larger order. Community energy projects "involve local groups developing low carbon energy services so that solutions are appropriate to local situations, and with the community having ownership over outcomes" (Hathway, 2010: 44). Such initiatives include green lifestyle-based activities to reduce energy consumption (e.g. Transition Towns, and Carbon Reduction Action Groups), more traditional behaviour change initiatives such as neighbourhood insulation projects and energy-saving campaigns, as well as renewable energy generation projects such as community-owned windfarms and biofuel projects.

The UK Government's Low Carbon Community Challenge (DECC, 2010) recently attracted over 500 expressions of interest. It joins a portfolio of policies (local to European) to help community projects and nurture local support for wider processes of low carbon energy transition (eg HM Government, 2009; NESTA, 2009). Policy interest such as this suggests an instrumental concern for facilitating additional, larger-scale sustainable energy transitions. However, participant rationales include ideas that bottom-up, community-based projects deliver energy savings and behaviour changes that top-down policy instruments cannot achieve, due to the greater local knowledge and engagement they embody, the sense of common ownership and empowerment, and the social capital and trust that is generated among local actors. These very different perspectives on the role and potential of community energy suggest that policy support is not unproblematic.

Additionally, these values-based *grassroots innovations* are experimenting with new energy-related consumption *practices* with a view to the socio-technical *transition* to local, renewable or lower carbon energy systems, based on alternative 'new economics' values that challenge mainstream growth-based conceptions of wealth and progress (Seyfang et al, 2010; Seyfang and Haxeltine, 2010). However, previous research shows grassroots innovations face a series of critical challenges requiring support to overcome, in order to achieve their potential benefits more widely. This includes developing 'niche' networks for mobilising reforms both to highly centralised energy institutions and infrastructures, as well as deeply ingrained social practices of 'normal' energy consumption and everyday life (Seyfang and Smith, 2007).

Little is known about the processes and conditions required to successfully harness community energy projects, and increase their influence on wider energy systems. Our new Community Innovation for Sustainable Energy research project (CISE; see www.grassrootsinnovations.org) aims to investigate these processes, and here we present some of our preliminary ideas for debate and comment. Our interest is in

learning how these niche innovations might grow, diffuse their ideas, and ultimately contribute towards a sustainable energy transition in the regime. Conceiving of these projects as niche innovations, or spaces where things are done differently, allows us to draw on relevant areas of theory which seek to understand and explain systemic transitions, and the role of radical niches in such transitions.

This paper's objectives are twofold: firstly to describe the current state and character of community energy in the UK, identifying what precisely is unusual and interesting about these initiatives in terms of promoting more radical forms of sustainable consumption; and secondly to apply a 'sustainability transitions' theoretical framework for understanding the potential role of such experiments (which we term 'grassroots innovations') in contributing to societal energy transitions. The paper proceeds with an outline of this theoretical framework; this is followed by a discussion of community energy; we then apply our grassroots innovations theory to the empirical subject of community energy, and discuss what the theory tells us (and where theory may require adaptation); we conclude with some reflections and an outline of our future research plans.

INTRODUCING GRASSROOTS INNOVATIONS

Socio-Technical Innovations And Sustainability Transitions

The combined pressures of climate change, peak oil and threats to energy security are driving a policy agenda towards creating a more sustainable energy system. However, theories of systems-change show that transforming complex, interdependent systems populated by multiple actors and interests, and embedded in every aspect of everyday life, require more than mere efficiency improvements. Where existing innovation paths are locked-in and path-dependent, radical changes are required to shift the entire system onto a more sustainable trajectory. Such are the subject of socio-technical transitions theory, which sees path-breaking, systems transforming innovation as involving co-evolutionary change processes between technologies, institutions, infrastructures, producers, consumers, intermediaries, and regulators. Interactions are complex, but patterns are observable (Geels, 2002). Incumbent 'regimes' develop incrementally and path-dependently. The centralised production of fossil-fuelled electricity from private utility power stations has co-evolved with markets, infrastructures, regulatory institutions and energy-related consumption practices. This electricity regime constitutes a form of structural power that disadvantages the diffusion of path-breaking socio-technical practices, such as many community-led energy initiatives (Smith *et al*, 2005).

Nevertheless, transition theory notes how historic regime transformations developed through an accumulation of projects in 'niche' spaces which were forgiving towards radical alternatives, and a body of work has emerged studying the nature and characteristics of successful transformative niches, where new radical innovations are tested and developed. These (temporarily) 'protective' spaces tolerate poor returns, accept uncertainty over the 'best' form and function, and provide supportive networks for experimentation and advocacy (Schot et al, 1994). We conceive the field of community-led sustainable energy projects as a niche supportive towards innovative local-scale sustainable energy solutions.

Case studies (see Schot and Geels, 2008 for a review) suggest that: a) **expectations** contribute to successful niche building when they are robust (shared by many actors), specific, and of high quality (substantiated by ongoing projects); b) **social networks** contribute when their membership is broad (plural perspectives) and deep (substantial resource commitments by members); and c) **learning** processes not only accumulate facts, data and first-order lessons, but also generate second-order learning about alternative cognitive frames and different ways of valuing and supporting the niche (ibid; Hoogma *et al*, 2001). Niche practices become influential to the extent that processes 'a' to 'c' become robust enough to influence wider institutional changes (Geels, 2002; Raven, 2006). Tensions emerging in mainstream energy regimes, such as security and environmental crises, cast niche solutions in a positive light, thereby attracting interest from policy-makers and businesses in the regime.

Until recently this literature has concentrated on technological resource efficiency innovations in supply-side issues such as energy generation and infrastructure, focusing on technology producers and intermediaries, businesses and government actors. Yet this focus may be unwarranted: despite improvements in eco-efficiency, the rate of consumption growth is outweighing efficiency gains (Jackson, 2009). Production technologies alone will not meet the sustainability challenge: attention must turn to the factors which influence and might transform consumption – demand - at the individual, household and community level.

However, the sustainability transitions literature has hitherto largely neglected demand-side factors such as lifestyles, social practices and co-evolutionary formulations of normal consumption, and has neither adequately conceptualised nor understood the role for civil society in contemporary transition processes. A recent review by some of its key contributors concludes that "we acknowledge that the role of consumers and grassroots initiatives in transitions is underrated and under-conceptualised, therefore we welcome new perspectives which theorise changes in demand-side practices as motors for transition" (Grin et al, 2010:331). Our analysis will test this theory by assessing its adequacy for community-led sustainable energy innovation diffusion and influence. Our approach is based on understanding the ways local projects contribute to building community energy niches in the structured context of mainstream energy regimes, and how these niches are influencing energy regimes or might do so (see figure 1). To this end, we briefly turn below, to a discussion of the role of civil society as innovators for sustainability.

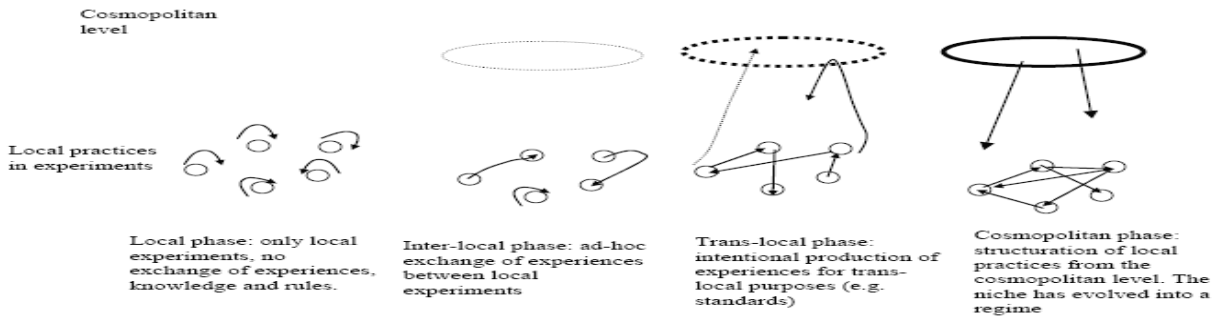

Figure 1: Emerging level of niches in relation to local practices in projects (Raven, 2005:47)

Civil society innovators and social innovation

Echoing work by NESTA, the Young Foundation, Green Alliance, and others internationally, the UK government recognises recent innovation thinking and policy is constrained in its historic focus upon technology firms (HMG, 2008). This underplays the value and potential of social innovation of concepts, organisational forms and arrangements, and distributed innovation in other contexts (e.g. civil society) and by other actors (e.g. user-led). Innovation in local communities in particular is an under-researched area that potentially offers ideas for sustainable, low carbon policy goals (Seyfang and Smith, 2007; Verheul and Vergragt, 1995; Hegger et al, 2007; Avelino and Kunze, 2009; Hess, 2007). In contrast to commercial innovation, community innovation operates in civil society arenas, in particular mobilising the energies of voluntary and neighbourhood groups, social enterprise and cooperatives, mutual societies and charities. It involves grassroots experiments in locally meaningful problem interpretations and social innovations, as well as using more environmentally- and socially-benign technologies, and results from high community involvement in process and outcomes (Seyfang and Smith, 2007).

This framing of community action for sustainability as 'innovative' allows us to make novel contributions to the sustainability transitions literature around 'grassroots innovations', which are distinct from the existing literature in terms of: context (civil society rather than the market economy); their driving force (social and/or environmental need, rather than rent seeking); the nature of the niche (alternative values as opposed to incubation from market forces); organisational forms (diverse forms including voluntary organisations, cooperatives and community groups, rather than firms); and the resource base (grant funding, voluntary input, mutual exchange, rather than returns on investment) (Seyfang and Smith, 2007). Little is known about the conditions under which community-led innovations do or do not diffuse into wider society, and there is a tendency to treat community projects as marginal and parallel to energy systems, rather than exploring how mutual adaptations may contribute to wider low carbon transitions. How, for instance, might local communities help energy companies meet their white certificate obligations, or co-develop solutions to smoothing peak energy demands locally?

We do know some of the intrinsic and extrinsic challenges facing community-led grassroots innovations (Seyfang and Smith, 2007). They often remain small-scale and fail to grow because of a lack of institutional support and long-term funds, whereas technological innovations have an established infrastructure of support (Mulgan et al, 2007). Additionally, community values can clash with commercial priorities, inhibiting the translation of knowledge and practices, and requiring careful negotiation by intermediaries (e.g. social entrepreneurs) (Smith, 2007; Seyfang, 2009). Mainstream marketing of narrower forms of the original community innovation can represent failure to originating activists, but facilitates a shallower-yet-wider greening to less active groups (Smith, 2006). Understanding these processes of translating local knowledge and practice, first into mobile, cosmopolitan forms, and then relocating it in new contexts, is central to our research approach.

These challenges are not insurmountable. Community-led innovation has diffused in the past, when conditions permitted (Hess, 2007; Douthwaite, 2002). The Danish wind turbine industry emerged from a community energy niche (Garud and Karnøe, 2003; Kemp et al, 2001). Home insulation policy for the UK's socially disadvantaged built upon models pioneered by community activists in the 1970s (Smith, 2006). But are these rare exceptions? How well founded are current policy aspirations? If renewed policy interest is to lead to effective institutional support (HMG, 2009), then evidence is needed about grassroots innovation diffusion processes and their interaction with mainstream energy developments. To this end, we present our empirical subject below: community sustainability energy projects.

COMMUNITY-LED SUSTAINABLE ENERGY PROJECTS IN THE UK

In this section, we explain what 'community energy' means, and why it is an interesting sector, particularly in relation to radical initiatives to promote more sustainable practices based on alternative, 'new economics' values.

Grassroots activists were relatively unnoticed by energy policies up to the 1990s, although they had been initiating community-based energy initiatives for over thirty years. During this time grassroots endeavours to develop alternative energy technologies were informed by the literature on appropriate technology (Dunn 1987), small-scale development (Schumacher 1974) and 'soft energy paths' (Lovins 1977). Activists engaged in community-based initiatives without the assistance of public resources, were frequently overlooked by mainstream energy suppliers. This disregard of community energy initiatives changed with the emergence of the rhetoric of 'new localism' and 'community' in the UK's energy policy in the late 1990s. For example, in the UK Government's report on sustainable development, community initiatives are implied to have the following potential:

> "Community groups can help tackle climate change, develop community energy and transport projects, help minimise waste, improve the quality of the local environment, and promote fair trade and sustainable consumption and production." (HM Government 2005: 27).

To this end, the UK's Low Carbon Transition Plan'[1] in 2009 encouraged local authorities and community groups to work in partnership to not only address carbon and energy related issues but also wider policy needs (HM Government 2009).

However, although 'community energy' is now the subject of government-supported initiatives, research and competitions such as the Big Green Challenge, the term 'community energy' is defined in different ways and used in a flexible manner by policy makers, academics, intermediaries[2] and community participants. It describes numerous types of energy initiatives with varying emphases on the degree of community

[1] The White Paper details a strategy to cut UK emissions by 80% by 2010 and by 34% by 2020. One of the key strategies is to reduce the emission from homes to near to zero in 2050 through energy efficiency and low carbon energy measures.

[2] Intermediaries are organisations and networks that build links between specific community energy groups, and which exist to share experience, good practice, expertise and advice. In some cases, intermediaries also act as a voice for community energy by providing evidence and advocacy to policy-makers.

involvement in the initiatives, their geographical boundaries and the patterns of benefit for the community.[3]

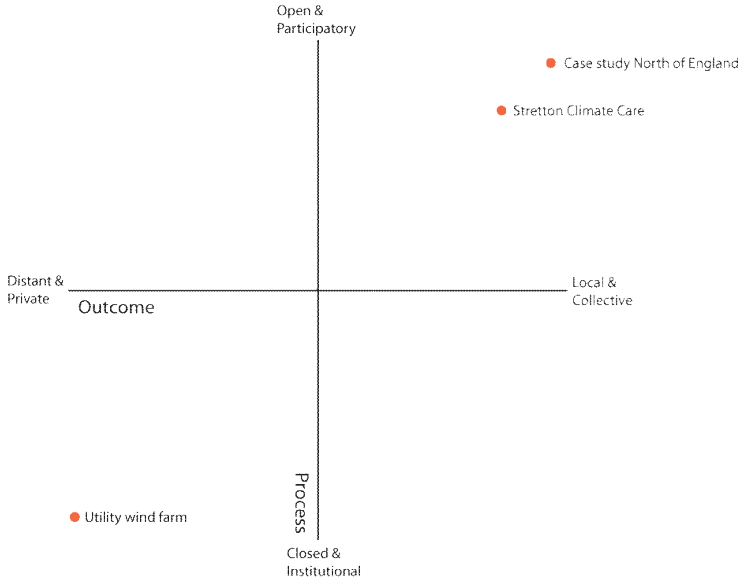

Figure 2: Illustration of the process and outcome dimension of community energy (adapted from: Walker and Devine-Wright 2008: 498)

The project initiation, administration and construction can either develop out of grassroots actions, be grounded in partnerships between communities, NGOs and local government or be initiated by entrepreneurs and utilities that are willing to share some of the gains with the community. The involvement of communities in energy initiatives can therefore take various forms from project initiation, administration, development, decision-making and financial support (Rogers et al 2008). We share Walker and Devine-Wright's view that what makes community energy initiatives distinct from other energy approaches is the local and collective character of the outcomes achieved, and the open and participatory process employed (Walker et al, 2007). These attributes are shown in the top right hand quadrant in Figure 2, which utilises two dimensions representing 'outcome' and 'process'.

For instance, Walker and Devine-Wright (2008: 498) position a 'utility company-developed wind farm' in the bottom left hand corner of the illustration. Such a renewable energy project might be compared with the governmental campaign 'Are you doing your bit' when thinking about behaviour change and energy efficiency projects. Both projects have got minimal interactions with local communities and are implemented by 'distant and closed institutions'. Economic returns and the electricity produced benefits the developer in the renewables project and similarly the outcomes of the campaign might impact on national carbon reduction measures but do not facilitate

[3] It is not only the term 'community energy' that is used in a flexible manner but also the term 'community' itself. There have been numerous definitions of what should be regarded as a community that have derived from the sociological literature. But the concept still represents "an elusive and somewhat intractable term with regards to its actual definition and meaning" (Peters and Jackson 2008: 5). Themes that recur in this literature are social capital, community capacity, social learning, social norms and social networks (Peters, 2010), as they play a key role in characterising communities (for a more detailed discussion on the conceptions of community see for example Peters and Jackson (2008).

social cohesion or create social capital. In the top right hand corner Walker and Devine-Wright place projects that are being initiated and developed by civil society and where benefits (such as heat) are locally distributed. An example of such a renewable project is one of Walker and Devine-Wright's case studies in the North of England. The community installed a ground source heat pump when refurbishing their village hall. The energy efficiency and awareness raising projects of the 'Stretton Climate Care' group could also be placed in this corner (see illustration). Launched in September 2007, the group conducts free energy checks in their local area and organises talks about practical actions to reduce energy consumption. Everybody from the community is able to join and participate in the activities and group.

We identify three particular areas where community energy projects offer something distinctive to top-down or business-led solutions. They are: a multi-faceted approach; the ability to change contexts; and a focus on engagement. We discuss each aspect in turn whilst concluding the section with a reflection on the challenges being faced by community energy groups.

Multi-faceted

Community energy projects often aim to combine a variety of activities from providing information, conducting home energy audits with follow-up progress meetings and retrofits to setting up voluntary initiatives and groups that measure their own personal change. An example of such groups is the Carbon Reduction Action Groups network (CRAG). A CRAG is a group of local people who have an interest in reducing their collective and individual carbon footprint. They come together in regular meetings to set themselves an annual emission target, a carbon ration, and track their emission throughout the year, measuring their progress against an agreed carbon allowance. The groups provide constant support and encouragement to their members to help them reduce their carbon footprint and also try to engage the wider community in doing the same by raising awareness, promoting practical actions and providing knowledge and skills. Other initiatives share knowledge and conduct workshops and community events that sometimes connect religious belief with practical actions or demonstrate to the public different ways of living and consumption practices (Moloney et al 2010; Steedman 2006). The attempt to focus on more than one approach and field of activity is further verified by Steward's et al (2009) conclusion that the applicants of the 'Big Green Challenge' made use of a range of interlinked CO_2 reduction measures.[4] The initiatives frequently aimed to develop holistic approaches that could potentially drive a more systemic change.

Changing contexts

Community energy initiatives and also policy makers have acknowledged the potential of such 'holistic approaches' in recent years in particular when trying to find ways of changing people's behaviours. For decades, attempts made by policy makers to change energy-related behaviour was individualistic, grounded in the assumption that individuals are rational decision-makers who are in full control of their behaviour. These have proved to be of limited effectiveness (Wilhite et al 2000). Research has demonstrated that behaviours are not mainly controlled by individuals but are shaped

[4] Community projects that entered 'The Big Green Challenge' were able to reduce their carbon dioxide emissions between 10 and 32 per cent over a period of a year. When considering these reductions against UK targets of achieving an overall reduction of 34 per cent by 2020, these community projects have made significant cuts (Houghton 2010).

by socio-technical infrastructures and conventions (Shove 2003). Consequently, individuals often feel disempowered when faced with the enormity of the task to tackle, for example, climate change (Thogersen 2005). The UK Sustainable Development Commission's recent report 'Making Sustainable Lives Easier' on achieving sustainable consumption states "'changing contexts' is more effective that 'changing minds'" (2011: 22).

With this in mind, we see that *contexts* – the socio-technical systems within which people live – need to change, in order to achieve more sustainable consumption outcomes; furthermore, individuals have very limited agency to change societal structures. Models of system-change are required which engage with, and respond to, this challenge. Heiskanen et al (2010) have argued that the structure and context of *communities* aids the process of reframing the issues associated with individual behaviour change programmes. Community-led approaches aid the process of people changing their everyday practices together in a supportive environment, empowering others to do the same and increasing the visibility of the impacts of behaviours (Steward et al 2009). They can be holistic, making use of local knowledge and approaches that not only inform the people of actions but also demonstrate them in real life examples. A community-based approach can improve people's capacities to act through attempts to develop locally appropriate approaches to change (Walker 2008; Capener 2009; Houghton 2010). Potentially, community energy initiatives are therefore able to reach "the parts others can't reach" (Steward et al, 2009: 147), influencing conventions, shaping local infrastructures and impacting positively on socio economic factors (such as increasing local income, skills and social cohesion). In policy, community projects are assumed to promote behavioural change, and embed social acceptability for larger sustainable energy technologies (HM Government, 2005).

A recent project that aims to develop carbon reduction approaches on a street-by-street level is 'Transitions Streets' initiated by 'Transition Town Totnes'. The project aims to engage the local community in behaviour change, energy efficiency measures, renewable energy and community awareness (Lockyer 2010) whilst providing emotional support and bringing people together in their local neighbourhood. Transition Town Totnes is part of a wider 'Transition Network'. Transition Initiatives that make up the network are groups of people who are keen to develop a community-led response to fossil fuel depletion and climate change. The aim is to organise local people to enhance the community to be more economically self-sufficient and resilient, embedding new energy related consumption practices. These practices are directed towards anti-consumerism and anti-growth and try to influence the social, infrastructural and cultural context which gives meaning to actions. These actions therefore help to change contexts rather than minds (Sustainable Development Commission, 2011).

Engagement

A third key characteristic that differentiates community energy initiatives such as Transitions Towns from other approaches that address energy-related consumption practices is the focus on participation (Hoffman and High-Pippert 2009). Only community-based approaches allow members of the public to be engaged as project participants (Walker and Cass 2007). Public utilities, households and business energy developments are usually based on an exclusive group of people that are not accessible to the wider community. A predominantly participatory approach to the initiation of

community energy initiatives is often based on a strong sense of social cohesion and trust even before starting a project. Putnam (1993: 171) regards interpersonal trust as an elementary feature of civic participation and engagement, "trust lubricates cooperation and cooperation builds trust". Such feelings of trust are even more strengthened the longer initiatives work on their projects. Community participation and interpersonal trust is not only what defines these initiatives, it is also what keeps them alive.

Members are keen to participate for various reasons: because of the potential benefits to the community, or an appreciation of place or a sense of duty, but not predominantly because of self-interest. Indeed, previous research has shown that participation in such initiatives is often driven by a desire to create a space where alternative values may be lived out and practiced; to experiment with alternative ways of living and provisioning, and to demonstrate that alternatives are possible (Seyfang, 2009). The initiatives bring together people from different backgrounds that might experience the community working together in quite different ways. Community energy initiatives therefore tend to counter, "what some argue is an era of declining civic engagement" (Hoffman and High-Pippert 2009: 6). Such community energy projects are potentially examples of Barber's (1984) participatory democracy in which community initiatives participate in innovative institutions of self-governance (Hoffman and High-Pippert 2009). They entail debates over concerns that are not mutually shared, developments of shared agendas and statements of common interest. Although these community initiatives do exist, Hoffman and High-Pippert (2009) have recognised that very few of them embody participatory democracy.

Challenges

Although a growing interest in community energy initiatives is apparent, such a positive view by policy makers seems to assume that community initiatives want to be used as a channel for carrying out government policies and have the aspiration to change the wider social structures that surround them. In addition, it presumes that these initiatives have currently the 'capacity' to change their own and other people's actions. Middlemiss et al have associated the term 'capacity' with "the ability of the community in question and its members to make changes by drawing on the resources available to them individually and collectively" (2010: 7561). But community initiatives face various challenges to be overcome, to increase their capacity to act. The successful implementation and progression of initiatives cannot be taken for granted. Church (2005) draws attention to the fact that community energy initiatives spend only ten percent of their time on developing their projects, as the rest of the time is used to ensure the survival of the organisation: such challenges are regularly not linked to technological problems, as technical features are often well developed, but rather relate to operational, legal or funding issues. In addition, community energy initiatives rely on supportive contexts and their ability to pick up a variety of skills quickly in order to survive. One of the key concerns for community energy initiatives is to create a constant income stream. Grant funding packages can often only be a short-term fix and are complicated to coordinate, as they regularly derive from more than one funding body - each having different obligations (Houghton 2010).

DISCUSSION: COMMUNITY INNOVATION FOR SUSTAINABLE ENERGY?

In this section, we show how our grassroots innovations approach to understanding innovation-diffusion from civil society can help us to better understand how this new sector is developing, what sort of support is needed to help it achieve its potential and overcome current challenges. Finally, we reflect on the extent to which the grassroots innovations approach needs to be adapted to help us understand the community energy context. We begin by operationalising our theoretical framework in this novel empirical setting.

Identifying a community energy niche

Viewed from the perspective of grassroots innovations theory, we see the community energy sector as a group of local projects, which may or may not form a coherent niche. Our analytical task is therefore to assess the extent to which niche processes are occurring, and identify what theory says the sector could do to overcome the challenges it currently faces. We can certainly identify a flourishing of community energy projects, and we can say that they represent innovative energy systems, in relation to the regime, by virtue of their sustainability. But do they constitute a niche?

Raven et al (2010) have illustrated how a collection of local, innovative projects, at first without any real connection, gradually develop into a niche (see figure 3 below). The projects start to network with each other and exchange learning, and then begin to develop a range of niche activities such as standardisation, shared learning, conferences, networks and so on, which then make it easier to set up subsequent projects, thereby growing the niche. They note that that niche-theory has gradually shifted in its focus, and its understanding of niches, from individual projects and initiatives, which are seen as 'carried by local networks and characterised by local variety' towards the 'global level'. This distinction allows for the assumption that instead of regarding individual community initiatives as numerous niches, it is a number of them or even the totality of groups that create the 'global level' niche. Specific community energy initiatives are therefore 'projects', a smaller unit of analysis than the overall 'abstract' niche (see Figure 3).

Considering the diverse characteristics of the field of community energy (Walker and Devine-Walker 2008) determining the overall 'abstract' niche is not straightforward. Community energy initiatives can be divided, for example, in relation to their focus of improving the energy system: renewable energy, energy efficiency and behaviour change. Even the community-led renewable energy projects can be sub-divided into the different technologies applied such as solar, wind and hydro. Community-led solar projects could therefore be considered as the 'abstract' niche or as a subset of the community energy niche. However, Raven et al (2010) have pointed out that the distinction between local experiments, niche and regime and their boundaries are "analytical, and not ontological" (Raven et al 2010: 63). Niches are not entities that are 'out there' to be discovered but rather provide a way of thinking through regime and niche interaction and internal processes of niche developments. Furthermore, the community energy sector and its actors (such as community-led energy initiatives, intermediaries and policy and funding bodies) often do not recognise these 'artificial' boundaries. Community energy initiatives often focus on more than one field of activity and technologies (Capener 2009; Steward et al 2009). Community-led energy activities

are often interlinked, as groups aim to develop holistic approaches to climate change that could potentially drive a more systemic change. It might therefore make most sense to conceive of all the diverse community-led energy initiatives together as one niche, as they share a common focus on 'sustainable energy'.

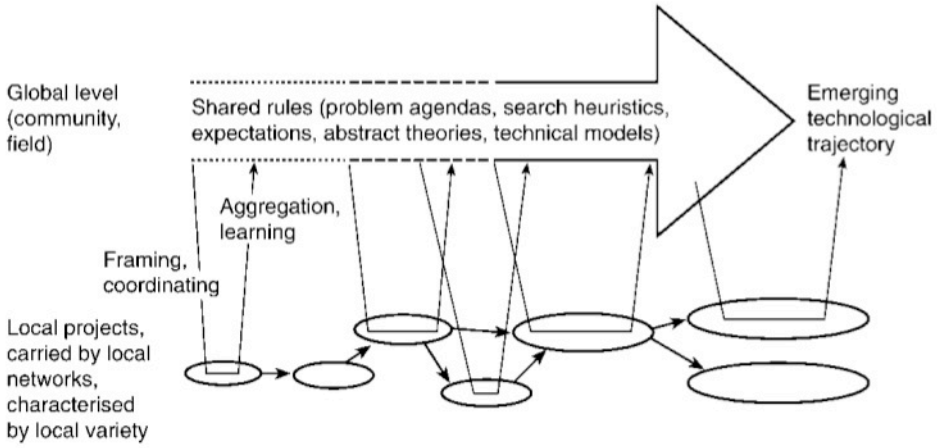

Figure 3: Technical trajectory carried by local projects (from Geels and Raven, 2006)

Niche processes: networking, visions and learning

We therefore see a community energy niche which consists of networks of community energy projects distributed spatially and temporally, and that enables participants to do a number of things: learning from one another and making demands for facilitating policy and market reforms on the basis of those lessons; helping to mobilise resources for future initiatives through their networking activities; and shaping expectations about the initiatives' role in wider transition in energy systems in the future. How does the UK community energy niche perform these tasks?

One of the most important features of a niche is that it is something more (or other) than its constituent projects. Raven et al (2010: 65) have argued that the "circulation of knowledge and actors is important, to enable comparison between local practices and formulation of generic lessons. Conferences, workshops, technical journals, proceedings and newsletters play a major role therein". These 'aggregation activities' (Raven et al 2010: 65) occur in a niche and in the process reproduce and consolidate the niche. What evidence is there of such activities in the UK's community energy niche?

In the UK over the last decade growing policy support and an increased role of intermediaries[5] allowed for numerous 'aggregation activities' to occur, in particular in

[5] Whereas transitions theory assumes a smooth diffusion of niche ideas into regime settings, grassroots innovations display oppositional values to the incumbent regime, and so this process of translation is difficult. Community values can clash with commercial priorities and policy developments, inhibiting the translation of knowledge and practices between initiatives but also between the community energy niche and the incumbent regime. This translation between niche and regime requires careful negotiation by intermediaries (Smith 2007) conducting 'regime-interfacing' activities.

relation to networking – the first type of key niche process to consider. Community energy programmes such as the 'Green Communities' run by the Energy Savings Trust have distributed case study reports about community energy projects so that other initiatives can learn from their experiences. Similarly, the Local United 'diffusion packs' consist of individual reports that aim to inspire groups to pursue community energy projects, providing 'how to guides' and templates for various legal and financial documents needed to set up the project. Instead of providing written reports to community energy initiatives, 'The PlanLoCal' resource, recently launched by the Centre for Sustainable Energy, consists of filmed stories of communities' experiences and lessons learned. These 'intermediary' niche actors have generated commonalities between initiatives, to develop resources for community energy groups, supporting the upsurge of interest in the field within the UK. Intermediaries have not only played a key role in distributing best practice reports but also have been involved in activities that lead to 'project-networking' and 'regime-interfacing'. Networking activities between community energy initiatives can be informal through telephone contact or on networking website, for example, such as one set up by an intermediary called 'Community Central'. Other networking 'aggregation activities' reveal themselves through conferences such as the 2011 conference 'Communities and Climate Action' and the upcoming Carbon Leapfrog workshop 'Creating Low Carbon Communities' that bridge across and between specific community energy initiatives. These conferences and workshops provide community energy initiatives with a space to exchange experiences and learning and to create shared expectations.

However, turning to the second major area, vivions, Walker et al (2006) have pointed out that the sector lacks a strong shared, overriding vision. Goals for community energy are based on short term strategies that do not consider how the current energy system could be replaced by a more distributed and locally owned system, and the sector envisages "remaining firmly in its expanded but not transforming niche" (Walker et al 2006: 13). So, there is a diversity of goals, from system-transformation, to continuance within a 'simple' niche (Seyfang and Smith, 2007). In addition, the diversity of the sector itself, covering energy supply and demand projects, different technologies and organisational forms, different visions and different sets of actors, does not bode well for acting in concert in relation to the regime. For example, the Low Carbon Communities Network aims to act as a voice for community energy by providing evidence and advocacy to policy-makers, fulfilling this 'regime-interfacing' role. However efforts to develop a shared voice are often not straightforward in such a diverse field. This difficulty is exemplified through a recent discussion between community energy initiatives at the Communities and Climate Change conference that we attended. The initiatives deliberated on whether they should create a 'network of networks' to create a stronger and shared voice for community energy in the policy context – which is what niche theory would suggest would be most effective in terms of building niche influence on the regime. Some of the initiatives argued that community energy groups would have more impact on policy development if a diversity of different voices were encouraged rather than one common voice. This lack of shared visions and goals, and an absence of perceived common interest, could lead to fragmentation and splintering amongst the community energy niche.

Learning processes, the third key aspect of niche management, have occurred between initiatives through for example, site visits and networking activities, and of course the

shared best practice reports mentioned above. But more systemic learning processes are not necessarily in place on a more strategic level. Church (2005) indicates that such consolidation is impossible in a context of short-term survival management, and here an obvious policy recommendation would be to support the development of cross-project, strategic shared learning. The new DECC Community Energy Online website (http://ceo.decc.gov.uk) may aim to fulfil this function, but at present it appears to be reliant on the energy projects themselves to supply information, and thereby fails to address the root problem, which is that local projects do not have the capacity to build consolidated learning resources. The lack of strategic, second order learning mechanisms potentially hinders the impact of community energy initiatives on current mainstream energy system developments.

Understanding the policy context

While grassroots activists have long been involved in developing more sustainable energy initiatives, the recent wave of policy support and related interest in community energy has certainly enabled the sector to grow. Indeed, the DECC Low Carbon Communities Challenge highlights the need to seed experiments working towards a sustainable energy transition, and learn from them how to harness and scale up their ideas and practices to meet policy goals – in much the same way as the Dutch transition managers have done (HM Government, 2009). The UK Energy White Paper (HM Government, 2009) policy document summarises measures to support community energy initiatives (many of which had been identified in previous policy documents) including the development of a smart grid, new funding strategies, licensing arrangements and performance indicators (Houghton 2010). Grant funding programmes, including the requirement to pay upfront for energy efficiency measures and microgeneration technologies, have been replaced by 'clean energy cash back' (such as the Feed in Tariff (FiT)[6]) and 'pay as you save' (HM Government 2009) to financially support energy-efficiency and renewable energy initiatives. Although the details of the Energy Bill 2010/2011 are still being discussed at the time of writing, communities and local authorities will have a role to play, in particular when considering the plan to create a 'Big Society' comprising active citizens and a growth in public service provision by civil society organisations.

The Low Carbon Communities Network (2010) claims that such a development would bring certain challenges and opportunities to the community energy sector. For example, the government's attempt to ensure that local groups provide certain services corresponds with the aims of numerous community initiatives and would encourage new groups to form and for existing ones to grow. However, the delivery of such services might create a competitive environment between these groups and larger

[6] Feed-In Tariffs (FiTs) is a 'Clean Energy Cashback' scheme. Under this scheme energy suppliers have to make regular payments to householders and communities who generate their own electricity from renewable or low carbon sources. The tariffs have been introduced by the Government to help increase the level of renewable energy in the UK. Although initially the coalition government agreed to not review the FiT until 2012, the Energy Secretary Chris Huhne has launched a comprehensive review of the scheme on the 7th of February 2011. It is expected that the review will conclude at the end of 2011. However, two issues will be fast-tracked: the consideration of solar projects over 50kW and the take-up of farm based Anaerobic Digestion plants. The reason for this review is based on the government's concern that the scheme is being used for large-scale solar farms rather than for community projects. These changes to the scheme might have some damaging implications for community-based cooperatives that make use of solar technologies.

competitors in which they would need to have a strong support structure in order to succeed. This points to the need for government to attend to the factors which enable successful niche emergence and consolidation, if it is to harness niche innovations. For example, even small changes to this currently-favourable positive selection environment (such as changing the terms of the FiT) might undermine a fragile and emergent niche; introducing more competitive relations between projects as in the example above, might be a disincentive for groups to share learning and network effectively, and develop shared visions; and removing funding for intermediary organisations while simultaneously calling for civil society to step into the role of public service providers will almost certainly undo the good work that has recently been put in place to develop the niche through aggregative activities.

Developing transitions theory for grassroots innovations

While sustainability transitions theory is a useful tool for conceptualising the emergence and development of community energy, and considering its scope and potential to influence wider systems, there are a number of weaknesses with the theory that become evident when applying it to grassroots innovations. One limitation of the transitions theory that we aim to counter, by seeking evidence to test the theory in this new, grassroots innovations context, is essentialising simplifications of niche-to-regime analysis. The niche-to-regime model simplifies a complex plurality of socio-technical configurations (i.e. community-led initiatives) into unrealistically homogenous niches working against a similarly problematic homogenous regime (Shove and Walker, 2007; Genus and Coles, 2008). This points to a related difficulty, which is the under-theorised relations between located socio-technical configurations in projects and the emergence of an abstracted, niche-level identity and interest, based around stylised socio-technical practices (Raven et al, 2008; Smith, 2007; Seyfang, 2009).

This is problematic for two reasons. First, in terms of niche development: How do community projects reinterpret, reinvent yet reinforce the generic, mobile lessons and norms constituting a niche? Theory is vague as to the precise roles of projects in niche-building. What dedicated intermediating work is needed, and by whom, for social learning to take place, expectations to develop, and supportive networks to build (Raven *et al*, 2008)? Conversely, when is social learning ignored; when do expectations deflate; and how do networks fragment? Our investigation seeks evidence for the hypotheses that niches grow through replication of projects in different locations; that strategic learning across replicated projects facilitates scaled-up adaptations; and that elements of these translate into new business models and markets. This suggests community niches do not provide blueprints, but rather reservoirs of ideas and practices; and that dedicated work is needed to transfer and adapt from across locations, scales and contexts (e.g. into commercial prospects).

Second, in terms of niche influence: How do strategic niches press for institutional reform? Whilst the literature argues successful niches prompt facilitating institutional reforms within the wider energy regime (Geels and Schot, 2007), it is unclear why this would happen given path-dependencies in the regime (see Shove and Walker, 2007). What *political* roles do community energy niches need to play in order to influence these reform processes? This is where social movement theory might inform transitions theory and reveal the political roles niches must adopt in sustainability transitions

(Smith, 2005; Scrase and Smith, 2009). How do community energy niches develop collective **identities** and **interests**; and what repertoires of activism press for reforms (Foweraker, 1995)? Where are the socio-technical (cf. political) 'opportunity structures' for pursuing community energy demands (Van der Heijden, 1999; Rootes, 1999)? On this latter point, we have to look at community energy the other way around, from the perspective of the regime. What appropriable solutions do community energy niches suggest for businesses and policy-makers in the regime? This speaks to the translation mode of diffusion: what niche practices can be adapted into more conventional business forms addressing pressures, say, to cut demand (e.g. community white certificates). The appeal of community energy to energy business and policy will depend upon how the former's performance is perceived and valued, and the context in which regime actors are operating into the future.

CONCLUSIONS

We have described the current state and character of community-led sustainable energy projects in the UK, and sought to understand what makes this emerging sector interesting and distinct to academics of sustainable consumption. We showed that community energy approaches are multi-faceted, bridging energy production and consumption in a variety of ways; they have the ability to move beyond simplistic attempts to modify behaviour through individualistic mechanisms, by having the ability to change contexts; and they enable a far greater degree of engagement in processes of co-creating new energy systems, than traditional top down approaches. Not least of these benefits, is the fact that participants in these projects often specifically seek the ability to put their 'new economics' values into practice, co-creating potential seeds of change within wider systems, and seeking to foster spaces where the rules of everyday life, socio-economic exchange and citizenship are different.

We applied a sustainability transitions theoretical framework to help us understand the emergence and potential trajectory of the sector, and applying this theory to civil society-led innovations, we conceived of the community energy sector as a nested hierarchy of grassroots innovation niches. There is good evidence that the community energy sector is performing the sorts of activities that theory predicts is required for successful niche-building, but that there is more to be done, and in particular, that the fragile emerging niche is vulnerable to changes in government policy and support. Furthermore, there will be adaptations required to theory, to adequately deal with this previously untested empirical context of civil society-led innovations.

Building on this preliminary review, the next steps of the project are: to conduct a content analysis of best practice reports, to assess what kinds of codified knowledge is being disseminated; to engage with community energy groups through a series of in-depth case studies; to interview intermediaries about their perspective on interfacing between community energy groups on one hand and policy/business contexts on the other; and to survey the community energy field in order to map the scope and scale of the sector. Our aim with the Community Innovation in Sustainable Energy research project is to explore how these processes of niche formation and learning between projects occur, and assess the extent to which this sector can ultimately contribute towards a sustainable energy transition in the regime.

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