Developing Community Energy Projects: experiences from Finland and the UK

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I hereby declare that this thesis has not been, and will not be, submitted in whole or in part to another University for the award of any other degree.

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Summary

Community energy has drawn interest from the general public, policy makers and researchers in the UK over the last few years. Community energy projects, such as energy saving measures and renewable energy projects, are usually organised by civil society groups rather than commercial businesses. This DPhil research approaches community energy as local grassroots innovation and compares its development in two different countries, Finland and the UK. Key research question is: *Why and how do community energy projects develop and how do they contribute to niche development?* The thesis uses Sustainability Transitions studies literature, especially literature on Strategic Niche Management (SNM), as a theoretical framing, and empirical in-depth analysis of four community energy projects, two in the UK and two in Finland.

The research examines how community energy projects develop in 'niches'. Research findings highlight that motivations for projects include monetary savings, energy savings and climate change. Projects are developed by pre-existing community groups or groups that have come together to develop an energy project. Local embedding of community energy projects to each project's individual circumstances helps successful project delivery. Pre-existing skills and tacit knowledge such as the ability to seek information and fill in funding applications can aid success. Engagement with key stakeholders further shapes projects' aims and objectives. Community energy projects benefit from a clear leader who works with a supportive team. There is evidence of projects networking at the local and national level in the UK, while in Finland networking remains limited to the local area and projects often develop in isolation. Furthermore, there is a clear lack of active intermediary organisations in the Finnish context. Policy discourse at the government level can aid the attractiveness of community energy, while continued funding support encourages more people to get involved in projects in their local areas.

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List of Abbreviations

AGSHP	Air and Ground Source Heat Pump
ANT	Actor Network Theory
ARA	The Housing Finance and Development Centre of Finland
BIS	Department for Business, Innovation & Skills
BRE	Building Research Establishment
CAfE	Community Action for Energy
CAN	Climate Action Network
CANEMU	Carbon Neutral Municipalities
CAT	Centre for Alternative Technology
CCAA	Communities and Climate Action Alliance
CCS	Carbon Capture and Storage
CEPF	Community Energy Practitioners Forum
CESP	Community Energy Saving Programme
CHP	Combined Heat and Power
CISE	Community Innovation for Sustainable Energy
CO_2	Carbon dioxide
CRI	Community Renewables Initiative
CSE	Centre for Sustainable Energy
DECC	Department of Energy & Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DPhil	Doctor of Philosophy
DTI	Department for Trade and Industry
EC	European Commission
ECHO	Energy Conscious Households
ECLEER	European Centre Laboratories for Energy Efficiency Research
E-Control	Energie-Control Austria
EMR	Electricity Market Reform
EPSRC	Engineering and Physical Sciences Research Council
EU	European Union
FIT	Feed-in-Tariff
GAP	Global Action Plan
GDP	Gross Domestic Product
GHG	Greenhouse gas
HM	Her Majesty's
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IPPR	Institute for Public Policy Research
km	kilometre
kW	kilowatt

kWh	kilowatt hour
LCBP	Low Carbon Buildings Programme
LCCC	Low Carbon Communities Challenge
LCCN	Low Carbon Communities Network
LDCA	Lyndhurst and District Community Association
LEAF	Local Energy Assessment Fund
MEA	Marches Energy Agency
MEKH	Hungarian Energy and Public Utility Regulatory Authority
MLP	Multi-Level Perspective
MW	Megawatt
NCRC	National Consumer Research Centre
NEF	National Energy Foundation
NFNPA	New Forest National Park Authority
NGO	Non-governmental organisation
OFGEM	Office of Gas and Electricity Markets
p/kWh	pence per kilowatt hour
PV	Photovoltaics
RCEF	Rural Community Energy Fund
R&D	Research & Development
RDPE	Rural Development Programme for England
RHI	Renewable Heat Incentive
SDF	Sustainable Development Fund
SEEDA	South East England Development Agency
SNM	Strategic Niche Management
SPRU	Science and Technology Policy Research
STRN	Sustainability Transitions Research Network
SYKE	Finnish Environment Institute
TEM	Työ ja Elinkeinoministeriö (Ministry of Employment and the Economy, Finland)
TIS	Technological Innovation Systems
TM	Transition Management
UCEF	Urban Communities Energy Fund
UEA	University of East Anglia
UK	United Kingdom
UKERC	UK Energy Research Centre
UNFCCC	United Nations Framework Convention on Climate Change
VVC	Valkeakoski Vocational College

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"We started our project after our heating costs, or electricity prices in general, had gone up and we were wondering if there would be a solution that could help us manage our expenses."

Hannu Mäkelä, Kaakonoja Area Residents Association, Kaakonoja, Valkeakoski, Finland, 2011.

"The block of flats had an oil heater that was almost 30 years old and it had really come to the end of its road. We had to do some kind of an overhaul of the heating system."

Lauri Lahtinen, Ylä-Kivelä block of flats, Keuruu, Finland, 2011.

"I really didn't know any of my neighbours, and I just felt that, that sense of community was hugely invaluable and that this was something that we could really do as a community together, so I could see Hyde Farm Climate Action Network and see it re-working and doing things together, and that would enhance my community."

Susan Sheehan, Hyde Farm Climate Action Network, Balham, London, UK, 2012.

"We are a village that has poor public transport and no mainline station and no buses running after 6:30 at night, with a 1500 population. I wanted to be able to offer something to the village that would give them what they want to do for their leisure time, at the same time offering a business opportunity."

John Charlesworth, Lyndhurst Community Centre, Hampshire, UK, 2012.

CHAPTER 1. Introduction

This thesis analyses innovations which are developed in communities by civil society actors. Innovation by communities is approached through the concept of ‘community energy’ – the generation and/or consumption of local sustainable energy measures such as energy efficiency or renewable energy. Community energy projects can involve activities and initiatives developed by people who often come together to take civil society action in their neighbourhoods and local areas. This DPhil research approaches community energy as a ‘grassroots innovation’: civil society action that can combine both technological and social innovation, with a focus on social good (Seyfang and Smith, 2007).

Using a theoretical framework from literature on niches and Strategic Niche Management (SNM) (Geels and Deuten, 2006, Markard et al., 2012, Raven et al., 2008), the development of community energy projects is compared in the context of two different countries: Finland and the UK. Community energy in the UK has drawn an increasing amount of interest from the general public, policy makers and researchers alike in recent years. Compared to Finland, the UK has a more established community energy niche, with over 5,000 groups involved in the sector as well as networks of actors and policy support – the latter most recently highlighted by the publication of the UK’s first Community Energy Strategy in January 2014 (DECC, 2014a).

The rest of this introductory chapter outlines the context of this DPhil research, including the concepts of socio-technical systems, energy and community energy. It first explains the role of socio-technical systems, and then continues to discuss how community energy has been defined by previous research and how the concept is understood within this DPhil research, taking into consideration the different country contexts of Finland and the

UK. The chapter also includes details about the *Community Innovation for Sustainable Energy* project, a three-year research project led by the Universities of Sussex and East Anglia and to which this DPhil is connected. Finally the chapter concludes with the key questions, aims and objectives of this research and an overview of the rest of this DPhil thesis.

1.1 The sustainability challenge of socio-technical systems

The focus of this research, community energy, usually involves the use of a certain technology by a group of people who use that technology in a specific social and economic setting. From a social constructivist point of view, technology is more than just a physical artefact. Technology is embedded in its societal setting and each shapes the other (Bijker, 1995, Rogers, 1995). Society shapes the way technologies are developed as much as technologies shape society (Bijker, 1995, Pavitt, 1987), though there are some physical limitations to the flexibility of 'hard' artefacts, and how far they can physically be changed (Geels, 2004).

The use of technology includes three dimensions: physical artefact, human activity (people using that technology) and knowledge (Bijker, 1995). Knowledge too is shaped by the interactions in the social world: "*Learners create meaning for themselves from their experiences of life: they 'construct' knowledge, making it their own, rather than imbibing it ready-made*" (Darby, 2006, p.2930). Knowledge is more than just information or data and knowledge relating to certain technology can, for instance, be constructed by each actor using that technology and learning through their own experiences rather than accepting knowledge as ready-made (Darby, 2006). In addition to community energy involving physical artefacts, human activities and knowledge, community energy projects are developed and operate in certain social, cultural and economic settings. These settings are further influenced by the surrounding *socio-technical systems.*

Socio-technical systems are systems that provide key services in societies, such as energy, transport, housing, healthcare and education (Geels, 2004). These socio-technical systems involve a range of features including technologies, institutions, services, norms, users and practices (Geels, 2004). The nature of socio-technical systems is that all parts and actors in such systems are interlinked (Geels, 2004). Socio-technical systems also include the production, distribution and end-use of technologies that fulfill all the different societal functions (Geels, 2004). In other words, technologies interact with their social settings, user groups, practices and institutions. A socio-technical systems approach also places an emphasis on the role of users and different social groups, which influence technological development, adaptation and change (Geels, 2004). For each community energy project, the socio-technical energy system where it is developed and operates will be different depending on cultural, political and economic settings.

With concern over sustainable development, socio-technical systems are increasingly being analysed in terms of their sustainability. How could these systems, which provide key services in society, become more sustainable? How, for instance, could the socio-technical energy, food and transport systems and the services, goods, behaviours and institutions related to them be decarbonised? As Smith et al. state: "*The challenge of sustainable development is increasingly understood in terms of 'transitions' to more sustainable socio-technical systems.*" (Smith et al., 2010, p.439).

Transitions research focuses on analysing large-scale transformations within socio-technical systems. Socio-technical transitions are a set of processes which lead to changes in socio-technical systems and the way fundamental services such as energy or transport are provided (Geels, 2002, Markard et al., 2012). Transitions usually emerge over long time spans (e.g. 50 years or more). When a transition takes place, a new emerging system may initially complement an existing system or partly replace it (Markard et al., 2012). Transitions are complex processes including "*a huge number of driving factors and* *impacts that involves co-evolving markets, networks, institutions, technologies, policies, individual behaviour and autonomous trends*" (Verbong and Loorbach, 2012, p.7). However, the driving factors for transitions are not always clear, reflecting to the processes' complexity (Verbong and Loorbach, 2012). During socio-technical transitions, new technologies, products, services, user practices, business models, regulatory structures and organisations emerge (Markard et al., 2012). Stability and 'lock-in' of existing systems to certain pathways makes change towards sustainability difficult - certain rules sustain existing technology and infrastructure, and social networks support old behaviours (Raven et al., 2010).

Despite the complexity, Verbong and Loorbach (2012) see the transitions concept as particularly useful as it offers a framework for a multidisciplinary approach, which can be useful in researching transitions within multidimensional systems, such as energy, food and transport (Verbong and Loorbach, 2012). This DPhil research uses the transitions concept as an overarching frame for the motivation of local communities to introduce alternative ways of producing and consuming energy within existing socio-technical energy systems.

1.1.1 Climate change and energy prices destabilising existing energy systems

At the time of undertaking this DPhil research between October 2010 and April 2014, climate change and energy policy featured in the UK news on a regular basis (e.g. Reuters, 2013, McGrath, 2013). For example, there were several reports on the lack of trust that citizens had towards the UK's Big Six energy utilities (Macalister and King, 2011), which dominate the gas and electricity markets.

Moreover, climate change and its impacts are likely to be disruptive and happen over a long period of time (IPCC, 2012). All areas of society and economy will be affected, at global, national, regional and local levels (IPCC, 2012). One way to tackle climate change is to reduce emissions from the energy sector and increase the use of *sustainable energy*, which in this research is understood to address both demand and supply, and include energy efficiency measures as well as zero carbon ways to generate heat and electricity. Energy consumption includes services, which are used for every day tasks such as heating, lighting, cooking and bathing. Energy saving measures, on the other hand, can include both technical and behavioural energy efficiency measures, such as cavity wall or loft insulation, energy efficient windows, draught proofing or behavioural measures such as turning appliances off. There is also a difference between measures which require capital investment and those that make operational cost savings. An example of a one off capital investment would be the installation of cavity wall insulation or energy efficient windows, whilst an operational cost savings measure would be turning off lights and appliances.

Numerous efforts have been made to agree on emissions reduction targets at the international level, notably led by the United Nations Framework Convention on Climate Change (UNFCCC). These meetings have brought common goals, with the most significant being the Kyoto Protocol, which was signed in December 1997 and came into force in February 2005 (UNFCCC, 2013). In the first commitment period of the Kyoto Protocol (2008-2012), 37 industrialised countries and the European Community agreed to reduce greenhouse gas (GHG) emissions by 5% compared to 1990 levels (UNFCCC, 2013). During the second commitment period (2013-2020) countries which have signed the agreement have committed to reduce GHG emissions by 18% below 1990 levels (UNFCCC, 2013). In addition to global agreements, the European Commission has imposed emissions reduction targets and member states have a target to increase renewable energy generation to 20% by 2020 and reduce CO_2 emissions by 20% below 1990 levels in the same timeline (EC, 2009).

National governments are considering ways in which they can promote policies that take the impact of climate change and opportunities for sustainable energy into account. For instance the UK was the first country in the world to introduce legislation in this area: the Climate Change Act 2008 requires the UK to reduce emissions by 80% by 2050 (compared to 1990 levels) (HM Government, 2009). Local authorities will have to interpret national policies for emissions reduction targets and put them into practical action in their local areas, while communities and citizens will feel the effect of those policies in their everyday lives. For example an opinion poll conducted for the UK Energy Research Centre (UKERC) found that in 2013, 72% of the British public thought that the world's climate was changing, while 67% of respondents thought that it was their responsibility to help do something about it (Poortinga et al., 2013). In relation to wider global, national and regional policy objectives of sustainable energy production, demand reduction and energy security, local energy projects can have an important part to play in sustainable socio-technical energy systems by providing energy generation and savings at the point of usage.

1.2 Community energy – sustainable energy action by civil society

The concept of community energy is often placed close to the ideas of locality, sustainability and togetherness. Citizens usually develop community energy projects in their local neighbourhoods. Before discussing the term community energy and how it has been defined in previous research, it is important to outline the concept of community, as it is understood within this research.

The terms *community* and *community-led* are used throughout this DPhil thesis. Community is a wide concept, which can have different meanings and interpretations. Furthermore, community can relate to both place and context. This thesis uses a definition of a community suggested by McMillan and Chavis (1986), who propose that a community can have four dimensions: *membership*, *influence*, *reinforcement* and *shared* *emotional connection*. Membership refers to the feeling of belonging to a group, whilst influence relates to the feeling of being able to make a difference within that group and the group being important to its members (McMillan and Chavis, 1986). Reinforcement means that the group's members feel that their needs are met by being a member of the group (McMillan and Chavis, 1986). Lastly, shared emotional connection is linked to issues such as shared common history, places and experiences, as well as time spent together (McMillan and Chavis, 1986). In other words, MacMillan and Chavis define a sense of community as:

> "Sense of community is a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together." (McMillan and Chavis, 1986, p.4)

Previous energy research has approached community in different ways depending on the aims and objectives of each research project. For instance, empirical research has in some cases only focused on geographical communities and has used these boundaries for strategic research reasons. Rogers et al. (2008) for example conducted a study of renewable energy in a rural location and defined the community by its geographical location for practical fieldwork reasons. However, community can be a wider concept than just a geographical location. It is also closely linked to politics, culture, shared interests and social networks (Walker, 2008, Walker and Devine-Wright, 2008, Seyfang et al., 2013b). For instance, people who are part of a community based on shared interests do not necessarily always live in the same geographical area (Walker, 2008). In this research, community is understood to mean people who share the same interests of being involved in a community energy project, and who also live in the same location.

1.2.1 Community energy projects: diverse, flexible and evolving

This research is especially interested in local, community-led sustainable energy activity, what such activities may look like, what motivates them and how they are developed. Local communities and civil society groups can be "*well placed to influence government* *and business, using their varied relationships with decision makers and key stakeholders to demand more ambitious progress on tackling climate change*" (Scott, 2010, p.3). Sustainable behaviours such as car sharing schemes, organic food groups and community wind farms are examples of local communities coming together and forming new innovative activities (Seyfang and Smith, 2007).

Previous research and policy literature have provided several definitions of community energy (see for instance DECC, 2014c, Schweizer-Ries, 2008, Walker and Devine-Wright, 2008). The definition of community energy can vary depending on the cultural and societal contexts of those who are defining the term. In this research the most relevant definitions are those provided by literature focusing on the UK and Finland.

Generally, community energy projects are energy projects which are led and developed by citizens in grassroots, civil society arenas. Previous research in the UK has highlighted that community energy projects tend to be very diverse, including a range of technologies and organisation types (Walker and Devine-Wright, 2008). Community energy involves different types of sustainable energy projects, which can focus on energy production or energy saving. The concept also includes energy projects that address behavioural aspects such as raising awareness of energy consumption in the home or finding solutions together on how to reduce energy consumption. Community energy projects can be developed by different types of organisations, including voluntary groups, social enterprises, co-operatives and charities. Walker (2008, p.4401) divides community energy projects in the following categories:

1) *Co-operatives*, such as windfarms and community heating projects
2) *Community charities*, such as associations and organisations
3) *Development trusts*, which raise funds for community energy projects
4) *Shares owned by a local community organisation*, for instance in energy projects.

Community energy can also be defined more widely than just by locality and interest. Walker and Devine-Wright (2008) go beyond place and interest by linking the definition of community energy to *process* and *outcome*. Process is about who the project is developed by and outcome is about who it is developed for (Walker and Devine-Wright, 2008, p.498). The UK government recognises that "*sharing of benefits and a focus on social outcomes*" (DECC, 2014a, p.20) is an important part of community energy and describes it as follows:

> "We used the term 'community energy' to mean community projects or initiatives focused on the four strands of reducing energy use, managing energy better, generating energy or purchasing energy. This included communities of place and communities of interest. These projects or initiatives shared an emphasis on community ownership, leadership or control where the community benefits." (DECC, 2014a, p.20)

In the context of Finland, the term 'community energy' does not exist in the same wording as in the UK. However, projects similar to those which are defined as community energy in the UK are usually considered under the term *lähienergia* (which translates to 'local energy') in Finland (Vehviläinen et al., 2010). Finnish Innovation Fund Sitra, which ran a Landmarks Programme and Energy Programme during 2009-2014, defines local energy as: "*Energy saved by a user or users collectively or renewable energy purchased from local production*" (Syvänen and Mikkonen, 2011, p.7).

The definition of community energy consequently varies to some degree between the two countries. Local energy projects in the Finnish context are low carbon, often renewable heat projects developed in the local area, using local knowledge and networks (Heiskanen, 2011). Often locality is the key defining factor for these projects also in terms of resource supply. For instance, previous research regarding Finnish co-operative wood fuel producers found that people involved usually defined local energy as projects which get their wood fuel supply from within a 50 kilometre (km) radius (Peltola, 2011). This shows how the term "local energy" is narrower in its connotation than community energy (even though local energy projects could also include projects like wind farm co-operatives, shares of which people can buy despite their location). Many pre-existing Finnish local energy projects have been developed by municipal energy companies or local authorities and it is only in recent years that people at the civil society level have started to initiate such projects themselves (Heiskanen, 2011).

The above shows that community energy can include a variety of projects in different locations, involving different types of groups and utilising different types of energy technology (generation or saving). This DPhil thesis concentrates on community energy projects in which local citizens have decided to produce sustainable energy generation or energy saving solutions, which can address both heat and/or electricity. It does not include projects developed by commercial energy utilities or local authorities, even though the projects under examination may have links to them in the form of information, advice or funding. Hence the key motivators, drivers and doers of the community energy projects considered here are local citizens themselves. The term community energy within the remit of this DPhil thesis is understood to mean projects which have the following characteristics:

- ***Sustainable energy projects addressing either heat or electricity generation or saving, such as renewable energy installations or energy efficiency measures***
- ***Projects, which are developed and owned by groups of ordinary people who live in the same locality. These groups can include for example co-operatives, voluntary residents' associations or charities*.**

Community energy is not a new phenomenon, but rather a concept which has evolved and changed over the years and groups have developed community energy for various reasons. For example groups may have had religious reasons for rejecting certain types of technology, or they were motivated by the 'back to nature' movement of the 1960s, while others were driven by poverty (Mulugetta et al., 2010). In other cases, motivations have included the desire for renewable energy or being able to draw from supportive government energy policy measures. For example wind energy has its roots in the 1970s co-operatives set up in Denmark, largely driven by the desire to create fossil fuel free energy supply (Smith, 2005). In Germany in the early 1990s, the Green Party influenced the launch of the Feed-In-Tariff law, allowing several community groups to take advantage of small scale renewable energy generation (Busgen, 2009).

Benefits of community energy schemes can include monetary benefits as project costs may be shared between project participants (Walker, 2008); regeneration of local areas (Walker et al., 2007); raising awareness of sustainable actions (Walker et al., 2007); expanding knowledge through learning from social networks (Darby, 2006) and other projects' experiences (Vehviläinen et al., 2010); and reducing emissions (Rogers et al., 2008). However, the latter can be difficult to measure as evaluation of emissions savings, especially from community energy projects, is still relatively sparse. In a survey of 119 community energy projects in the UK, 61% measured their energy generation, 52% measured their energy saving and 50% calculated their carbon footprint (Park, 2012).

Furthermore, communities are not necessarily harmonious and there can be conflicts within the groups of people who organise projects (personal communication with one interviewee who did not want to be linked to his/her community energy project). Social networks can play a key part in getting people involved in sustainable energy action by bringing people together, sharing information and skills, and encouraging people to work together for the common good (Smith, 2005).

1.2.2 Community Innovation for Sustainable Energy (CISE) project

Before moving on to Chapter 2: Theoretical Framework, it is important to note that this DPhil is linked to larger research project, *Community Innovation for Sustainable Energy*

(CISE)[1], which was run by the University of Sussex and University of East Anglia (UEA) between October 2010 and December 2013. The CISE project was funded by the Engineering and Physical Sciences Research Council (EPSRC) and European Centre Laboratories for Energy Efficiency Research (ECLEER, part of EdF Energy). It focused on the challenges that the community energy sector faces in the UK and the type of support that projects need to realise their full potential. Three key areas of community energy activities were included for further study within the CISE project:

- Community renewable energy projects
- Community demand reduction projects
- Community awareness-raising/behavioural change projects.

Between 2010 and 2013, the CISE team conducted 12 in-depth community energy case studies (Seyfang et al., 2013a), as well as a survey of 190 community energy initiatives across the UK (Seyfang et al., 2013b). These groups used combinations of energy technologies, awareness raising activities and demand reduction techniques. The community energy projects that were analysed in the the UK context of this DPhil research were also part of the CISE project (for more details on case selection see Chapter 3: Research Design and Methodology, and for more details on UK analysis see Chapter 4: The UK Case Studies). Hence, an important contextual and analytical forming of this DPhil has been the engagement with the CISE project. This has included for instance the sharing of ideas with the CISE project team, attendance of meetings, conference calls and workshops, as well as contributing to publications and writing case study reports. Some of the results from the UK part of this DPhil have been used to the benefit of the wider CISE case study analysis, synthesis and outcomes (see for example Seyfang et al., 2013a, Martiskainen, 2012b, Martiskainen, 2012a). Furthermore, this DPhil has used primary data collected by the CISE team as a secondary source and background material for the thesis. However, it should be noted that this DPhil research and the work presented in the thesis forms a separate study from the main CISE project and is solely the work of the author.

[1] Details about the CISE project and research outcomes are available at http://grassrootsinnovations.org

1.3 Research questions, aims and objectives

This DPhil research aims to identify the innovation processes linked to the development of community energy projects by answering the research question:

Why and how do community energy projects develop and how do they contribute to niche development?

To answer this research question, the thesis looks at specific community energy projects in Finland and the UK. These countries have differing community energy sectors, as well as wider energy regimes and can hence provide valuable insights on potential differences or similarities in community energy innovations.

The overall research question is broken down into three sub questions:

1. *Why and how do community energy projects develop in Finland and the UK? What are their contextual settings? What initial motivations, expectations and visions do they have?*
2. *To what extent do community energy projects network, learn from others and share experiences with other groups and actors?*
3. *Is there evidence of transferable lessons and sharing of those by for example intermediary organisations?*

The research questions and the theoretical framework are operationalised through qualitative case study analysis, which is discussed in more detail in Chapter 3 (Research Design and Methodology). The research has the following aims and objectives:

Empirical aims: to describe in detail and compare the development of community energy cases in Finland and the UK; why and how these are developed; and what can be learnt from the processes linked to community energy development in these two countries.

Theoretical aims: to gain insight into the processes linked to community energy projects in terms of Strategic Niche Management, especially in relation to local embedding of projects, networking, learning and sharing of lessons, which may then be applied to other projects and the wider community energy sector or beyond it.

Policy aims: to identify key support mechanisms required for community energy development and to discuss any implications national energy policy might have for community energy development (and vice versa) in Finland and the UK.

The research question and aims will be answered using a theoretical framework from Strategic Niche Management literature and empirical data collection from community energy projects and intermediary organisations involved in community energy development.

1.4 Overview of the thesis

Chapter 2: Theoretical Framework discusses the relevant theory literature for this thesis, focusing on Strategic Niche Management, especially the development of new innovations in niche spaces. *Chapter 3: Research Design and Methodology* outlines the chosen qualitative case study methodology and discusses the methods, data collection and analysis used in this research. *Chapter 4: The UK Case Studies* provides an analysis of community energy in the UK as well as an in-depth analysis of two UK community energy projects. *Chapter 5: Finland Case Studies*, analyses the Finland part of the thesis, including in-depth analysis of two community energy projects. *Chapter 6: Cross-case Analysis* brings together the four community energy projects and compares their development, taking into account the country contexts of the projects. Finally *Chapter 7: Conclusions and Recommendations* discusses the key findings and outcomes of the thesis, making recommendations for further theory development and empirical research.

1.5 Conclusions

Within the above outlined context, this research is approaching community energy as a concept, which allows people to face and deal with issues such as rising energy prices and concerns about climate change in their local communities and neighbourhoods. This thesis aims to unravel why community energy projects are developed, what motivates them and how their development might be influenced by their local contexts; the learning and sharing they do between other projects and stakeholders; as well as the evidence of those lessons being shared with other groups or actors.

The outcomes of the research are expected to be of interest to researchers working in the areas of sustainability transitions, community energy, grassroots innovations and energy policy. The thesis will also provide theoretical learning in relation to Strategic Niche Management and whether the concepts of SNM could potentially be applied to a niche such as community energy. Furthermore, the results are expected to be of relevance to those people and organisations that are involved in community energy development, be it at civil society level or in a more intermediary role of advising and aiding community groups to develop such projects.

CHAPTER 2. Theoretical Framework: Niches as spaces for grassroots innovation

2.1 Introduction

This research is interested in how innovations develop through local grassroots initiatives, initiated by civil society actors, rather than by firms, and the processes that are linked to that development. Local innovations are approached through the concept of community energy and the processes related to the uptake of community energy projects. This research is interested in how local innovations, such as community energy projects, can offer a new way to produce and consume energy and potentially contribute towards a more sustainable socio-technical energy system. Community energy projects are new in a sense that they usually differ from utility dominated mainstream business models of energy production and consumption. Community energy projects involve non-commercial actors, such as voluntary groups and they may also be creating new ways to participate in energy production or consumption. Key theoretical framing for this research is that we need a transition from 'dirty', fossil fuel based energy solutions to 'clean', low carbon energy solutions. This transition involves new ways of consuming and generating energy and consequently cleaning both the supply and demand side of energy: increasing generation of heat and electricity from renewable sources such as wind, solar, biomass and geothermal energy, and a wide use of energy efficiency measures, such as insulation and low energy lighting. Furthermore, potential behavioural changes, the way people behave and use energy services may have a part to play.

The development of community energy projects is analysed using literature on niche creation, the Multi-Level Perspective (MLP) and Strategic Niche Management (SNM) (Geels, 2002, Genus and Coles, 2008, Kemp, 1994), as well as concepts of grassroots innovations and green niches (Seyfang and Smith, 2007). Even though the theoretical framework focuses on the development of niches, it first discusses broader concepts of transitions as background knowledge to the thesis.

The socio-technical energy system providing heat and electricity in European countries like the UK is largely based on fossil fuels, causing increasing concern over GHG emissions (HM Government, 2009). Whilst energy use efficiency has improved in many areas of industry, transport and buildings over the years, oil price shocks, emissions linked to fossil fuel use, concerns over energy supplies and increased overall consumption have meant that the current energy system remains problematic (HM Government, 2009). Community energy projects have typically been developed outside the mainstream energy models, hence indicating that they are not fully established in the main energy system. However, there is a change noticeable in this for example in the UK, where the launch of the Community Energy Strategy in January 2014 shows that the UK government is giving some weight and further financial support to community-led energy projects (DECC, 2014a), although those steps may be relatively small compared to the dominating fossil fuel industries. The concept of a niche space allows the analysis of how effective these community-based energy projects are in creating sustainable energy initiatives. This chapter first outlines the concept of grassroots innovations, then moves on to how socio-technical systems are locked-in to certain pathways and how change in those systems could be initiated by new innovations. The chapter then discusses niche theory literature and concludes with key research question of the thesis.

2.2 Grassroots innovations

This thesis is interested in the development of local community energy projects. Such activities by civil society actors have been conceptualised by Seyfang and Smith (2007) as 'grassroots innovations'. Rogers defines an innovation as "*an idea, practice, or object that* *is perceived as new by an individual or other unit of adoption*" (Rogers, 1995, p.12). The importance here is the perception of newness: "*if an idea seems new to the individual, it is an innovation*" (Rogers, 1995, p.12). Perceived newness of an innovation can be related to knowledge, persuasion or a decision to adopt the innovation (Rogers, 1995).

Grassroots innovations are different from main market innovations in a sense that they are usually motivated by "*social need and ideology*" rather than purely by market forces (Seyfang and Smith, 2007, p.591). Grassroots innovations usually have a solution-focused approach to local problems and they can involve both technological and social innovation (Seyfang and Smith, 2007). Technological innovation, for example, has historically been focused in producing better marketable products, which have reduced costs and increased reliability (Kemp, 1994). Grimm et al. (2013) suggest that social innovation can be process, as well as, goal oriented. Process oriented social innovations involve the development of "*new products and services that address social needs*", which "*help to build more sustainable, cohesive and inclusive societies*" (Grimm et al., 2013, p. 438). Goal oriented social innovations, meanwhile,

> "take place at the level of operational practices and are instrumental to the way in which things are done. Social innovation thus defined is primarily a means to an end rather than an anticipated outcome of a given process." (Grimm et al., 2013, p.438)

Grimm et al., however, conclude in their review of previous research and policy documents relating to social innovation, that the term social innovation is still loosely defined and could benefit from further theorising and conceptualising (Grimm et al., 2013).

In this thesis, the focus is in grassroots innovations, which Seyfang and Smith define as:

> "We use the term 'grassroots innovations' to describe networks of activists and organisations generating novel bottom–up solutions for sustainable development; solutions that respond to the local situation and the interests and values of the communities involved. In contrast to mainstream business greening, grassroots initiatives operate in civil society arenas and involve committed activists experimenting with social innovations as well as using greener technologies." (Seyfang and Smith, 2007, p.585)

Grassroots innovations include initiatives such as car-sharing clubs, local food groups, voluntary recycling schemes and community renewable energy projects (Seyfang and Smith, 2007). What is common to these activities is that they are usually run by civil society actors such as community groups, voluntary organisations and social enterprises, rather than by large businesses (Seyfang and Smith, 2007). Grassroots innovations differ from innovations which focus for example solely on technology demonstration projects and are developed by market firms. Projects which focus purely on developing new technology can be limited by their problem framing and hence only focus on technical aspects and may ignore opportunities for innovation by social groups (Seyfang and Smith, 2007). Even though there have been communities in the past organising their own energy supply in the UK (Smith, 2005), the newness in community energy can be linked to several aspects of such a project. Examples of innovation within community energy could include the mode of organisation (e.g. a community group develops an energy project instead of a utility), the use of technology in a new setting (e.g. certain technology is new to the community group) or finance (e.g. the community group has to find new ways of financing their project).

Seyfang and Smith (2007) consider that by taking the focus out of technology or market development, grassroots innovations allow social good to be taken into consideration, which in turn can give an opportunity to develop for example social experiments that would not be developed or implemented elsewhere (Verheul and Vergragt, 1995). Grassroots innovations could potentially play an important role in the face of problems such as climate change, the effects of which are likely to be felt as much by local actors (local communities) as well as by national actors (national governments). This thesis is interested in how these grassroots innovations potentially emerge, what motivates them and how they spread. To aid this quest, the thesis discusses next how change in socio-technical systems can be studied through the (Sustainability) Transitions literature.

2.3 Socio-technical systems and lock-in

The nature of existing socio-technical systems is such that they are usually stable and 'locked-in' to certain development pathways (Raven et al., 2010, Smith and Raven, 2012). Different social groups such as users, financial organisations, universities, public authorities and institutions actively (re)create and define socio-technical systems (Geels, 2005, p.446), contributing to the way socio-technical systems are formed and maintained. The stability of existing systems is further sustained by certain established rules in areas such as technology, infrastructure, institutions and behaviours. Geels (2004) has identified three types of key rules that contribute to the stability of socio-technical systems:

- *Regulative* rules are formal rules, which include for instance laws or legal contracts that constrain behaviours and provide rewards and/or punishments (Geels, 2004).
- *Normative* rules include values and mutual expectations on for instance the way certain social groups are expected to behave (Geels, 2004).
- *Cognitive* rules are formed around language, symbols and the ability to engage with knowledge (Geels, 2004).

Certain technologies for instance dominate the socio-technical energy system because existing infrastructure and regulatory frameworks support their production and use. Despite the lock-in and stability of socio-technical systems, these systems are not insusceptible to change. New innovations are continuously developed within socio-technical systems and occasionally they change some or all parts of the system, and these changes can be approached for instance using literature on sustainability transitions.

2.3.1 Researching sustainability transitions

Research focusing on sustainability transitions has a growing body of researchers and literature dedicated to this field (Markard et al., 2012), which has been demonstrated by for example the establishment of the Sustainability Transitions Research Network (STRN)[2]in June 2009, followed by the launch of the academic journal *Environmental Innovation and Societal Transitions*[3] in June 2011. Transitions can be studied from different system perspectives, including socio-technical systems, innovation systems and adaptive systems (Verbong and Loorbach, 2012). *Sustainability transitions* research was historically concerned with the emergence of new technologies that could contribute to sustainable development (Schot and Geels, 2008). However, later research on sustainability transitions has focused more on socio-technical transitions that could result in sustainable production and consumption (Markard et al., 2012). Previous research has identified two main areas of analysis within transitions: research in the *systems in transition* and research into *transitions management* (Genus and Coles, 2008). Systems in transition research focuses on "*past episodes of transformational innovation"* (Genus and Coles, 2008, p.1437), whilst transition management is interested in the possibility of steering on-going technological change (Genus and Coles, 2008).

The transitions concept is useful for this DPhil research as an overarching frame for analysing the motivation for communities to introduce alternative ways of producing and consuming energy. The most relevant strands of sustainability transitions literature are the literature on MLP and SNM. The literature on Transition Management (TM), which is more interested in the governance of transitions, and Technological Innovation Systems

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[2] http://www.transitionsnetwork.org, the network had 788 members in February 2014.
[3] http://www.journals.elsevier.com/environmental-innovation-and-societal-transitions/

(TIS), which analyses the emergence of new technologies, are less relevant, even though Jacobsson and Johnson have argued that an innovation system perspective is useful when analysing new technology development within an energy system as "*the emergence of a new, or transformed, energy system is a slow, painful and highly uncertain process*." (Jacobsson and Johnson, 2000, pp.625-626). This research is not using the TIS approach, however, as the research is not interested in new technological development per se. Furthermore, TM, which focuses on large-scale on-going transitions and governing structures does not provide enough tools for analysing local projects.

This thesis draws on the MLP, as a tool to illustrate the relationships between three key concepts of niche, regime and landscape, but focuses on niche creation as the interest is in local innovative projects. The remit of this DPhil thesis is not to do a historical, long-term analysis of community energy, but instead it aims to examine how local community groups may experiment with sustainable energy within socio-technical systems. The focus of this research, community energy, operates in local projects and albeit there are links to different institutions and organisations, the concept of community energy is approached through projects at the grassroots level (Seyfang and Smith, 2007). Previous research has approached and analysed the development and impact of community energy projects by using different strands of literature, for example environmental psychology and behavioural change (e.g. Heiskanen et al., 2010, Schweizer-Ries, 2008), civic engagement and trust (e.g. Walker et al., 2010) and path dependence (e.g. Heiskanen et al., 2011). However, as this DPhil research is interested in local projects and how those projects may be developed, the niche creation literature allows the analysis of the processes linked to the development of local projects and their relationships with the emerging or established niche.

2.3.2 The multi-level perspective on transitions

Before discussing the niche development framework and SNM literature that is central to this thesis, the MLP on transitions is outlined briefly as it provides an illustration about where niches fit within the wider socio-technical systems. The MLP has been used by several scholars within transitions research, mainly for conducting historical, long-term studies of technological change within socio-technical systems (see a review by Smith et al., 2010). The MLP starts with a notion that transitions within socio-technical systems can be studied through three key components: *niches* (micro-level new innovations), *regimes* (meso-level existing systems) and the *landscape* (macro-level prevailing cultural and economical settings). These levels are linked to each other and interact, providing insights into how new innovations can be developed in niches, how they diffuse and potentially transform the existing regimes (Geels, 2002). Niches, regimes and landscape are not physically defined entities but they can be approached as co-evolving processes (Smith and Raven, 2012). The three layers of the MLP are illustrated in Figure 1, developed by Geels (2002), and the three layers are discussed in more detail below.

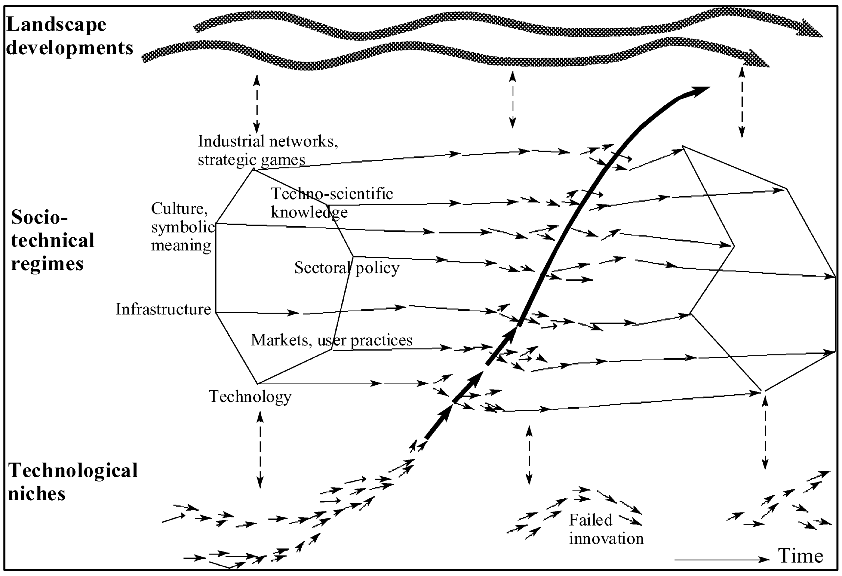

Figure 1: A dynamic multi-level perspective on technological transition (Geels, 2002, p.1263)

2.3.2.1 The landscape

The overarching frame within the MLP is the ‘landscape’ (macro-level), which constitutes the existing, main environment within which a socio-technical system exists. The socio-technical landscape is formed of abstract features such as political trends, values and culture, as well as more concrete events such as economic growth, wars, immigration and environmental problems (Geels, 2002). The landscape does not change often and when it does, changes at this level are gradual and take place over long timeframes (Geels, 2002). In this DPhil research the landscape concept is relevant in a sense that as the thesis analyses community energy in two different countries, those countries also have differing landscapes, especially regarding political trends and cultural values. However, there can also be similarities in these landscapes, especially regarding issues such as electricity prices, which are influenced by increasingly global energy markets (for example the impact of gas and oil prices) or for example EC Directives on gas and electricity (for example EC, 2009).

2.3.2.2 Regimes

According to the Geels’ (2002) model the overarching landscape impacts on the socio-technical ‘regime’, the (meso-level) existing dominating system, which consists of established technological artefacts, infrastructure, policy, markets, knowledge, culture and user behaviour. The socio-technical regime builds on Nelson and Winter’s definition of a ‘technological regime’:

> “…technicians’ beliefs about what is feasible or at least worth attempting. For example, the advent of the DC3 aircraft in the 1930’s defined a particular technological regime; metal skin, low wing, piston powered planes. Engineers had some strong notions regarding the potential of this regime. For more than two decades innovation in aircraft design essentially involved better exploitation of this potential; improving the engines, enlargening the planes, making them more efficient.” (Nelson and Winter, 1977, p.57)

Socio-technical regimes can be approached as the set of rules, which are embedded in production processes and behaviours relevant to the dominating selection environment as defined by Rip and Kemp:

> “a technological regime is the rule-set or grammar embedded in a complex of engineering practices, production process technologies, product characteristics, skills and procedures, ways of handling relevant artefacts and persons, ways of defining problems—all of them embedded in institutions and infrastructures. Regimes are intermediaries between specific innovations as these are conceived, developed and introduced, and overall sociotechnical landscapes.” (Rip and Kemp, 1998, p. 338, quoted in Genus and Coles, 2008, p. 1437)

The socio-technical system consists of several regimes that are linked and influence each other through interlinking social groups and institutions (Geels, 2004). Socio-technical regimes encourage engineers and firms to share the same routines, working towards the same direction and hence forming ‘technological trajectories’ (Geels, 2002). As mentioned earlier regarding socio-technical systems, socio-technical regimes are also usually locked-in and path dependent to well-established technologies, stabilised user practices, and public policies which support existing markets and industry structures (Raven et al., 2010, Smith and Raven, 2012). These predominant regime processes also include knowledge development and research & development (R&D) (Smith and Raven, 2012). For example community energy projects are subject to different regimes, such as the electricity and heat regimes, which are also likely to manifest differently for different community energy projects, depending on their contextual and local setting and for example the type of technology they use (e.g. projects may include electricity supply technologies and hence be influenced by the pre-dominating electricity regime).

2.3.2.3 Niches

The main theoretical focus of this DPhil thesis is in ‘niches’ (micro level) of the MLP, spaces where networks of actors develop new path-breaking innovations (Geels, 2002). Occasionally events at the landscape level can put pressure on existing regimes, initiating a requirement for change, or a shift, in the regime (Geels, 2002). Pressures for change at the socio-technical regime level can lead to new innovations being developed in niches (Verheul and Vergragt, 1995). The MLP suggests that existing socio-technical regimes produce 'normal' innovation patterns, while 'revolutionary' change originates in niches (Smith et al., 2010, p.440). 'Normal' innovation patterns would be those which follow existing technical trajectories and fit the dominant regimes: "*'normal' innovation patterns reproduce broad socio-technical regimes*" (Smith et al., 2010, p.441). An example of this would be innovations, which are developed to serve the dominant fossil fuel based electricity regime, rather than developing renewable energy innovations. Niches "*act as 'incubation rooms' for radical novelties*" (Geels, 2004, p.912) and provide "*spaces that shield experimental projects with radical innovations from too harsh selection pressures from incumbent regimes*" (Raven, 2012, p.126). Niche spaces involve learning processes as the development of new innovations continuously reflects on the surrounding environment and adapts accordingly (Verheul and Vergragt, 1995). Niches and regimes can, and do, exist alongside one another. As Geels (2002) notes, niches do not exist as separate from regimes and landscapes, but they are interlinked:

> "The important point of the multi-level perspective is that the further success of a new technology is not only governed by processes within the niche, but also by developments at the level of the existing regime and the sociotechnical landscape." (Geels, 2002, p.1261)

Niches can involve several, competing, innovations (Geels, 2005) and usually only a handful of innovations become established in the main regime. 'Windows of opportunity' provide innovations a chance to be selected and spread from the niche to the mainstream regime (Geels, 2002). New innovations that enter the mainstream markets are not necessarily always the 'best' ones, for example in terms of sustainability, but instead their diffusion can be determined by their manufacturability and profitability (Cowan, 1985). This means that only a small proportion of new innovations will actually diffuse to the mainstream (Pavitt, 1987). However, niches do not easily break through and change regimes as they have less established rules and social networks (Geels, 2004). The processes of new innovations emerging and becoming available to users in mainstream markets is a complex process where innovations are continuously changing, adapted and diffused (Pavitt, 1987).

Even though the MLP model's illustration looks linear, a transition is not a linear process, but involves interaction and complicated relationships between the landscape, regimes and niches (Geels, 2002). A transition can start at all levels of the system. For instance pressures in the landscape level can result in new innovations being initiated both within regimes, as well as in niches. Examples of this include for instance the requirement to develop low carbon energy solutions in order to deal with climate change, evidence of which is increasingly influencing for example policy making in the UK (HM Government, 2009). This may mean that a government introduces legislation for stricter emissions from energy generation in order to tackle climate change linked to GHG emissions (an example of this would be the UK's Climate Change Act 2008). This consequently may be a driving factor for the development of new low carbon energy technologies and user practices.

2.3.2.3.1 From technological niches to green niches

Previous research on niche development has conceptualised different types of niches. Niche creation resonates from the early research on new technology development and 'technological niches': "*The development of a new technology is not a momentary event, but requires a series of learning processes in which the technology and its social and physical environment are mutually adapted*" (Verheul and Vergragt, 1995, p. 321). Verheul and Vergragt for example note that niches are created by "*a network of actors which share a common problem definition in relation to the innovation*" (Verheul and Vergragt, 1995, p. 322). 'Small market niches' are separate from the existing dominating market regime (Geels and Raven, 2006). However, innovation does not only happen in commercial organisations, but equally takes place in social networks and groups who are outside of the more traditional established institutions of government and industry (Verheul and Vergragt, 1995).

Verheul and Vergragt (1995) discuss especially social experiments, innovation activities that take place outside the more traditional industrial innovation processes. Such examples could be for instance the development of alternative renewable energy technologies by citizen groups in the 1970s (Verheul and Vergragt, 1995). Verheul and Vergragt (1995) identify the following three key questions in relation to social experiments being created in niches:

1) Why do certain new social experiments (e.g. development of alternative technologies by citizen groups in the 1970s) develop outside more traditional industrial innovation institutions of firms and governments?
2) How can social experiments innovate?
3) How is their broader adoption achieved?

Later research has widened the concept of social experiments to green or grassroots niches, which can foster especially grassroots innovations (Seyfang and Smith, 2007, Smith, 2007). Smith defines green niches as:

> "These niches are spaces where networks of actors experiment with, and mutually adapt, greener organizational forms and eco-friendly technologies."(Smith, 2007)

Furthermore, Seyfang and Smith describe green niches as "*sustainability experiments in society*", which have a widespread participation by individuals, citizen groups, policy makers, non-governmental and industry organisations (Seyfang and Smith, 2007, p.589). Grassroots innovations in green niches are created especially to promote sustainability in response to the needs of the local community and perhaps with an aspiration that one day such initiatives may become a norm: "*niche practices that resonate with widespread* *public concern sometimes catch on, get copied, become adapted and spread*" (Seyfang and Smith, 2007, p.589). As mentioned earlier, niches usually emerge as answers to problems or pressures at the landscape or regime levels (Geels, 2002). The MLP illustrates these three levels and their potential interaction in long-term transitions. As this DPhil research is interested in how niche innovations, such as grassroots innovations, interact with socio-technical systems, the SNM literature provides further tools for analysing how niches emerge and can be supported.

2.4 Framework for niche analysis

Previous SNM literature provides analysis into how niches emerge and develop, and how they can be supported. Schot and Geels (2008) have provided a history of SNM research and divide the research sector in 'early' SNM research, which focused on niche-internal processes, and 'later' SNM research, which focuses on the interaction between niches and their environments (Schot and Geels, 2008, p.538). Later SNM research is also interested in the processes and actors that provide protected niche spaces and 'nurture' new innovations (Smith and Raven, 2012). In this DPhil research, the interest is more in the early SNM literature, especially in relation to how innovations develop in local projects (Raven et al., 2008), whilst keeping in mind the role of niche protection (Smith and Raven, 2012).

This DPhil creates a novel framework by synthesising an established niche development approach created by Geels and Deuten (2006) (and further developed by Geels and Raven (2006) with Raven et al.'s (2008) perspective on the development of projects in niches, especially taking into consideration the importance of local contextual settings. The thesis also draws on the work by Smith and Raven (2012) on niche protection. Geels and Deuten (2006) see niche creation as a flow of knowledge between innovative projects. These experiments usually start in local projects, where innovations start to develop in response to local problems (Geels and Deuten, 2006). According to Geels and Deuten (2006), radical innovations usually start to develop in small projects: "*new technologies emerge as small technical steps in response to local problems, and only later give rise to new technical trajectories*" (Geels and Deuten, 2006, p.266). Following Rogers' (Rogers, 1995) definition of innovation as something new and novel to the user, the concept of innovation within this research is wider than just a development of a new technology (artefact). It can also mean new and innovative ways of organisation, technology installation or behaviour, especially with regards to grassroots innovations such as community energy (Seyfang and Smith, 2007).

Despite Geels and Deuten (2006) mainly focusing their analysis on the development of new technologies, their conceptual perspective gives insight into how niches start to develop from knowledge flows between individual projects, which then, through various supporting activities such as the establishment of networks and intermediary organisations, form a niche. Geels and Deuten (2006) represent this with two sets of key actions:

1) Local practices
    a. This is where concrete, individual projects start. An example of this would be a project developing novel renewable energy technology, an innovative community project or ways of installing an existing technology in a new setting.
2) Cosmopolitan level
    a. This is a space shared between actors in a specific field or community. An example of this would be a new field of renewable energy technology where projects share learning, best practise guidelines and networks.

Niche creation starts at local projects and builds on the knowledge flows between those individual projects. The knowledge flows are illustrated in Figure 2.

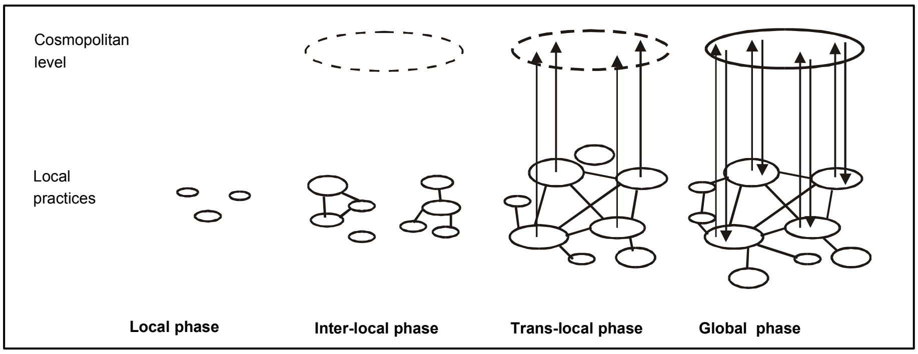

Figure 2: Different phases of knowledge sharing from local to global phase (Geels and Deuten, 2006, p.269)[4].

In order for local knowledge to reach and help create a niche, knowledge needs to be in a context-free form and replicable to other projects, conditions and locations (Geels and Deuten, 2006). Knowledge flows from local projects to the cosmopolitan level, however, do not happen automatically but require dedicated work by certain actors (Geels and Deuten, 2006). This work is divided into two main types of activity. *Practical work* and skills take place in actual local projects. This includes work by actors linked to certain projects and utilising their knowledge and skills for the benefit of that project. *Aggregation work* builds on the practical work but its focus is to produce context-free knowledge. Actors dedicated to aggregation work collect knowledge and experience from local projects and translate it to cosmopolitan level knowledge. This knowledge is context-free, more generic and hence shareable with others. Geels and Deuten (2006) establish three relevant processes that collect local knowledge and translate it to generic guidance: *circulation*, *aggregation* and *intermediation.*

[4] Geels and Deuten (2006) base this figure on two PhD thesis:
Deuten, J. J. (2003). *Cosmopolitanising Technology: A Study of Four Emerging Technological Regimes,* PhD thesis. Enschede: Twente University Press, and Raven, R P J M (2005). *Strategic Niche Management for Biomass,* PhD thesis. Eindhoven University, The Netherlands.

2.4.1 Local phase of niche development

At the beginning of a new emerging field, or niche, only a small amount of projects exist. In this *local* phase, individual projects are developed, mainly separate from each other. For example at the start of a community energy niche, community energy projects are developed in separation from other projects and there is little project-to-project communication, and this practical work is more about projects 'learning by doing'. At this phase for example pre-existing skills and knowledge are important, as projects may need to develop on their own, with little outside help. Darby (2006) for example found in a study of energy awareness in an English village, that when it came to the use of technology such as energy saving measures, the concept of 'tacit knowledge' played an important role. Tacit knowledge is the knowledge that people have but which is not taught or openly expressed (Wagner and Sternberg, 1985), and it cannot be easily codified (Gascoigne and Thornton, 2013). As Darby writes:

> "The concept of tacit knowledge explains how it is that we possess the awareness and skills that enable us to select the information we want from all that is available, to carry out actions and to evaluate facts and theories." (Darby, 2006, p.2931)

For example at the local phase of a community energy niche, when projects are developed in isolation, tacit knowledge of projects' local and cultural environment, knowing how to find people with certain skills and being able to operate effectively as a team may be important factors for projects' success.

2.4.2 Inter-local phase of niche development

Gradually, as more projects enter the field, the interaction between projects also increases. Once projects start to communicate and share experience, an *inter-local* phase emerges. In the inter-local phase, circulation of knowledge initially starts as knowledge flows between individual projects and is undertaken by people who are directly involved in the local projects (Geels and Deuten, 2006). There is no dedicated infrastructure for circulation at this phase and in fact, circulation in the inter-local phase aids the creation of knowledge infrastructure for future projects (Geels and Deuten, 2006). Different circulation activities include for instance the sharing of technical knowledge between projects, as well as knowledge on issues such as project development or available support mechanisms (Geels and Deuten, 2006). In this phase, community energy projects for example would start to share experience and learning with each other. This may be in the form of visits between projects, showcasing how certain technology works for example. Circulation is not, however, confined only to the local or inter-local phase but takes place in all niche development stages and is conducted by different actors.

2.4.3 Trans-local phase of niche development

The *trans-local* phase sees knowledge being translated from local projects to the cosmopolitan level. The model predicts that in the trans-local phase, dedicated aggregation activities start to emerge, conducted by intermediary actors such as professional organisations and standardisation committees (Geels and Deuten, 2006). Aggregation takes place when general lessons are abstracted from individual projects. These local lessons are then translated into best practice, standards, rules and guidelines (Geels and Deuten, 2006). Geels and Deuten define aggregation as follows:

> "'Aggregation' is the process of transforming local knowledge into robust knowledge, which is sufficiently general, abstracted and packaged, so that it is no longer tied to specific contexts. This global knowledge can travel between local practices." (Geels and Deuten, 2006, p.266-267)

Aggregation by intermediary organisations aims to produce shared knowledge that is available freely for others to use (Geels and Deuten, 2006). Though Geels and Deuten (2006) note that the creation of shared knowledge could be problematic in some cases, especially if those involved in knowledge creation are also competitors within the field. Another important aspect of aggregation is codification, an activity which translates tacit knowledge linked to projects into codified knowledge in the form of "*model building, language creation and message writing*" (Geels and Deuten, 2006, p.267).

Aggregation and codification allow projects to learn from previous experience and build on the knowledge accumulated in previous experiments (Geels and Deuten, 2006). Learning consists of both first-order and second-order learning, so that learning is the "*adaptation within existing frames of reference and systems but also a higher-level understanding, and questioning, of those systems and framings"* (Seyfang and Haxeltine, 2012, pp.391-392). In other words, learning is not only about facts, but also about the values that an innovation represents (Smith et al., 2014). Previous literature on SNM and grassroots innovations, has referred to learning processes related to niche innovations as social learning, which contains especially the processes of second-order learning (see for example Raven et al., 2008, Seyfang and Haxeltine, 2012, Seyfang and Smith, 2007).

For example in the trans-local phase of a community energy niche, intermediary organisations such advisory and funding bodies translate the lessons from existing community energy projects. This could include for example best practice guidance on issues such as how to seek funding opportunities and advice of technology options. Furthermore, networks at this stage become more established and there is emerging networking activities between local community energy projects and the intermediary organisations.

2.4.4 Global phase of niche development

In the final, *global* phase, the knowledge flow is a two-way process, with knowledge from local projects flowing to the cosmopolitan level as well as global knowledge from the cosmopolitan level flowing back to local projects. Both levels also have their own dedicated networks: "*Local networks refers to actors who are directly involved in projects, while the global network refers to an emerging field or community*" (Geels and Raven, 2006, p.378). Geels and Raven (2006) build on the work by Geels and Deuten (2006) and discuss niches as spaces, which are 'carried' by projects in local practices. This is illustrated in Figure 3 below:

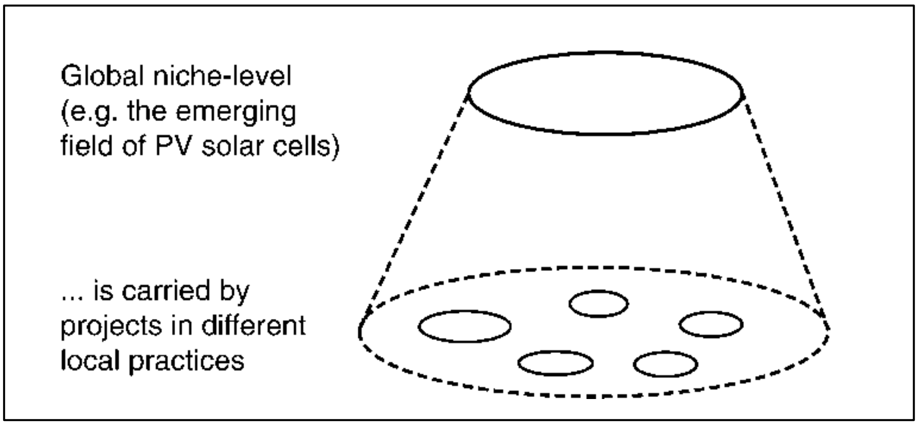

Figure 3: Local projects and how they 'carry' a niche (Geels and Raven, 2006, p.378)

One key element of niche creation is intermediation and the establishment of intermediary actors. Intermediary actors are usually professional organisations, networks and other dedicated actors that form part of the niche (Geels and Deuten, 2006). Geels and Deuten argue that "*global knowledge is an achievement that involves dedicated cognitive work*" (Geels and Deuten, 2006, p.266), which can be undertaken by intermediary organisations developed as part of "*a new technical community*" (Geels and Deuten, 2006, p.267-268). Intermediary organisations operate through various forums, including specialist events such as conferences and seminars, journals dedicated to the field, as well as professional networks. Furthermore, intermediary organisations and networks can also support experiments in their practical application (Verheul and Vergragt, 1995), while also performing aggregation activities. This aggregation work subsequently aids the development of new emerging trajectories (Geels and Raven, 2006). Initially the new trajectories are vague and unstable (Geels and Raven, 2006). However, they can become more prominent with dedicated support from active networks and clear guidance on issues such as best practise and standards (Geels and Raven, 2006).

At the global phase niche protection becomes important. In order to challenge existing regimes and diffuse to the regime level, niches require protection and supporting mechanisms in place (Smith and Raven, 2012). Niche protection can be for instance in the form of subsidies and capital investment aimed at projects within emerging niches (Raven and Geels, 2010, p.89), as well as creating networks and providing resources, which intermediary organisations especially can help with. Smith and Raven see niches as providing shielding, processes that “*hold at bay certain selection pressures from mainstream selection environments*” (Smith and Raven, 2012, p.1027). Examples of active shielding processes could include oil companies who support the development of renewable energy such as solar photovoltaics (PV) in the side of their core business (Smith and Raven, 2012). See also Figure 4.

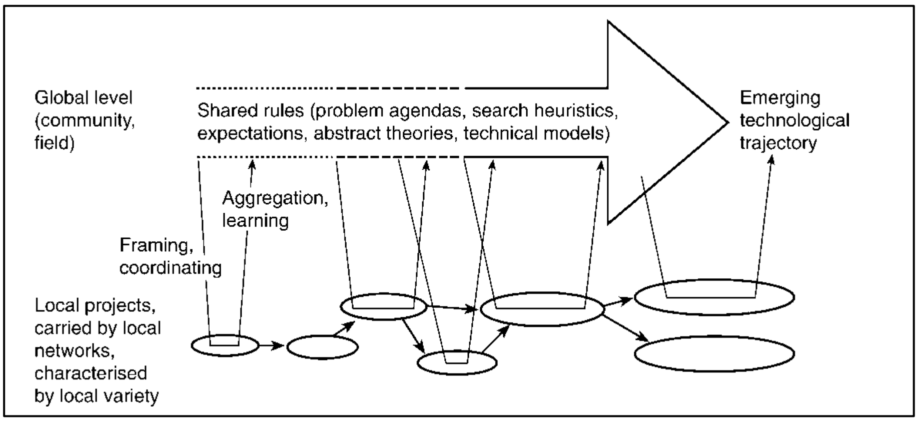

Figure 4: Emerging technical trajectory, carried by local projects (Geels and Raven, 2006, p.379).

The conceptual perspective developed by Geels and Raven (2006) suggests that in a global phase, a community energy niche would see the establishment of dedicated intermediary organisations. Those organisations would actively facilitate the establishment of community energy projects, by for example identifying potential groups to work with and further guide them with issues such as how to establish an effective community energy project. There would also be established conferences, publications, journals and other media for community energy at this phase, as well as protection from organisations within, and perhaps, outside the field.

Geels and Deuten (2006) concentrate on niche internal processes and do not give attention to the influence of external processes, such as the interaction between niches and regimes or the potential influence of events taking place at the landscape level. For example Hargreaves et al. (2013) argue that Geels and Deuten's (2006) perspective, especially in relation to its scope for analysing grassroots innovations, is lacking in one dimension. Hargreaves et al. (2013) note that in the context of community energy in the UK for example, intermediaries are not only aggregating lessons, establishing institutional infrastructure for the niche and co-ordinating action at local projects, but they are also conducting a role by "*brokering and managing partnerships with actors from 'outside' the community energy sector*" (p.878).

Despite the Geels and Deuten's (2006) perspective lacking the availability to grasp all aspects of the development of the emergence of grassroots innovations within niches, it is useful as an analytical tool for this DPhil research as it allows the analysis of the early stages of niche creation, especially in the context of a country like Finland, which has thus far a fairly limited amount of citizen-led community energy action.

2.4.5 Perspective of project development within a niche: learning from local practices translated to cosmopolitan level lessons

Building on the niche development literature outlined above, this thesis adapts an empirical niche development perspective initially created by Raven et al. (2008), who note that previous niche development literature (e.g. Geels and Raven (2006) and Raven and Geels (2010)[5]):

> "offers a framework for analysing the relation between individual projects in local contexts and the translation of local experiences into generally applicable rules at the global niche level" (Raven et al., 2008, p.465)

[5] The Raven and Geels paper referred to in Raven et al. (2008) was submitted for publication in 2007.

Niche creation includes several processes at different phases of a new field emerging. Much of niche creation is based on learning, networking, and experimenting with new innovations (Raven, 2012). Raven et al. (2008) analysed the relations of local renewable energy projects and whether, and how, local experience from those projects was transferred into generally applicable rules at the cosmopolitan level, i.e. indicating a global niche phase. It should be noted that the terminology used in the niche literature varies between different authors. For instance Geels and Deuten (2006) use the term 'cosmopolitan level' meaning the networks, conferences, publications and intermediary organisations, which have emerged and can help facilitate local projects. Raven et al. (2008), however refer to this as the 'global niche level'. The framework developed for this thesis uses the term 'global niche level' as per Raven et al. (2008), and which Geels and Deuten (2006) refer to as the 'cosmopolitan level'. However, 'global niche phase' is understood in this thesis following Geels and Deuten (2006) and which refers to an established niche, with 'global/cosmopolitan level' actors such as intermediary organisations and networks, as well as conferences and publications having been established for the sector. This is illustrated in Figure 5 below.

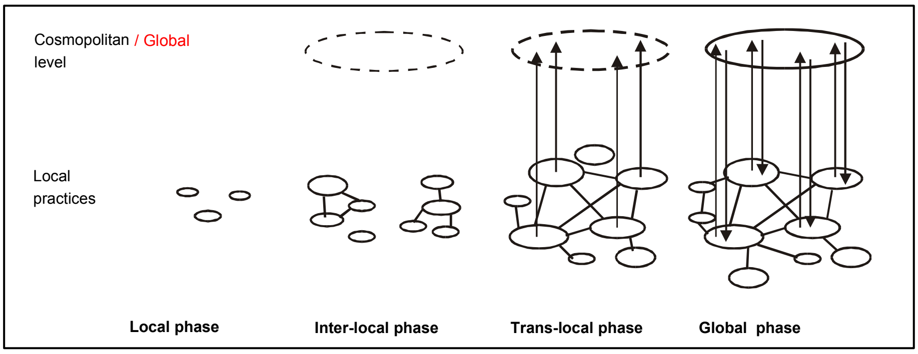

Figure 5: Different phases of knowledge sharing from local to global phase (adapted from Geels and Deuten, 2006, p.269).

Raven et al. (2008) identify three key processes in relation to local projects: (1) *variation through local contextualisation of a niche innovation*, (2) *negotiation and alignment of expectations* and (3) *retention and transfer to the global niche level*. The three processes offer a useful way to analyse projects in the early phase of the development of niche innovations. The processes identified by Raven et al. (2008) complement the perspective by Geels and Deuten (2006), which lacks the more detailed local analysis. Furthermore, the three processes identified by Raven et al. (2008), which are titled (1) *local contextualisation* (2) *negotiation and engagement* and (3) *transferable lessons* in this DPhil thesis, aid the aim of answering the research question on why and how community energy projects develop and how they contribute to niche development.

2.4.5.1 Local contextualisation

Firstly, each project has expectations, which are influenced by the project's local context (Raven et al., 2008). *Variation through local contextualisation of a niche innovation* refers to the processes involved in voicing the project's initial expectations and creating a vision. One of the success factors for niche creation is the voicing of expectations and visions for the development of projects, as well as the wider field. Raven and Geels (2010) highlight that expectations are important in two key ways. Firstly, expectations can guide direction for innovative activity and other local projects, as they are translated to search heuristics (Raven and Geels, 2010). Secondly, expectations can be used strategically in order to attract resources from potential sponsors:

> "Protection in technological niches comes from networks of dedicated actors, who are willing to invest resources in the new technology. High expectations and formal subsidies contribute to this willingness." (Raven and Geels, 2010, p.89)

Expectations can be different for different people and organisations that are involved in local projects. For example, people within a project can have different initial expectations about what the project is about and power relations may have a part to play as to whose expectations are the most influential ones (Raven et al., 2008). Projects and their funding organisations, for instance, may have different expectations about the outcomes of specific projects (Raven et al., 2008). These initial expectations are readjusted in the negotiation and engagement with the local community and key stakeholders.

2.4.5.2 Negotiation and engagement

Secondly, *negotiation and engagement* includes participation and how the project's expectations are negotiated and adjusted according to its local context (Raven et al., 2008). Expectations are adapted and adjusted according to interaction with the local community and key stakeholders, and thus help to shape the project's vision and build a niche (Raven and Geels, 2010). As Raven et al. (2008) note "*Project visions are not fixed*" (p.467), but visions change in the course of each project and they will be influenced by the social and political contexts that projects operate in. Furthermore, negotiation and alignment of expectations include both informal and formal engagement with key stakeholders and the local community:

> "Negotiating expectations can be a highly political process and influenced by existing and newly created power relationships. It is influenced by processes of participation and engagement of stakeholders, their expectations and particular social interests, and the ways in which they shape and reshape the initial vision of the project." (Raven et al., 2008, p.467).

For example community energy projects may need to readjust their project plans over time according to the available skills that they have and the amount of funding that they can secure.

2.4.5.3 Transferable lessons

Thirdly, Raven et al. (2008) note that as each project is different and has a different local context, this causes variability between projects. Following niche literature, especially in relation to niche development, Raven et al. (2008) join aggregation and intermediation activities into a concept of *retention and transfer to the global niche level*. These processes include the sharing of lessons from particular projects, which can be generalised and transferred to the global niche level. They are the lessons Geels and Deuten (2006) refer to as aggregated knowledge that can be translated to global niche level guidance. Raven et al. (2008) highlight that it is important for projects to be able to learn from global niche level actors and benefit from global niche level guidance, such as best practice, technical standards and shared ideas. These rules can guide local projects, but they should also "*leave room for local variations, as local actors reinterpret and reinvent them for local circumstances*" (Raven et al., 2008, p.466). Raven et al. (2008) continue, that voicing expectations allows local actors to show how they interpret the global niche level rules, while negotiation of expectations allows people involved in local projects to adapt generic project designs to their local context and circumstances. These three processes, (1) local contextualisation, (2) negotiation and engagement and (3) transferable lessons are outlined in Table 1 below.

Process	Key dimensions	Example activity
Local contextualisation	a) Vision of the project b) Expectations c) Local context	a) Reduce heating bills b) Geographical and cultural location of a project
Negotiation and engagement	a) Participation b) Negotiation of expectations c) Engagement	a) Project meeting b) Adjust project plan in a changing policy context c) Organise visits to other sites
Transferable lessons	a) Lessons from local project to global niche level	a) Technology guidebooks, funding guidelines, networking advice

Table 1: Summary of processes linked to niche development

In their analysis of two local sustainable energy projects, Raven et al. (2008) found that these successful projects had the following niche processes in common:

- Projects were local reinterpretations and reinventions of a more generic concept of an emerging niche trajectory
- These local variations were the result from differences in contextual setting and the way projects engaged with their local stakeholders
- The project and its context coevolved, i.e. the context influenced the project's variation, while the implementation of the project itself also changed the context
- Both projects provided generic lessons that were aggregated and shared with others
- The projects also acted as examples for other projects, providing some transferable lessons to the niche.

A key outcome from Raven et al.'s (2008) analysis is how local contexts influence project development, and vice versa, and the extent to which, subsequently, learning from projects can be translated to global niche level rules. As Raven et al. conclude: "*both the translation of a generic concept into a local project variation as well as the transfer of local lessons into global rules occur, but are difficult and require dedicated work*" (Raven et al., 2008, pp.473-475). Furthermore, Raven et al. highlight especially "*organizational models, financing structures, technical solutions, and ideological meanings*" as rules that can be applied in other contexts (Raven et al., 2008, p.475). The concepts developed by Raven et al. (2008) - of local contextualisation, negotiation and engagement and transferable lessons – are particularly useful for this DPhil as they focus on analysing the processes linked to the development of grassroots innovations, and how learning from such innovations may be translated to build a niche.

2.5 Limitations of previous transitions and niche development literature

Previous literature on niche development has been critiqued by scholars on several grounds, mainly relating to the methods used, the focus on technology and how key concepts of the MLP, for instance, have been defined (Genus and Coles, 2008). For instance, previous research has highlighted that the MLP has had a focus on technology, historically only concentrating on how new technology innovations emerge (Genus and Coles, 2008, Shove and Walker, 2007, Smith et al., 2010). Previous literature has also highlighted the importance of taking into account various social groups and their interactions in niche development (Genus and Coles, 2008). For example, Seyfang and Longhurst have argued that much of previous research on niche development processes have mainly concentrated on analysing "*supply-side, technological innovations in market settings, neglecting consumption-focussed social innovation in civil society*" (Seyfang and Longhurst, 2013, p.883). Furthermore, Smith and Seyfang have argued that not all niches are subject to, or can be subject to, strategic management:

> "The more managerial thinking in the niche analysis literature is found, perhaps unsurprisingly, to be less appropriate amidst the messier pluralities and voluntary associations of grassroots innovation." (Smith and Seyfang, 2013, p.829)

Shove and Walker, meanwhile, state that the transitions literature, the majority of which has focused on large-scale, historical system changes, has been too distanced from the everyday life of people:

> "Making few claims about how individuals and organisations can, might, or should act to affect the processes in question or to steer trajectories towards predefined, normative goals" (Shove and Walker, 2007, p.764).

In addition to Shove and Walker's (2007) call for daily life to be incorporated within transitions research, Genus and Coles (2008) too have called for more emphasis to be placed on cultural and social aspects in research using concepts from the MLP. There have also been large differences in previous research regarding definitions of key concepts. These have included, for instance, differences in the understanding of what a transition is, where it starts or where it ends (Genus and Coles, 2008), as well as the relationships between niches, regimes and landscape (Genus and Coles, 2008). Smith et al. (2010) have further highlighted the complexities of the relationships between niches and regimes, especially in the case where different niches are having to address multiple regimes and perhaps also compete between each other. Smith et al. have pointed out that operationalising the key concepts of niches, regimes and landscapes requires careful thinking over "*bounding, partitioning and ordering the system under study*" (Smith et al., 2010, p.444).

Another critique, regarding the MLP especially, has been directed at the use of methods in historical case studies. Genus and Coles (2008) have argued that the use of case study data in historical MLP studies has not always been systematic and studies have lacked a thorough explanation of data collection methods and sources. Often previous research using the SNM and MLP literature has focused on long-term, historical, case studies using secondary literature (for example Geels, 2005, Geels, 2002, Geels and Raven, 2006). Genus and Coles (2008) have suggested thorough thinking of research questions, especially when using the MLP, in relation to landscape factors and how they may influence the development of niches.

This critique of the transitions literature has some value, especially in relation to the MLP's historical technology focus and some lack of detail in research methods. In terms of this DPhil thesis, the most relevant critiques are those addressing the limited focus on cultural and social aspects, and the limited focus on people and communities in civil society. The criticisms directed at the MLP have been taken into account in this DPhil thesis, especially in relation to methods, technological focus and the role of civil society actors. With regards to methods, this thesis includes a thorough discussion of the methods chosen for this study, as detailed in Chapter 3: Research Design and Methodology. This thesis also aims to use the concept of niches in the empirical domain of grassroots innovations, which take social good into account rather than just focusing on technological development. Furthermore, grassroots innovations, which are developed by civil society actors such as community voluntary organisations and co-operatives, may have a more closely connected link to everyday life, than innovations that would focus purely on technological development. Despite the criticisms discussed above, the concept of niches (as well as regimes and landscapes) is still useful as a theoretical focus for this thesis. The concept of a niche allows the analysis of new innovations, which develop outside of the main dominating socio-technical systems. For example, in the case of community energy, the perspective of niche internal relationships developed by Geels and Deuten (2006) provides a tool for identifying processes within emerging niches, while the perspective by Raven et al. (2008) enables further analysis of how those processes manifest in local projects. By using this perspective the thesis tests the theory of niche development in an empirical setting, which is less focused on technological innovations and more focused on grassroots innovations, with an aim to examine how local projects develop in niches and whether there is evidence of learning from those projects being translated to global niche level rules within the domain of community energy.

This thesis has also considered other strands of literature, mainly Actor Network Theory (ANT) (Law, 1992) and theories of sustainable consumption (see for example a review by Jackson, 2005). ANT in particular can be of interest to those studying technology in society, especially in cases where human and technological actors interact constantly (Jolivet and Heiskanen, 2010). ANT "*provides a socio-technical approach to analyse controversies and concepts that helps to track the chain of micro-decisions and power relationships through which actors gradually agree upon, going from mere idea to its realization*" (Jolivet and Heiskanen, 2010, p.6748). In that sense ANT could be used to study the decision making and power relationships related to the development of community energy. As this thesis is interested in how innovations at the local phase emerge, issues such as local context, tacit knowledge of local actors and the character of people who are involved in developing such innovations are likely to be of importance. Asdal (2012) for example argues that ANT does not give much weight to context. Subsequently, this has had the effect that "*not enough attention is given to that which enables issues and situations to emerge in the first place*" (Asdal, 2012, Abstract). As the interest of this thesis is in how innovations develop and emerge in local projects, ANT does not provide sufficient tools for the analysis of how contexts influence such actions:

> "Rather than working from an assumption that there was an outside context within which actors to different degrees were embedded, the focus was on actor-networking, that is, the ways in which the transformation of interests and material and social reality were enabled." (Asdal, 2012, pp.383-384)

Researchers interested in sustainable consumption have used theories such as Symbolic Interactionism and Symbolic Self-Completion, for example, to explain why people purchase and consume certain goods or symbols (Jackson, 2005). The conclusion has been that consumption of certain goods (goods being a wider concept than just commodities and including also services) is not only based on their practical value but also to construct our identity (Jackson, 2005). People use certain goods or symbols for the image they portray of them to the outer world (Jackson, 2005). For example research on the purchase of organic food has found that people who think of themselves as ‘green consumers’ are more likely to purchase organic food (Jackson 2005). This could also be the case for community energy. However, theories of sustainable consumption tend to focus on individual behaviour, while this thesis is more interested in communal action, i.e. people working together as groups of people. Furthermore, as community energy can address both consumption (for example measures which focus on reducing energy demand) as well as production (for example the generation of renewable energy), the niche literature is more relevant as it addresses both consumption and production. Niche literature, and concepts such as grassroots innovations, provide conceptual and analytical tools for researching community energy projects; how such projects are initiated by groups of people; how such projects interact with the local contexts; and whether there is learning that could potentially be shared with others.

2.6 Hypothesis and key research question

In this research, community energy is hypothesised to be a form of grassroots innovation and potentially a niche in the existing socio-technical energy system. The idea of community energy is largely based on citizens taking the lead in developing sustainable energy solutions.

2.6.1 Community energy as a niche?

Community energy, for example in the UK’s socio-technical energy system, has a very small part in a sense that the main energy system is based on large-scale gas and electricity supply mainly coming from fossil-fuel or nuclear power plants. Community energy, as understood within the remits of this research (see also Chapter 1: Introduction for a definition of community energy), meanwhile, is based on small, localised solutions. Such activities are usually developed and led by citizens instead of utilities. However, community energy activity has a role within the socio-technical energy system, and much of that role has been based on new, innovative activity. Community energy projects can involve aspects in both technology and organisation that are novel to the community in question. For example, communities may be utilising pre-existing technologies, but which are new to them. Furthermore, communities may be using new ways by which they organise their projects, seek new skills or use external advice. People come together, organise, plan and develop an energy project, the functions of which have historically been conducted by energy utilities. In that sense, community energy can be approached as something new within the socio-technical energy system, and it may form a niche, which in the right conditions could have the potential to influence the existing socio-technical regimes.

Community energy involves several aspects, actors and artefacts. Considering technology as being socially constructed and formed of physical artefacts, human activity and knowledge (Bijker, 1995), the development of community energy projects can be understood to have the following aspects: energy generating or saving technologies used in community energy projects (artefacts), the development of community energy projects (human activities) and community energy projects' learning, relationship and sharing of experiences with others (knowledge). Within the remit of this thesis, the following key points guide the hypothesis. Community energy projects emerge when they are developed in a supportive environment, i.e. a niche space, that allows for the processes of local contextualisation, negotiation and engagement and transferable lessons to take place and there is evidence of the following (based on Raven et al., 2008):

- The project involves several people, i.e. the *community*, in a certain *context*: people get together and an idea for a community energy project emerges guided by motivations and initial expectations, which are influenced by the community's local context. A community may pre-exist, or it forms for the purpose of developing an energy project.

- *Resources* to develop the project are gathered, this can include a range of areas from finance to technical and soft skills, such as how to fill in funding applications.
- Project visions and plans are adjusted according to *negotiation* of expectations, as well as *engagement* with the local community and key stakeholders.
- An energy project is installed: this can involve *technology* such as renewable energy (e.g. solar panels) or energy efficiency measures (e.g. cavity wall insulation).
- Community energy project and context coevolve, i.e. context influences the project variation, while the implementation of the project itself also changes its context.
- The community learns as they develop their project: *learning* happens at different stages and involves a range of actors, including within or from outside the community.
- The project's learning and outcomes can be shared with others as *transferable lessons*. This can take place between projects or be guided by intermediary organisations, which translate local experiences to global niche level rules.
- Similar projects start to emerge elsewhere: projects learn from aggregated lessons, potentially leading to community energy *diffusion*. See also Figure 6 below.

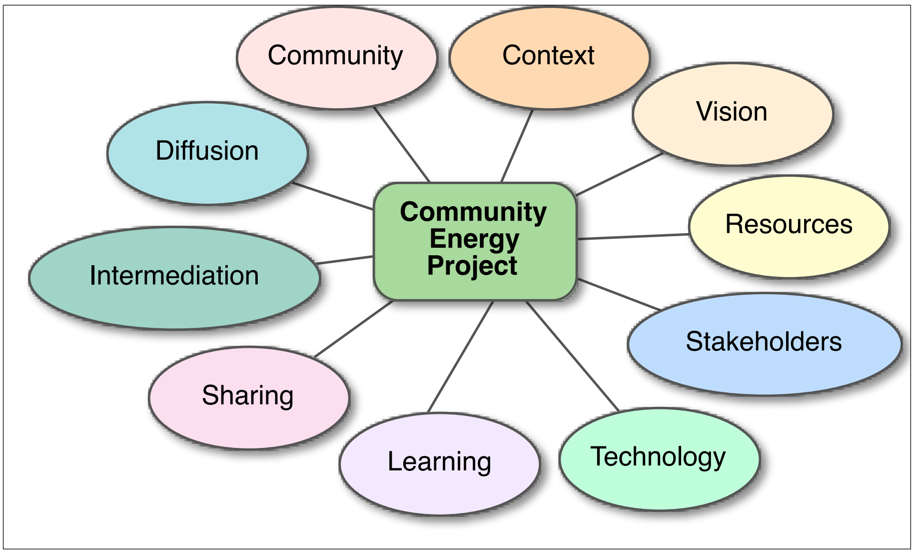

Figure 6: Illustration of a community energy project, developed for this thesis

2.6.2 Key research question

Following the considerations outlined in the theoretical framing of this research and the focus of the subject matter, the overall research question for this thesis is:

> ***Why and how do community energy projects develop and how do they contribute to niche development?***

To answer this research question, the thesis looks at specific community energy projects in Finland and the UK. Both countries have a different type of a community energy sector, as well as wider energy regime, and can provide valuable insights on potential similarities or differences in community energy innovations.

The overall research question is broken down to three sub questions?

1. *Why and how do community energy projects develop in Finland and the UK? What are their contextual settings? What initial motivations, expectations and visions do they have?*
2. *To what extent do community energy projects network, learn from others and share experiences with other groups and actors?*
3. *Is there evidence of transferable lessons and sharing of those by for example intermediary organisations?*

The research questions and the theoretical framework are operationalised using a method of qualitative case study analysis, which is discussed in more detail in Chapter 3: Research Design and Methodology.

2.7 Conclusions

This DPhil thesis focuses on the development of local projects and uses a framework developed using niche literature to aid the analysis. Niches act as protective spaces where new innovations can be developed and tested away from the pressures of main selection environments, such as dominating markets. The development of a niche can be analysed by following the development of projects within an emerging niche. This thesis does that by analysing community energy projects in relation to three key processes of (1) local contextualisation, i.e. motives, voicing of expectations and development of visions for projects, (2) negotiation and engagement, which involves the readjusting of visions and project plans according to engagement with local community and key stakeholders, and (3) transferable lessons, such as shared learning and experience from project outcomes. Niche actors, such as community energy projects, can for example aid the local contextualisation of their projects by having a clear vision and formulating expectations, whilst also readjusting these according to engagement with, for example, funders or expert organisations. Actors such as intermediary organisations can provide niche protection, by offering for example context-free knowledge, guidance and networking opportunities for new emerging projects. Shared experience from successful, as well as unsuccessful, projects aids the development of a niche, with intermediary actors aggregating local lessons to global niche level rules and guidance.

CHAPTER 3. Research Design and Methodology

3.1 Introduction

This DPhil research analyses the development of community energy through the concept of niches, using specific case studies of community energy projects in two different countries as empirical material. The thesis approaches community energy as an innovative activity, something that is perceived to be a new activity to each community in question (Rogers, 1995). This chapter outlines the protocol for the case study research, discussing the chosen research design and methodology for this thesis.

3.2 Case study methodology

This DPhil uses a case study methodology to study the phenomenon of community energy. In order to analyse community energy and capture the real life experiences of community energy projects, the following section discusses why a case study methodology was chosen, how cases were selected and what is the unit of analysis of this thesis.

3.2.1 Reasons for choosing a case study approach

Case studies are commonly used especially in social scientific research, as they offer a range of flexible approaches to research a certain phenomenon:

> "Case studies take as their subject one or more selected examples of a social entity – such as communities, social groups, organisations, events, life histories, families, work teams, roles or relationships – which are studied using a variety of data collection techniques." (Hakim, 2000, p.59)

Case study research offers a methodology that can be used to study "a *contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*" (Yin, 2009, p.18). Furthermore, case study research allows flexibility in research design. Evidence can be gathered from multiple sources and analysed so that the different sources either support or contradict each other, and hence may prompt further inquiry or confidence in the findings (Yin, 2009), while also producing context-dependent knowledge (Flyvbjerg, 2011). Flyvbjerg argues that case study method is important to researchers for two reasons:

> "First, it is important for the development of a nuanced view of reality, including the view that human behaviour cannot be meaningfully understood as simply the rule-governed acts found at the lowest levels of the learning process, and in much theory. Second, cases are important for researchers' own learning processes in developing the skills needed to do good research." (Flyvbjerg, 2011, p. 303)

Case studies are suitable for qualitative research, which seeks to include thorough accounts from a range of different actors. As Lewis notes, case studies "*are used where no single perspective can provide a full account or explanation of the research issue, and where understanding needs to be holistic, comprehensive and contextualised*" (Lewis, 2012, p.52). This thesis is interested in how innovations develop in local projects. Case study approach offers the opportunity to choose real-life, context-situated experiences for analysis, whilst also allowing the testing of theoretical statements relating to how grassroots innovations use and contribute to niche spaces (see for example Seyfang et al., 2013a).

3.2.2 Selecting cases

Case study research can include a variety of different types of cases and a different number of cases (Yin, 2009). *Descriptive* or *representative* cases usually explain cases of which there is little previous knowledge of, or descriptive illustrations of issues thought to be average or typical (Hakim, 2000, Yin, 2009). *Homogenous* cases give a detailed picture of a certain phenomenon and can be used to analyse "*social processes in a specified context*" (Ritchie et al., 2012, p.79). *Heterogeneous*, or *maximum variation*, cases involve cases which vary from each other, with an aim that common themes can be identified across the cases (Ritchie et al., 2012). *Extreme* or *unique* cases can be used in situations where a specific, unusual or rare case occurs (Hakim, 2000, Yin, 2009), and these cases can be seen to be potentially enlightening about a certain phenomena (Ritchie et al., 2012). Sampling based on *intensity* is similar to extreme cases, but "*focuses on cases, which strongly represent the phenomena of interest, rather than unusual cases*" (Ritchie et al., 2012, p.79). *Critical* or *selective* cases test a well-formulated and proposed theory, which the case is testing and if found valid, can be generalised to other non-critical cases (Hakim, 2000, Yin, 2009). Critical cases can test prevailing ideas and are designed so that they represent "*experimental isolation of selected social factors or processes within a real-life context"* (Hakim, 2000, p.60). *Longitudinal* cases follow certain cases over a period of time (Yin, 2009). As can be seen from the literature, the definitions of cases can vary somewhat between the different authors (e.g. Flyvbjerg, 2011, Hakim, 2000, Ritchie et al., 2012, Yin, 2009). The types of cases are summarised in Table 2 below.

Type of cases	Description
Descriptive/representative/typical cases	Explains a case of which there is little previous knowledge of, or describes illustrations of issues which are thought to be average and/or typical
Homogenous cases	Gives a detailed picture of a certain phenomenon
Heterogeneous/maximum variation cases	Cases which vary widely, with an aim to draw common themes across cases
Extreme/unique cases	Specific, unusual or rare cases
Intensity cases	Strongly represents a phenomenon of interest
Critical/selective cases	Tests a well-formulated and proposed theory
Longitudinal cases	Follows a certain case over a period of time

Table 2: Summary of types of cases (based on Flyvbjerg, 2011, Hakim, 2000, Ritchie et al., 2012, Yin, 2009)

One of the main aspects of case study design is to decide between a single or a multiple-case design/collective case study (Stake, 2005) and what types of cases to select (Yin, 2009). Case selection can be based on theoretical considerations and some expectations of being able to draw theoretical outcomes from those cases (Flyvbjerg, 2011, Yin, 2009). Flyvbjerg (2011) notes that strategic case selection is not set in stone, but cases can have different characteristics, for example a case can be extreme and critical at the same time, and while research proceeds and more is learnt about the case, the role of the case may shift. Strategic case selection, where cases are representative of the parent population, and clear research methodology, can improve generalisation from a small sample size (Lewis and Ritchie, 2012). However, Yin argues that case study research should not aim for generalisability in the same way as quantitative, statistical research does, but rather aim for analytical generalisation, in which "*the investigator is striving to generalise a particular set of results to some broader theory*" (Yin, 2009, p.43). This thesis approaches generalisation carefully and follows Yin (2009) in a sense that the generalisation is reflected on the theoretical framework, noting also the following in relation to theoretical generalisation:

> "It is our view that qualitative research studies can contribute to social theories where they have something to tell us about the underlying social processes and structures that form part of the context of, and the explanation for, individual behaviours or beliefs." (Lewis and Ritchie, 2012, p.263)

In this thesis, case selection is based on information oriented-selection, so that "*cases are selected on the basis of expectations about their information content*" (Flyvbjerg, 2011, p.307) and they are expected to aid the analysis of micro-scale processes involved in local projects, especially in relation to learning, networking and sharing experience. Furthermore, case selection is based on a multiple-case design and replication logic:

> "Each case must be carefully selected so that it either (a) predicts similar results (a literal replication) or (b) predicts contrasting results but for anticipatable reasons (a theoretical replication)." (Yin, 2009, p.54)

The following theoretical considerations, which are key to this thesis, guide the case selection strategy:

- The thesis is interested in finding out how new innovations develop in local activities (see Chapter 2: Theoretical Framework).
- The theoretical assumptions are that local projects, which develop in niche spaces, involve the processes of (1) local contextualisation, (2) negotiation and engagement and (3) transferable lessons (see Chapter 2: Theoretical Framework).

- The processes evolving from the project are dynamic and interactive, in other words, they are neither static nor one-way. The niche space can support the development of local projects, whilst local projects can in turn feed experiences back to the global niche level, building it further (Geels and Deuten, 2006). This suggests a constant moving relationship between phenomena and context (Raven et al., 2008). One aspect to the thesis is to explore these relationships further.

Based on these assumptions, the following criteria were used for case selection in this thesis:

- An area of study, which involves local innovative activity. This is why community energy is interesting as a topic for this thesis. Community energy involves people at civil society level, who develop sustainable energy activities that have traditionally been an area for utilities.
- An area of study where local innovative activity is taking place in a niche space. As discussed in Chapter 2: Theoretical Framework, niches provide supportive infrastructures and intermediary activity, where networks of actors develop new path-breaking innovations and help shape the protective niche space further (Geels, 2002). Niches develop as sequences of innovative projects, which start to emerge and learn from previous experience within the field (Geels and Deuten, 2006). Niche innovations can be supported by intermediary actors, who perform activities such as providing information about funding opportunities, creating space for networking and developing best practice guidelines (Geels and Deuten, 2006).
- In order to analyse the development of community energy niches, two *heterogeneous* contexts were chosen, one with an apparently more established community energy niche, the UK, and another with a less established community energy niche, Finland. Furthermore, Finland has a different community energy context to the UK. The socio-technical energy system in Finland is localised and

based on municipal actors, while the UK system is more centralised. This provides an opportunity to identify potential central themes across individual community energy projects, which operate in those two different contexts.

- This DPhil is linked to the Community Innovation for Sustainable Energy (CISE) research project, which analyses the community energy sector in the UK. Given the recent rise in community energy activity in the UK, the UK provides an interesting context in which to analyse the development of such projects. Work within the CISE project, to which this DPhil research has also contributed, has identified that there is evidence of a global phase of a community energy niche in the UK, with a range of intermediary actors and networks operating in the field (Hargreaves et al., 2013, Seyfang et al., 2013a, Seyfang et al., 2013b).
- Finland has a much lower level of community energy activity than the UK. There is evidence of local projects emerging, however, active intermediation, networks and policy support remain limited (Heiskanen, 2010, Vehviläinen et al., 2010). Finland makes an interesting context to study community energy, especially given the country's strong municipal culture compared to the UK (Käpylehto, 2011). Furthermore, research in this area remains rather limited (Heiskanen, 2010), which subsequently provides also an opportunity to make a contribution to this area.
- In order to analyse civil society, local projects, it was important to adopt a research design, which would include empirical data collection with actual community energy projects. Key aspect of empirical research is the practicalities linked to research in the field (Yin, 2009). Choosing UK and Finland provided an opportunity to analyse the development of niche innovations in two different contexts. The researcher has lived in both countries and is fluent in English and Finnish language, which meant that it was possible to conduct in-depth case studies using native languages. This provided access to a potentially wider sample of literature and interviewees, as well as the opportunity to conduct in-depth interviews and analysis as cultural and linguistic cues could be taken into consideration.

Small-scale qualitative cross-national research can have the advantage that it allows the researcher to study certain phenomena "*'from inside', in their cultural and social context, in actual local practices, and in people's everyday life*" (Gómez & Kuronen, 2011, p. 685), which can also be seen to address some of the criticism directed at previous SNM research regarding their lack of incorporating the role of social groups and every day life (Shove and Walker, 2007). Researching community energy projects in two different countries provided an opportunity for the identification of potential common typologies (Matthews and Ross, 2010) and narratives across multiple cases (Abbott, 1992). Furthermore, community energy was analysed in a cross-national context, i.e. the nations/countries were defined as geopolitical and socio-cultural entities (Hantrais, 2009), while also taking into consideration how these settings could produce differences in niche spaces, especially in relation to niche protection, learning processes and networking (Smith and Raven, 2012).

3.2.2.1 Unit of analysis

The primary unit of analysis in this thesis is a community energy project, allowing the analysis of local projects, while also providing material on how those projects interacted with global niche level actors, such as intermediary organisations (Geels and Deuten, 2006). Given the time and resource limitations of a DPhil research, two community energy projects in the UK and two in Finland were chosen for in-depth analysis.

Community energy project selection was started with the Finland context, as there are fewer community-led energy projects developed there. Projects were then chosen from the UK. Even though previous research has highlighted the diversity of community energy (Walker and Devine-Wright, 2008), in order to match the definition of community energy within this research, the following initial characteristics were also kept in mind: sustainable energy projects addressing either heat or electricity generation or saving (such as renewable energy installations or energy efficiency measures), and projects, which were developed and owned by groups of people who lived in the same locality (e.g. co-operatives, voluntary resident's associations or charities). Furthermore, the projects were chosen in relation to evidence of them having a vision (local contextualisation), involving engagement with stakeholders (negotiation processes) and whether there was evidence of learning and networking (transferable lessons). Table 3 below summarises these in more detail.

Process	Explanation	Empirical evidence
Innovation	The project is innovative for example in the aspect of technology use or group organisation	Project uses technology which is new to the community
Local contextualisation	Project is developed to fit its specific local context, with a clear vision	Project which uses existing technology but adapts it to its local setting
Negotiation and engagement	Project plan is adjusted in negotiation with the local community and stakeholders	Project plans are adjusted for example to fit the requirements of an external funder
Transferable lessons	Lessons from the project are translated and shared with other actors	Learning from project is shared by an intermediary organisation

Table 3: Processes linked to project development and niche building

The following section explains the more detailed individual community energy project selection for Finland and the UK.

3.2.3 Finland cases

The sampling for the Finnish case study selection was based on a snowball approach. In terms of community energy projects in Finland, initial contact was made with two researchers in September 2010, Pekka Peura at University of Vaasa and Eva Heiskanen at the National Consumer Research Centre (NCRC) to identify potential projects and contacts in Finland. This communication via e-mail and a meeting with Eva Heiskanen in December 2010 produced several contacts in the following organisations that either have an interest or activities in community energy: WWF, Finnish Nature Conservation Association, Finnish

Environment Institute, Motiva (government's energy efficiency agency), Gaia Consulting, Sitra (Finnish Innovation Fund), Greenpeace and Demos (think tank). All of these organisations were initially contacted by e-mail between May and June 2011, using a standard description to explain the aims and objectives of the research. The organisations were asked about their knowledge of existing community energy projects, or other/additional contacts that may be relevant to this research.

In addition to contact with Finnish researchers and expert organisations, an internet search was conducted using the term '*yhteisöenergia'* (yhteisö means community in Finnish) and '*lähienergia'* (lähi means local or nearby in Finnish), the latter a term that was advised by Finnish contacts to be the most equivalent to the term '*community energy*' used in the UK (Heiskanen, 2010). From this initial communication it became clear that community energy, as a citizen-led activity, does not widely exist in Finland. Instead, several local energy projects have been developed together with local authorities or municipal energy companies and local district-heating networks are common. However, there has been increasing interest towards more independent projects, separate from local authorities. Some funding programmes have also supported community energy projects, such as the Finnish Innovation Fund Sitra's "Maamerkit" (Landmarks) programme, which has funded ideas for local energy action (Kirkinen, 2011). Following the literature and internet search, as well as communication with Finnish experts, the following projects were identified as potential cases for further study (Table 4):

Name	Description	Innovation	Citizen-led	Compatible with CISE
Ylä-Kivelä Housing Cooperative, Keuruu	Apartment block heating system refurbishment	First block to install solar thermal and pellet boiler	Yes	Yes
Kempele Ecoquarter, Oulu	Development of 10 new detached houses	CHP plant and wind turbine	Yes	No – New-built houses only
Kangasala Ecovillage, Kangasala	Ecovillage established in 1994	Wood chip boiler	Yes	No – Ecovillage, certain lifestyle
Kaakonoja Area Residents' Association, Valkeakoski	Residents' Association study on heat pumps	Air source heat pump study	Yes	Yes
Carbon Neutral Municipalities - **CANEMU**, Mynämäki, Uusikaupunki, Kuhmoinen, Padasjoki and Parikkala.	Five municipalities aiming to become carbon neutral, 2008-2010.	Energy efficiency measures and renewable energy installations	No	No – initiative led by local authorities

Table 4: Examples of Finnish community energy projects

From the list of projects, those, which fitted the requirements for a citizen-led project, were chosen for the final analysis: **Limited Liability Housing Company Ylä-Kivelä** in Keuruu and **Kaakonoja Area Residents' Association** in Valkeakoski. These were chosen as they filled the criteria for suiting the definition of a community energy project, they were truly citizen-led, involved sustainable energy and were applicable within the remits of the CISE project. Furthermore, Kaakonoja and Ylä-Kivelä projects also had evidence of local contextualisation, negotiation and engagement and transferable lessons during the development of the projects. Table 5 summarises these cases in more detail.

Case	Innovation	Local contextualisation	Negotiation and engagement	Transferable lessons
Limited Liability Housing Company Ylä-Kivelä	First block of flats in Finland to install pellets and solar thermal renewable energy heating	Using existing technology and adapting it to own setting	Dealing with local community and project partners	Inviting people to visit, acting as an example
Kaakonoja Area Residents' Association	Running of a heat pump information study	Using existing technology and adapting it to own setting	Dealing with external funders and experts	Organising an information day to the local community

Table 5: Summary of Finland cases

3.2.3.1 Limited Liability Housing Company Ylä-Kivelä

Limited Liability Housing Company Ylä-Kivelä (referred to as Ylä-Kivelä from now on) is a residential block of flats in Keuruu, central Finland. The block was built in 1975 and has 40 flats and around 50-60 residents. The majority of the flats are owner-occupied and private landlords rent out the rest. In 2009 Ylä-Kivelä became the first block of flats in Finland to replace an oil-based heating system with a solar thermal and pellet heating system. Their existing oil heater was around 30 years old and had to be replaced. Lauri Lahtinen, a resident and also a caretaker of the block at the time and in charge of its overall maintenance, started to consider different heating options for the building. At the time oil prices were rising in the global market, also reflecting heavily on the price of oil-based residential heating. One of the options considered in Ylä-Kivelä was joining the local district-heating network, but this had its drawbacks, as Keuruu is one of the most expensive district heating areas in Finland (Lahtinen, 2011). Therefore, alternative options to oil and local district heating were needed and renewable energy seemed an option worth considering seriously.

3.2.3.2 Kaakonoja Area Residents' Association

Kaakonoja Area Residents' Association (referred to as Kaakonoja) is a residential community association based in Valkeakoski, central Finland. The Kaakonoja area has around 700 houses built during the 1950s and 1960s. The majority of the houses are detached, though there are also some modern tower blocks. The Kaakonoja Area Residents' Association was formed in 1983 and has approximately 250 members. It is a not-for-profit organisation and all income generated by the Association is recycled back to its activities. In late 2007, two members of the association - Hannu Mäkelä, a retired journalist and Tuomo Knuuttila, a retired electrical engineer - initiated a project with an aim to collect independent information on heat pump models and find those most suitable for their residential area. The men wanted to explore cheaper options for their increasing electric heating bills, but as they could not find reliable independent information on various options, they decided to run a project by themselves, with funding support from the local EU Leader agency (see for example Heiskanen et al., 2011).

3.2.4 The UK cases

As already noted, community energy in the UK has flourished in the last five years. There is an increasing interest from citizens to get involved in community energy projects and various funding programmes have supported such activities, especially those aimed at small-scale renewables by the UK government, local authorities and energy utilities (see Chapter 4 for more details about the UK's funding programmes). Previous research has identified at least 5000 groups, which have developed community energy projects in the UK (DECC, 2014a) and has highlighted the diversity of the UK's community energy sector (Burton and Hubacek, 2007, Park, 2012, Walker, 2008). However, the actual number of projects may be difficult to establish as not all community energy projects are active in their networking or external communications (Seyfang et al., 2013b).

The community energy project selection for the UK part of the thesis was based on the same criteria as for the Finland part. Initially, two key secondary data sources were used for identifying the types of community energy projects in the UK: the Lancaster database of community energy projects[6] and an initial community energy database developed by the CISE project.

This DPhil research is connected to the CISE project and the objectives of case selection within the CISE project were also kept in mind in relation to the community energy project selection for the UK cases: a variety of community energy projects developed over the last decade, including a community wind energy project, a neighbourhood insulation project, a community awareness project and a community solar heating club. Case selection within the CISE projects was informed by literature review, triangulation of previous research and documented information available (Seyfang et al., 2013a). Based on the above criteria, a neighbourhood energy efficiency project, **Hyde Farm Climate Action Network**, located in Balham, London, and a community centre development project, **Lyndhurst Community Centre**, located in Lyndhurst, Hampshire, were chosen for deeper analysis in the UK, as those cases were accessible for further research and had evidence of having processes linked to local contextualisation, negotiation and engagement, and transferable lessons (see Table 6).

[6] UK Community Energy Projects Database, available online at: http://geography.lancs.ac.uk/cei/CommunityEnergyUKProjects.htm

Case	Innovation	Local contextualisation	Negotiation and engagement	Transferable lessons
Lyndhurst Community Centre	First community centre in New Forest to install biomass	Using existing technology and adapting it to own setting	Dealing with local community, external funders and experts	Showcasing achievements to others, funder using as example project
Hyde Farm Climate Action Network	Development of community draught proofing activities	Using existing technology and adapting it to own setting	Dealing with local community, external funders and experts	Sharing experience and lessons with other community groups and intermediary organisations

Table 6: Summary of UK cases

3.2.4.1 Lyndhurst Community Centre

Lyndhurst Community Centre (referred to as Lyndhurst) is a charity-run community building located in Lyndhurst, New Forest, Hampshire. It was built in 1962 and has over the decades become a hub of the village. Over 40 local community groups and businesses regularly use the Centre. During 2009 and 2010 Lyndhurst went through a complete, £700,000 refurbishment and as a result the building was installed with a biomass boiler. Funding for the project came from various sources, including The Big Lottery, New Forest National Park Authority (NFNPA), local authorities and the local community. Lyndhurst was the first community centre in the New Forest to install a biomass heating system, creating also opportunities for local wood fuel supply networks to develop. The refurbishment's part-funder, the NFNPA facilitated links between local wood fuel supply and demand, also creating uses for previously unmanaged woodland.

3.2.4.2 Hyde Farm Climate Action Network

Hyde Farm Estate, located in Balham, south London, mainly consists of residential houses built between 1896 and 1916. The area was designated as a Conservation Area in 1996 and most of the 1,800 houses in the area are two-bedroom maisonettes or two to three bedroom houses of Edwardian character. A proportion of housing in the estate was originally allocated to injured war veterans. In 2007, a group of 3-4 Hyde Farm residents set up Hyde Farm Climate Action Network (CAN) (referred to as Hyde Farm), with a focus on energy and climate change issues. Most of the Hyde Farm area houses are built with single brick walls and single glazed sash windows. This has meant that the houses are draughty and hard to keep warm. Hyde Farm residents have organised regular activities, which have included for instance the installation of draught proofing and insulation measures, creating community gardens and developing renewable energy generation. Hyde Farm has received external support from programmes such as the Energy Conscious Households in Action (ECHO Action), run by the European Energy Programme, and the British Gas Green Streets programme.

3.2.5 Summary of case selection

In this thesis, there are effectively cases within two different contexts. On a higher level, the thesis analyses two different community energy niches, an established niche in the UK and an emerging niche in Finland. The development of actual community energy projects is analysed via four individual community energy projects. Figure 7 illustrates these:

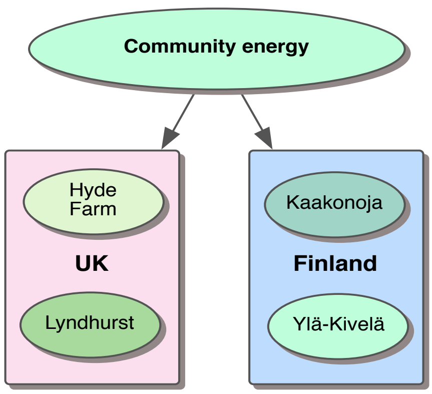

Figure 7: Cases within two different contexts

Lewis notes that "*In practice, case study analysis can become very complex*" (Lewis, 2012, p.52), as cases are analysed "*with comparisons made between different actors within a single case, between cases, and between groups of participants across cases*" (Lewis, 2012, p.52). The main bulk of the analysis in the thesis focuses on the analysis of the individual community energy projects in the two countries, and whether there are common themes that emerge from their development despite the different contexts.

3.3 Data collection and methods of data analysis

The case study analysis is supported by a literature review and empirical data collection from the community energy projects in Finland and the UK. The following sections discuss the relevant literature and documents reviewed for the thesis, as well as the way empirical data collection was designed and undertaken.

3.3.1 Literature review: The use of secondary data

A widespread *literature review* was used to inform the thesis on key issues related to the topic. Secondary data from existing sources can be useful in several ways, as it allows the use of previous research and documentation material and avoids duplication of previous data (Yin, 2009). The following four strands of literature were particularly of relevance for this thesis:

1) Academic and policy literature on community energy (Journals such as Energy Policy, Journal of Environmental Policy & Planning and Environmental Politics, books and book chapters)
2) Academic literature on research methods, sustainability transitions and grassroots innovations (Journals such as Research Policy, Innovation, Technology Analysis & Strategic Management, books and book chapters)
3) Policy and governmental literature on energy policy and innovation policy in Finland and the UK (government reports, non-governmental organisations' reports, expert organisations' reports)
4) Documentation on community energy projects (media reports, community energy projects' websites and other organisations' websites).

The literature review was started in October 2010 and was used to review previous research on community energy in the two countries. Furthermore, previous academic literature was utilised for the development of the theoretical framework, selection of case studies and development of the methodology used in this DPhil. Previous academic literature also provided an understanding of key issues affecting community energy development in the UK and Finland. Initial searches for the literature review were conducted using specific key words, phrases and databases. The keywords were narrowed down in order to avoid some fairly general search terms such as 'renewable energy', which initially produced several hundreds of papers. For example, a search using the term 'community energy' produced 85 academic articles on Scopus and 34 on SpringerLink, while the term 'wind energy' produced 4289 academic articles on Scopus and 1139 on SpringerLink respectively (14.07.2011, note that some community energy articles may also contain wind energy and vice versa). Through sources such as the European Union (EU) and the International Energy Agency (IEA), there is comparable harmonised data available for Finland and the UK in areas such as energy statistics. Furthermore, secondary academic and government policy literature is widely available for both countries' energy policy. See Table 7 for a summary of literature searches.

Country	**UK**	**Finland**
Databases	• Scopus • Web of Science • Science Direct • IEA reports • EU reports • UK Government reports	• Scopus • Web of Science • Science Direct • IEA reports • EU reports • Finnish Government reports
Keywords "+ UK" **Keywords "+ Finland"**	• Community energy • Local sustainable energy • Grassroots innovation • Community solar energy installation • Biomass community energy	• Community energy • Local sustainable energy • Grassroots innovation • Community solar energy installation • Biomass community energy • Lähienergia • Energia paikallistasolla

Table 7: Literature searches for cases

The initial database searches were also supported by contact with other more experienced researchers. For instance, colleagues in SPRU and UEA suggested relevant reading on community energy literature and literature on transition theory. SPRU and UEA also organised a workshop on Grassroots Innovations in December 2010, for which a reading list of relevant theoretical papers were circulated. Furthermore, literature relevant to the Finnish context was identified with the help of Finnish researchers and further material was obtained during a research visit to the National Consumer Research Centre during August and September 2011. The main outcomes of the theoretical literature review were discussed in Chapter 2: Theoretical Framework. However, the literature relevant to this research is referred to throughout the thesis as appropriate and listed in the bibliography.

3.3.2 Empirical fieldwork: The collection of primary data

In order to answer the research question and analyse the processes linked to community energy projects and their relative niches in Finland and the UK, primary data was collected through interviews with key actors. These included interviews with the four community energy projects, as well as expert and intermediary organisations in both Finland and the UK. The following sections discuss in more detail the types of interviews used, how they were developed and what the interview and data collection processes entailed.

3.3.2.1 Semi-structured interviews

This thesis uses an in-depth case study design, involving four community energy projects in two different countries. In order to allow for flexibility within the data collection, but within some predefined boundaries to take into account the theoretical framing of the research, the research used semi-structured interviews as the main method of data collection. As Arthur and Nazroo note, there is some room for interpretation as how semi-structured interviews are defined, or even conducted:

> "There are different models of semi-structured interviewing, and terms are not necessarily used consistently, so that what some commentators describe as 'semi-structured' interviews may be described by others as unstructured or in-depth or, at the other end of the spectrum, open-ended survey interviews." (Arthur and Nazroo, 2012, p.111)

Arthur and Nazroo (2012) note that some researchers approach semi-structured interviews more flexibly, by for instance allowing changes to which order questions are asked, while others take a stricter view. Within this research, semi-structured interviews were defined and conducted within the following boundaries:

- Interviews that would allow a linkage between theoretical framing and empirical data collection

- Interviews that would cover certain key topics from each interview, while allowing for flexibility to explore other areas or new emerging ideas
- Interviews which would enable further probing of the interviewee as required, allowing the interviewer to reflect on each interview situation and obtain in-depth information.

The use of semi-structured interviews made the interview process and data collection iterative. This approach meant that key topics were covered by the interviews, while flexibility within these pre-defined boundaries allowed new ideas to be taken into consideration.

3.3.2.2 Identifying interviewees

The interviewees were selected from two tiers of community energy actors:

1) Actors who either have direct involvement in community energy project development in Finland and the UK, i.e. community energy practitioners
2) Actors who have an interest in community energy development and are located somewhere between actual community energy projects and government's policy makers, i.e. intermediaries such as research organisations, non-governmental organisations and energy agencies.

Potential interviewees were initially contacted by phone and e-mail, using a standard description to explain the aims and objectives of the research. Potential interviewees were also asked about their knowledge of existing community energy projects, or other/additional contacts that may be relevant to this study. The majority of people agreed to be interviewed, with three people declining due to time commitments and one person declining for no stated reason.

Interviews were used to identify key issues relating to community energy project development in Finland and the UK, especially to help answer the main research question and more specifically in relation to the three main theoretical themes: (1) local contextualisation, (2) negotiation and alignment and (3) transferable lessons. Furthermore, interviews with expert organisations were used to establish niche activities of aggregation and intermediation. Table 8 summarises the interviewees while the full list is available in Appendix C.

Interviewees	Finland	UK
Community energy practitioners	• 2-4 key informants of each community energy project	• 2-4 key informants of community energy projects
Organisations that directly helped community energy projects	• Pirkan Helmi, EU Leader agency	• New Forest National Park Authority (NFNPA) • Lambeth Council
Expert and intermediary organisations	• Finnish Environment Institute • Finnish Innovation Fund Sitra • Finnish Nature Conservation Society • Finnish Energy Efficiency Agency Motiva • National Consumer Research Council • Vaasa University • WWF • Think tank (anonymous) • Renewable energy project developer (anonymous)	• Centre for Sustainable Energy • Energy Saving Trust • Global Action Plan • Low Carbon Communities Network • Marches Energy Agency • New Forest National Park Authority • South East England Development Agency

Table 8: Key organisations identified for interviews

3.3.2.3 Conducting interviews

The interviews were conducted using a ‘topic guide’, a document that included details of the key topics around which to ask interview questions. Topic guides, when designed well, can help with direction of research, aid the systematic collection of data and ensure consistency between different interviews (Arthur and Nazroo, 2012). A topic guide was designed to reflect the theoretical framing and key objectives of the study. A different topic guide was designed for each type of interview - e.g. a different topic guide for community energy practitioners and another for expert/intermediary organisations (a topic guide example is included in Appendix E). The topic guides were also designed to be flexible, allowing the researcher to reflect on interviews and adjust the topic guide if required. Interview questions were then designed for each topic, keeping the following key theoretical themes in mind: local contextualisation, negotiation and engagement and transferable lessons.

Before fieldwork and interviewing commenced, an Ethical Review process was conducted as per requirements of the University of Sussex[7]. The Ethical Review included details of interviewee recruitment materials, interview topic guides, interview consent forms and a letter of invitation for a research visit from the NCRC. Table 9 below outlines the main topics covered in the interviews.

[7] Full details of University of Sussex ethical review guidelines is available at http://www.sussex.ac.uk/res/1-6-12-3.html

Topic	Research question	Example questions	Theoretical theme
Motivations	Why do community energy projects develop?	What motivated the project? E.g. money, energy saving, climate change, interest in technology, getting together with others, dealing with a problem etc.	Local contextualisation
Expectations	Why do community energy projects develop?	What did the participants expect from the project?	Local contextualisation
Vision	Why do community energy projects develop?	What were the project's aims and objectives? What did the project want to achieve?	Local contextualisation
Organisation	How do community energy projects develop?	How was the projects organised? What was the project team like, e.g. did it have a clear team and leader? Did they have regular meetings etc.?	Negotiation and engagement
Capabilities	How do community energy projects develop?	Did the group have existing knowledge and resource base, e.g. knowledge of technology, funding sources, how to develop projects etc.	Local contextualisation, negotiation and engagement
Funding	How do community energy projects develop?	Funding sources, how much, from where, how easy was it to obtain, was it crucial to the project, etc.	Negotiation and engagement
Learning	How do community energy projects develop?	Evidence of learning, what type and from where, e.g. internet, publications, other groups, organisations	Negotiation and engagement, transferable lessons, aggregation
Networking	How do community energy projects contribute to niche development?	Did the project network with other community energy projects, experts, intermediary organisations	Transferable lessons, aggregation, niche evidence
Diffusion	How do community energy projects contribute to niche development?	Awareness of other projects, have they spread and how, community energy in energy policy etc.	Transferable lessons, aggregation, niche evidence
Niche establishment	How do community energy projects contribute to niche development?	Networks, publications, conferences etc.	Transferable lessons, aggregation, intermediation

Table 9: Interview themes

A total of 33 semi-structured interviews were conducted during the research and in addition transcripts from ten interviews conducted by the CISE team were used as secondary data. Interviewees were given an Information Sheet to read before agreeing to the interview and were asked to sign a Consent Form. In accordance to the University of Sussex's research ethics guidance, interviewees were given the opportunity to stay anonymous if they so wished. Three interviewees chose to stay anonymous.

The majority of fieldwork in Finland was undertaken during August and September 2011 and June 2012. The UK fieldwork took place in April 2012 and October 2012, and benefited from the experience gained during the Finnish fieldwork, especially in terms of interview questions. Most interviews were conducted face-to-face (n=28). Even though face-to-face interviews were a preferred method, some interviewees were not able to commit to a face-to-face interview either due to time commitments or geographical reasons. In these cases interviews were conducted over the telephone (n=5). The researcher is fluent in Finnish and in English, so interviews were conducted in Finnish in Finland and in English in the UK. All, apart from one[8], interviews were recorded using a digital recorder. Telephone interviews were conducted using Skype and digitally recorded. Interviews lasted an average of 1 hour, with the shortest interview being 32 minutes and the longest 1 hour 50 minutes. The total recorded interview time for the 33 interviews was 27 hours 42 minutes. All interview materials were transcribed either by the researcher or by external organisations. UK interviews were transcribed by APA Secretarial and Finland interviews by Tutkimustie Oy. Table 10 shows the summary of interviewees.

[8] This person did not want the interview to be voice recorded, so the interview was recorded by hand.

Finland	Number of interviews	Types of interviews
Kaakonoja	8	5 practitioners (4 + 1 follow up interview) 3 intermediaries
Ylä-Kivelä	7	6 practitioners (5 + 1 follow up interview) 1 intermediary
Intermediaries	12	Other expert organisations
UK		
Hyde Farm	3	2 practitioners 1 intermediary
Lyndhurst	3	2 practitioners 1 intermediary
CISE project intermediary transcripts	10	These organisations were interviewed by the CISE project team and transcripts from those interviews were used as a secondary data resource

Table 10: Summary of interviews undertaken

3.3.3 Methods of data analysis

Interview data collected during this DPhil were analysed using a method of coding and establishing common themes across the community energy cases (Spencer et al., 2012). Interviews were analysed in the following steps:

- Interview transcripts were read and initial emerging themes were identified
- These themes were arranged as meta codes, which formed the main frame for the analysis (data was arranged using qualitative data analysis software Dedoose)
- Interview transcripts were coded using the list of meta codes
- The coding process was iterative and sub-codes were added as they emerged (see also Figure 8[9])

Once all the interviews were coded, the transcripts were checked against each other, in order to ensure validity of coding across all the interview data.

[9] Please note that for illustration purposes the codes are in line, however, that does not mean that one code automatically follows another code or is directly linked to it.

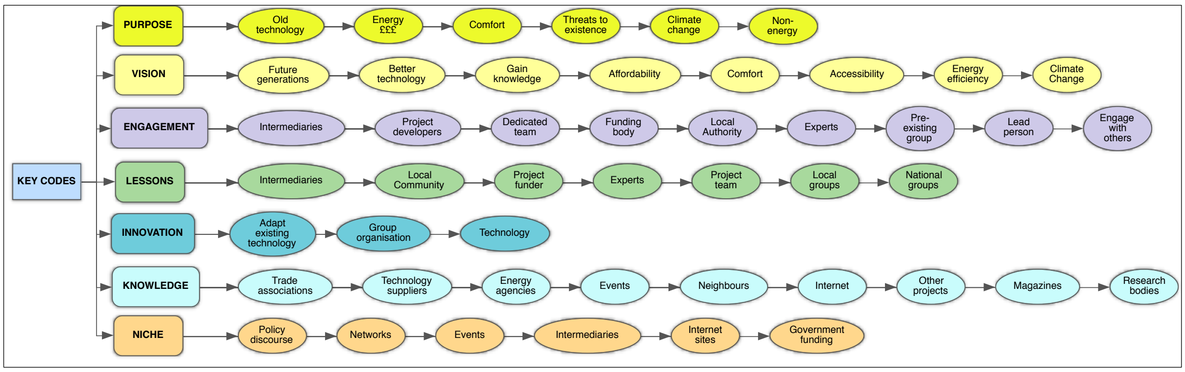

Figure 8: Key codes used to aid the analysis

3.4 Operationalising the main concepts of the theoretical framework

This section discusses how the three key processes linked to niche development were analysed in this thesis. The analysis was conducted in three different phases with two different datasets and aided the empirical analysis of the UK and Finland cases (Chapters 4 and 5). The units of analysis, community energy projects, were analysed regarding how they are developed, what learning is involved, how projects network and share their learning, while still being connected and affected by the main energy regime. The data from the community energy projects were analysed in relation to the three key niche processes. First, the local contextualisation of each community energy project was identified. Second, processes linked to negotiation and alignment of expectations within each project were analysed. Third, potential transferable lessons from each community energy project were identified. The second data set, interview material with expert organisations was analysed in relation to what a potential community energy niche may look like in both countries, especially whether there is evidence of aggregation, the dedicated collection of knowledge, and intermediation, the establishment of intermediary actors.

3.4.1 Local contextualisation

Local context is key to niche innovations such as community energy projects, as local contexts shape how niche innovations develop (Raven et al., 2008). Local contextualisation can be identified and empirically analysed by the following key processes of motivations, expectations and project vision. Each project is likely to have differing *motivations* according to its local context and the type of people that are involved. Motivations for community energy projects can range, for example, from the requirement to save energy, save money, preserve communities or get involved with like-minded people (Seyfang et al., 2013b). Niche literature states that voicing *expectations* is important for projects operating in niches, especially in terms of attracting potential external support from funding and intermediary organisations (Raven and Geels, 2010). Initial expectations can be analysed empirically by identifying for example the project's external funding processes and the project's outcomes (Raven and Geels, 2010). Following on from initial expectations, Raven et al. (2008) use a wider concept of '*project vision'.* This is important for the project's success in terms of what project participants want to achieve and how they may proceed with the project. This can include for example the creation of clear project plans, objectives and aims. Furthermore, the projects were analysed in relation to how much existing knowledge they utilised and adapted that to their local context. This could be for instance using some of the pre-existing skills that the community energy groups had.

3.4.2 Negotiation and engagement

Negotiation and engagement includes participation and how project's expectations are negotiated and adjusted according to the local context (Raven et al., 2008). It also involves issues such as engagement at the project level. The analysis of negotiation and engagement includes processes such as the project's organisation, meetings and day-to-day running, as well as communication with the project participants. People who were involved in the project, are likely to have different roles and potential influence, including leadership and (other) power relations (Raven et al., 2008). Other activities include the impact of external factors such as relationships with funding organisations and dealing with planning laws and other regulations. Furthermore, project delivery and its actual implementation may change the initial expectations during the process (Raven et al., 2008).

3.4.3 Transferable lessons

Transferable lessons from niche innovations are those which can be collected from local projects and translated to global niche level rules (Geels and Deuten, 2006, Raven et al., 2008). In this research interview data was used to analyse the evidence of the formation of global niche level rules, including evidence of networking, aggregated knowledge and intermediation. Networking includes any evidence of projects interacting with other projects and organisations by, for example, sharing information with them, organising events, visiting others and taking part in internet discussion boards. Aggregated knowledge from these activities includes knowledge that is usually collected by intermediary organisations and translated to general guidance for community energy project development, including publications, internet sites, organised workshops and conferences dedicated to community energy development (Geels and Deuten, 2006, Raven et al., 2008). See also Table 11 below.

Process	Key dimensions	Example activity
Local contextualisation	a) Vision of the project b) Expectations c) Local context	a) Reduce heating bills b) Geographical and cultural location of a project
Negotiation and engagement	a) Participation b) Negotiation of expectations c) Engagement	a) Project meeting b) Adjust project plan in a changing policy context c) Organise visits to other sites
Transferable lessons	a) Lessons from local projects to global niche level	a) Technology guidebooks, funding guidelines, networking advice

Table 11: Summary of processes linked to niche development (this first appeared in section 2.4.5.3)

3.4.4 Cross-country analysis

The analysis presented in this thesis will contribute to the SNM literature by testing the theoretical framework developed in Chapter 2 in the empirical domain of community energy in the two different contexts of Finland and the UK. Comparing the development of community energy in the UK (where several thousand projects have taken off the ground), with the Finnish context (where there are not many citizen-led projects)[10] will allow the comparison of two different niche phases. Hypothetically it could be assumed that the community energy niche in Finland is still at the start of the niche development, in the local or inter-local phase, while its emergence is more evident in the UK (see Figure 2, in section 2.4). Given the increased interest and activity in community energy in the UK, the UK makes an interesting place to study community energy in. However, community energy in the UK has not reached the global phase or even much impacted on the UK's energy regime yet. In Finland, on the other hand, it could be argued that community energy niche is only starting to develop. Some early pioneering projects have been established and researchers are starting to get interested in the field (Vehviläinen et al., 2010). In the Finnish context, there is much less academic analysis available on community energy in secondary literature. However, through initial communication with Finnish energy researchers at organisations such as the NCRC, Vaasa University and Sitra, it is evident that community energy projects are being developed even though niche-building phenomena such as networks, standard practices and conferences remain limited.

Both UK and Finland use a mix of electricity generating technologies including fossil fuels, nuclear power and renewable energy generation (see also Appendix A and B), but they differ in institutional structures in a sense that the UK's socio-technical energy system is largely dominated by centralised actors with six large energy companies dominating the electricity market. Finland, on the other hand, has a more decentralised system compared to the UK, with municipal actors who have both large and medium scale generation. What is common to both countries is that they use a mix of electricity generation sources, are either building (Finland) or considering to build (UK) new nuclear plants and are obliged to increase their share of renewable energy generation under EU policy. By 2020, Finland is expected to increase its share of renewable energy generation to 38% (compared to

[10] Personal communication with Finnish researchers in 2011 identified less than 20 truly citizen-led projects. However, as there is limited amount of research available in this sector in Finland, the total number of actual projects is difficult to estimate.

30.5% in 2008) and the UK to 15% (compared to 2.2% in 2008) as per EU targets[11] (EU, 2012). However, despite the interest in large conventional energy projects, there also remains an interest in low carbon, local renewable energy projects in both the UK and Finland. Both countries have set this objective in their national low carbon strategies. The UK's Low Carbon Transition Plan (HM Government, 2009) clearly states that communities have an important part to play in creating innovation and contributing to low carbon society. There are several references to this throughout the strategy document, starting from the beginning: "*everyone has a role to play in tackling climate change, from reducing their own emissions to planning for adaptation*" (HM Government, 2009, 2nd page of document, not numbered), to a full section on how communities can play a part not only in living sustainably, but also in creating low carbon innovation:

> "Helping communities to take action is an integral part of the Government's strategy. We often achieve more acting together than as individuals. The role of the Government should be to create an environment where the innovation and ideas of communities can flourish, and people feel supported in making informed choices, so that living greener lives becomes easy and the norm." (HM Government, 2009, p.92)

The UK's Low Carbon Transition Plan in relation to the role of communities was further strengthened by the publication of the Community Energy Strategy in 2014 (DECC, 2014a). In Finland's Climate Change and Energy Strategy 2008 (TEM, 2008), on the other hand, there is no mention to the role of communities as such, with the only reference being that "*citizens should be encouraged to take voluntary action to improve the energy efficiency of existing housing stock*" (TEM, 2008, p.65, translated from Finnish). Notably, a later National Energy and Climate Strategy 2013 (TEM, 2013a), published after the data collection of this DPhil research, makes some notions to supporting more local, smaller scale, renewable energy generation and taking into consideration local innovations in national and municipal level energy policy (TEM, 2013a). However, neither the 2008 nor the 2013 Finnish strategies mention the role of communities as explicitly as the UK's plan.

[11] These figures are based on EU definition as share of renewable energy in final energy consumption, which includes renewable fuels usage and renewable electricity and heat production. Final energy consumption is energy used by industry, households, services, agriculture and transport.

Analysing the development of community energy projects in two different types of contexts, with different types of community energy niche phases, will enable the research to identify whether there are potential similarities or differences across the four community energy projects. Following a literal and theoretical replication logic, the cases will either predict similar results (a literal replication) or predict contrasting results but for anticipatable reasons (a theoretical replication) (Yin, 2009). In this thesis, a literal replication could show that the four community energy cases have similarities for example in their project development, while a theoretical replication logic could show that there are differences between the cases due to the two different contexts that the community energy projects were developed in. The theoretical framework developed in Chapter 2 suggests that in the trans-local and global niche phase, intermediary actors play an increasingly important role in providing information, networking opportunities and general global niche level guidance that local projects can access (Geels and Deuten, 2006, Raven et al., 2008). This thesis tests this framework by analysing whether it was somehow 'easier' for the UK projects to be developed than the Finnish ones, given that there is a more prominent community energy niche in the UK with more active intermediary organisations, networks and information available than in Finland. This is analysed especially through identifying the motivations of community energy projects, what information and support resources were available for projects, the level of networking involved and any evidence of shared learning, or learning from other actors such as intermediary organisations.

3.5 Conclusions

This DPhil thesis uses a method of case study approach for answering the research question of *Why and how do community energy projects develop and how do they contribute to niche development?* The chosen methodology enables the analysis of local community energy projects, in two different country contexts of Finland and the UK. Case studies offer the opportunity to investigate a certain phenomenon in real life context, providing a useful methodology for the analysis of local community energy projects. The development of four community energy projects, which are located in two different country contexts, are analysed in relation to their local contextualisation, the way they act on their initial motives and expectations, and whether these projects produce any general lessons that could be translated and transferred to the global niche level. This DPhil research is interested in the emergence of potential similarities and differences of the processes linked to the development of the community energy projects, in the two different contexts of the UK and Finland.

CHAPTER 4. UK Case Studies

4.1 Introduction

This chapter introduces the UK context and includes analysis of the two community energy projects, Lyndhurst Community Centre and Hyde Farm Climate Action Network. It starts with the outline and discussion of the UK context for community energy, including the relevant policy instruments that were in place during the data collection of this DPhil. The community energy projects of Hyde Farm and Lyndhurst are analysed and discussed in relation to the processes involved in the development of those projects, and whether learning was shared from those projects to other actors and the wider community energy niche.

4.2 Community energy in the UK

The interest in community energy in the UK has grown in recent years, from the general public, researchers and policy makers alike. Community energy, however, is not a new phenomenon in the UK, as documented in a review of the UK's alternative technology movement, for instance by Smith (2005). Rooted in the 1970s movement towards developing alternatives to fossil fuel and nuclear energy, small-scale sustainable energy projects emerged outside the main energy systems (Smith, 2005). In the past ten years, variable amounts of support from grant programmes and government policy measures have supported community energy projects (Walker et al., 2007). The potential for community, and local, energy has featured in the UK energy policy discourse since the 2003 Energy White Paper (Walker et al., 2007), culminating in the publication of the UK's first Community Energy Strategy[12] in January 2014 (DECC, 2014a). Four years prior, in 2010, DECC (DECC, 2014c) launched a web-portal specifically for community energy action

[12] The Community Energy Strategy was published after the data collection of this DPhil research, therefore the most relevant policy support measures for this thesis are those that were in place between 2010 and 2012. Nevertheless, the publication of the Community Energy Strategy is an important milestone for the UK's community energy field, providing further direction for the sector.

and in 2014, estimated that there are over 5,000 community groups involved in sustainable energy activities in the UK (DECC, 2014a). Furthermore, the UK government launched its ‘Big Society’ rhetoric in 2010, with a view that citizens and communities can work together with government to build a better Britain:

> “We want to give citizens, communities and local government the power and information they need to come together, solve the problems they face and build the Britain they want. We want society – the families, networks, neighbourhoods and communities that form the fabric of so much of our everyday lives – to be bigger and stronger than ever before. Only when people and communities are given more power and take more responsibility can we achieve fairness and opportunity for all.” (Cabinet Office, 2010, p. n/a)

Actions such as volunteering, and citizens and communities providing local services such as libraries and community centres that may otherwise be threatened with closure (Cabinet Office, 2010), do on one hand provide people the opportunity to become active citizens (Kisby, 2010). However, it can also seem that the Big Society rhetoric is a justification by government to cut public spending at a time of global financial crisis (Kisby, 2010). Nonetheless, communities interested in running their own services, for example by developing a community energy project, may still need a supportive government to enable citizens to become active:

> “You have got a government that is extremely focused on creating a small state and actually what a lot of people are after within the [community energy] sector is inherently big state stuff – the state providing support to small enterprises.” (UK1, 2011)

Community energy activity in the UK has been supported by the government since 2000 via various grant programmes (Walker et al., 2007), such as the Community Renewables Initiative (CRI), Community Energy Saving Programme (CESP) and the Energy Saving Trust’s Green Communities Funding Database. Furthermore, DECC launched the Low Carbon Communities Challenge (LCCC) programme and a web-portal specifically for community energy action in 2010 (DECC, 2014c). Despite a recent surge in interest and activity in community energy development in the UK, community energy as an academic research area is still relatively new in the UK.

Previous research has shown that community energy development in the UK faces challenges, especially in relation to funding and legal issues (Walker, 2008). The UK planning system, associated costs and administrative processes have caused their own hurdles (Walker, 2008). Furthermore, many projects have limited resources as they often rely on volunteer time and people's goodwill to get going (Seyfang et al., 2013b). Despite these barriers, several projects do succeed and also influence others in their success by networking and sharing their experience (Seyfang et al., 2013b).

4.2.1.1 Motives for community energy development

Community energy projects can be developed for various reasons. This was highlighted for example in a survey of 190 UK community energy projects by Seyfang et al. (2013b). The survey identified that motives include economic, environmental, social, political and infrastructural reasons (Seyfang et al., 2013b). Furthermore, each project analysed for the survey had an average of eight objectives, ranging from the desire to save money on energy bills (economic), to reducing emissions (environmental), preserving local communities (social) and influencing energy policy (political) (Seyfang et al., 2013b). The different motives for community energy projects in the UK are illustrated in Figure 9 below:

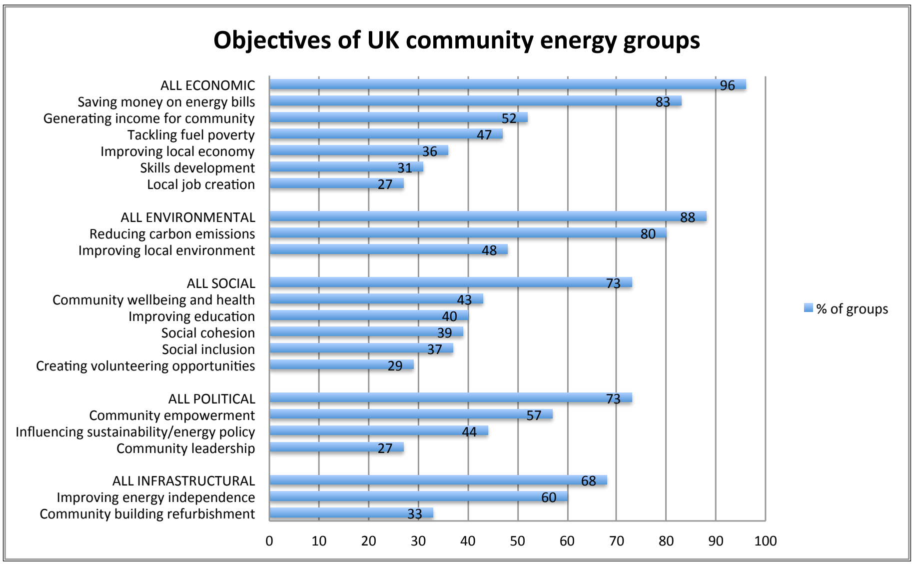

Figure 9: Objectives of community energy projects (Seyfang et al., 2013b, p.982)

One large motivator for community energy action has been the steady rise in gas and electricity prices in the UK (Seyfang et al., 2013b), and the costs related to services such as heating and lighting. Despite the global economic downturn in 2008 and its impact on reduced consumer spending, fossil fuel prices have kept their hold (IEA, 2012). In 2012, the average annual UK household energy bill was £800 for gas and £479 for electricity (DECC, 2013a)[13]. Data from DECC show that domestic electricity prices rose by 5.7% between 2012 (quarter 2) and 2013 (quarter 2), whilst domestic gas prices rose by 6.4% in that same time frame (DECC, 2014b). Figure 10 illustrates the trend in average domestic gas and electricity prices in the UK between the years of 2000 and 2012.

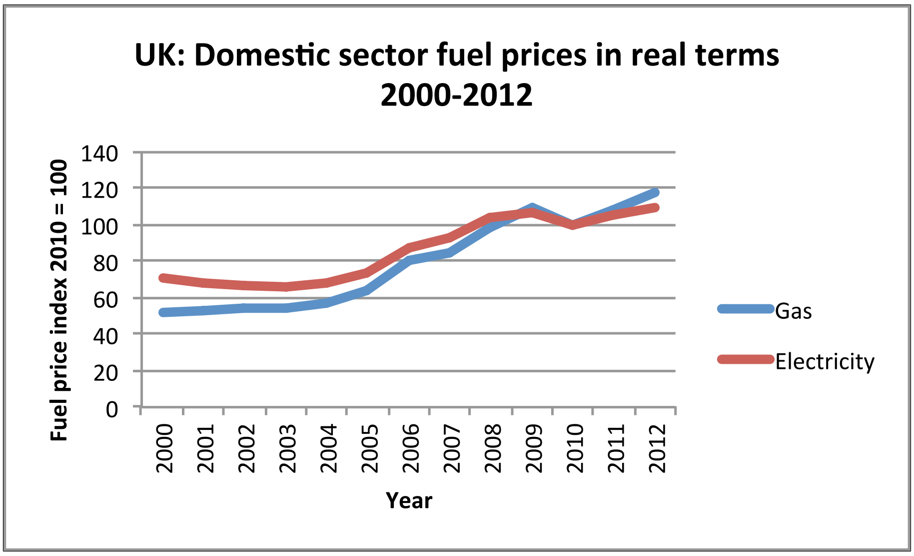

Figure 10: Trends in UK gas and electricity prices (DECC, 2014b)

A survey of British households conducted for the BBC in September 2013 found that 73% of respondents thought that the price of energy in the UK is unreasonable (ComRes, 2013). 63% of respondents had cut their energy use because of rising energy bills, whilst 38% of respondents were concerned over how they would pay their heating bills during the winter months (ComRes, 2013). As 74% of domestic gas consumption is used for space heating (DECC, 2013a), cold winters and rising prices have a substantial effect on

[13] Prices are calculated based on the following annual household usage: 3,300 KWh for electricity and 18,000 KWh for gas.

households' budgets. In 2010, around 4.75 million UK households lived in fuel poverty, i.e. they had to spend more than 10% of their income on energy services including fuel for heating, hot water, cooking, lighting and use of appliances (Palmer and Cooper, 2012).

In terms of the UK's wider energy system, many community energy projects operate in residential areas, addressing the heat or electricity consumption of either residential or public buildings (such as making energy efficiency measures in households or refurbishing community buildings) (Seyfang et al., 2013b). Hence, the energy data that are most relevant to this study are residential and public usage, rather than industrial use. There are around 27.3 million houses in the UK, of which two thirds are expected to be standing in 2050 (Palmer and Cooper, 2012). The UK's housing stock is relatively old and inefficient, with around 50% of housing stock built before 1965 and only about 10% of homes built post 1990 (Palmer and Cooper, 2012). Approximately 13% of the UK's total GHG emissions comes from gas and electricity consumption from the residential sector (HM Government, 2009). As indicated by the survey of Seyfang et al. (2013b), 80% of community energy groups mentioned the reduction of carbon emissions as one of their motives.

4.2.2 Creating a sustainable and low carbon energy system in the UK

The UK government has developed several policy measures and initiatives to decarbonise the country's energy system. Under EU commitments, the UK is required to increase renewable energy to 15% in final energy consumption by 2020 (EC, 2009). The EU reported in 2013, that the UK's interim 1st target of renewables was 4% in 2011/2012 (EC, 2013), indicating that the country still has a long way to go to reach the full 15% target by 2020. The UK has set ambitious GHG reduction targets, and as mentioned before, was the first country to introduce a legally binding climate change target. Under the Climate Change Act 2008, the UK has an obligation to reduce greenhouse gas emissions by 34% by 2020 and at least 80% (from 1990 baseline level) by 2050 (DECC, 2013d). Figure 11 below shows the trend in UK's GHG emissions between 2009 and 2013.

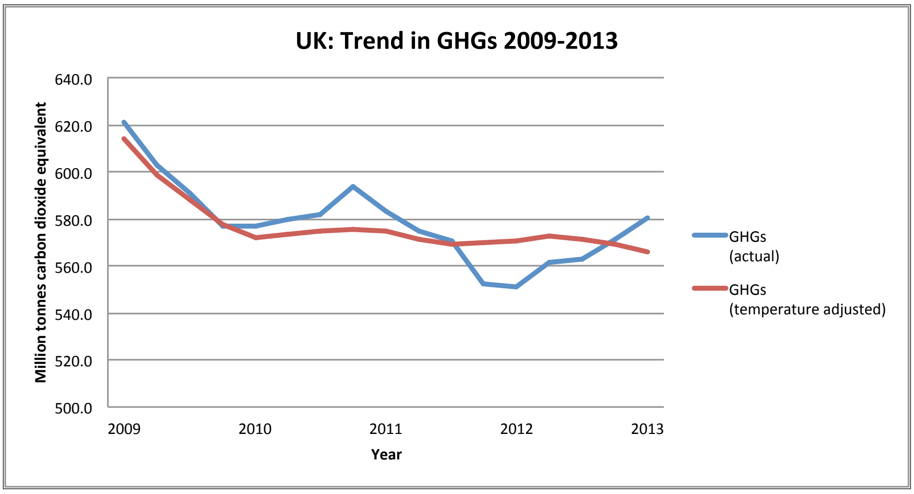

Figure 11: UK greenhouse gas emissions from Q1 2009 to Q1 2013 (DECC, 2013f)

In order to meet the 2050 target, the UK government has proposed a mixture of measures which are outlined in the document *Reducing the UK's greenhouse gas emissions by 80% by 2050*, published in June 2013 (DECC, 2013d). Measures and actions under the policy include for instance energy efficiency measures in household, industry, business, public, transport and the agricultural sectors (DECC, 2013d). It also includes Electricity Market Reform (EMR), which sets several measures for the electricity sector to secure an affordable and low carbon energy future for the UK (DECC, 2013d), including nuclear, renewables and carbon capture and storage (CCS) (DECC, 2013d). DECC has also inidicated the provision of over £200 million of funding for low carbon technology innovation between 2011 and 2015 (DECC, 2013d). Furthermore, a separate heat strategy, *The Future of Heating: Meeting the Challenge*, outlines a framework for the UK low carbon heat sector by 2050 (DECC, 2013b).

In terms of specific measures to support community energy projects, the UK government, industry and non-governmental organisations have run several funding programmes over the last ten years. The most relevant incentives in relation to this DPhil thesis have been those measures that were in place between 2010 and 2012, which is the period of data collection of this research. However, this thesis also briefly introduces some of the other incentives that have been important for community energy development in the UK.

4.2.2.1 Government support for community energy pre-2010

Research in 2008 identified that over 60 programmes had supported community energy projects in the UK, by providing grants, information and advice (Adams and Berry, 2008). It is not possible to introduce all the measures in the scope of this DPhil thesis, however, the thesis provides a snapshot of those government programmes that have been identified by previous research to have been the most prominent. Walker et al. (2007) provide a summary of the earlier UK government programmes launched to support community energy.

The first programme, *Community Action for Energy (CAfE)*, was launched in 2002 and funded by the Department for Environment Food and Rural Affairs (DEFRA) with an aim to work with existing community networks and provide them with advice, support and further networking opportunities (Walker et al., 2007). CAfE was re-launched as *Green Communities* in 2009 (CSE, 2009). Green Communities was managed by the Centre for Sustainable Energy (CSE) on behalf of the Energy Saving Trust, and by 2011, when its funding ended, the network had grown to 6,500 members (CSE, 2014). The Green Communities programme included a network of community energy actors, including both practitioners and intermediaries, and the programme offered advice, information tools, events and training (CSE, 2014).

Another early programme was the *Community Renewables Initiative (CRI)*, launched in 2002 by the Countryside Agency and funded by the then Department for Trade and Industry (DTI) (Walker et al., 2007), now the Department for Business, Innovation & Skills (BIS). CRI had local teams in ten different locations across England, providing free advice and support for community energy projects in the form of information toolkits, expertise and networking opportunities (Walker et al., 2007). *Clear Skies* was launched by DTI in 2003 and it provided grants for small-scale renewable energy generation. The Clear Skies programme was replaced in 2006 by the *Low Carbon Buildings Programme (LCBP)*, which had two different energy efficiency and renewable energy funding streams, one for the domestic sector and the other for the public and charitable sector (BRE, 2014) The LCBP provided around £131 million in grants for around 20,000 projects (BRE, 2014) and it was subsequently replaced by the introduction of the *Feed-in-Tariff (FIT)* in 2010. So the early government grant schemes for community energy were stop-start in nature, with several programmes ending and changing over the years. See Table 12 for a summary.

Measure	Funding for	Time period	Total £££	Technologies
Community Action for Energy (CAfE) / Green Communities	Advice, information, training and support	2002-2011	Total funding n/a	Energy efficiency with related renewable energy technologies
Community Renewables Initiative (CRI)	Support and project development	2002- 2007	Total funding n/a	Solar roofs, biomass and wood heat schemes, farm waste schemes, wind turbines
Clear Skies	Capital funding	2003-2006	£12.5 million	Solar thermal, wind turbines, micro/small scale hydro turbines, ground source heat pumps, room heaters/stoves with automated wood pellet feed, wood fuelled boiler systems
Low Carbon Buildings Programme (LCBP)	Replaced Clear Skies	2006-2010	£131 million	Solar thermal, solar photovoltaics, wind turbines, small scale hydro turbines, ground and air source heat pumps, wood fuelled boilers or pellet boilers

Table 12: Community energy funding programmes in the UK pre-2010 (based on BRE, 2014, CSE, 2009, CSE, 2014, Walker et al., 2007)

4.2.2.2 Government support for community energy post-2010

Measures since 2010 introduced by the UK government to support community energy include most prominently the *Feed-in-Tariff (FIT)*, *Renewable Heat Incentive (RHI)* and the *Green Deal Communities.* Furthermore, between 2010 and 2012, DECC ran a *Low Carbon Communities Challenge (LCCC)*, a two-year, £10 million programme which provided funding and advice for 22 communities across the UK (DECC, 2012). The LCCC "*focused on established organisations with a track record of taking action on energy and low carbon issues on a community scale*" (DECC, 2012, p.2), with an aim to facilitate carbon emission reductions, provide free advice, encourage local engagement and promote activities linked to behavioural change (DECC, 2012). Another programme, the *Local Energy Assessment Fund (LEAF)*, provided a total of £10 million between 2011 and 2012 to community energy projects for the installation of energy efficiency and renewable energy technologies (DECC, 2011).

The FIT was introduced in the UK in April 2010 and it supports small-scale low carbon electricity generation by individuals, communities, organisations and businesses. Small-scale is defined as less than 5 megawatts (MW)[14] of installed capacity, including technologies such as solar PV, wind, hydro, micro combined heat and power (CHP) and anaerobic digestion (DECC, 2013c). The introduction of the FIT scheme in the UK has been somewhat cumbersome, with the level of FIT payments changed by the government. For example the level of support for an up to 4 kilowatt (kW) solar installation on an existing building was reduced from its initial starting level of 46.81 pence/kilowatt hour (p/kWh) in 2010 to 21.65 p/kWh in 2012 (Ofgem, 2013a). The changes in the FIT payments understandably caused frustration amongst those planning on installing FIT eligible technologies (Seyfang et al., 2013b), as their business plans were forced to change resulting in several projects being put on hold due to the cuts (Muhammad-Sukki et al., 2013). Furthermore, a coalition of solar companies took legal action against the

[14] The UK government is consulting during 2014 of raising the limit to 10MW for community groups (DECC. 2014c).

government in 2011 after FIT cuts were announced for December 2011, before an official consultation was due to end. The companies also argued for lost income (Clark, 2011). The UK High Court ruled that the government had acted illegally by implementing the FIT cuts before the end of an official consultation period and even after legal appeals by the government, a decision was made by the Supreme Court that new FIT rates could not come into effect until 1st April 2012 (Muhammad-Sukki et al., 2013), meaning that the government could not impose the cuts in December 2011 as it had initially planned to do. However, despite the issues linked to the level of FIT payments, it is nevertheless an important policy measure in the UK especially for community energy projects. It has also meant that community groups "*have to adopt more business-like models, whereby they generate investment capital from sources other than grants*" (Hargreaves et al., 2013).

The *Renewable Heat Incentive (RHI)* is aimed at supporting communities and organisations to install renewable heat technologies such as biomass, ground and water source heat pumps, geothermal, solar thermal, biomethane and biogas heating (DECC, 2014c). RHI provides revenue support for renewable heat for 20 years (DECC, 2014c). At the time of finalising this DPhil thesis, the RHI was also being extended to benefit householders from April 2014 onwards and it provides long-term financial support for renewable heat technologies such as heat pumps, biomass boilers and solar thermal panels (DECC, 2014d). The *Green Deal*, meanwhile, is the government's main programme for addressing energy efficiency improvements, guaranteeing loans to households for energy efficiency measures. The *Green Deal Communities* scheme provides a total of £88 million funding to local authorities to work with community groups (DECC, 2014c). However, the initial uptake of the Green Deal by households has been slow and some commentators have criticised that taking loans out at commercial rates to install energy efficiency measures is not an attractive incentive, even though the energy savings should cover costs over a 25-year period (Harvey, 2014). Other measures include the *Rural Community Energy Fund (RCEF)*, which is aimed at rural communities and provides a total of £15 million to help renewable energy project development from feasibility studies to planning application stage (DECC, 2014c). At the time of writing this DPhil, DECC had also announced that an *Urban Communities Energy Fund* (UCEF) was going to be launched during 2014, a programme of £10 million to support renewable energy project development from feasibility studies to planning application stage in urban areas (DECC, 2014c). Table 13 summarises the measures post-2010:

Measure	Funding for	Time period	Total £££	Technologies
Feed-in-Tariff (FIT)	Low carbon electricity up to 5MW	2010 ->	Ongoing	Solar PV panels, wind turbines, water turbines, anaerobic digestion (biogas energy) and micro combined heat and power (micro-CHP)
Low Carbon Communities Challenge (LCCC)	Community energy action	2010-2012	£10 million	Energy efficiency and renewable energy
Local Energy Assessment Fund (LEAF)	Energy efficiency and renewable energy	2011-2012	£10 million	Energy efficiency measures and renewable energy generation
Renewable Heat Incentive (RHI)	Renewable heat	2011 ->	Ongoing	Biomass, heat pumps (ground source and water source), geothermal, solar thermal collectors, biomethane and biogas
Green Deal Communities	Energy efficiency	2013 ->	£88 million	Insulation, heating, draught proofing, double glazing, renewable energy generation – e.g. solar panels or heat pumps
Rural Community Energy Fund (RCEF)	Project development from feasibility to planning	2013 ->	£15 million	Wind, solar, biomass, heat pumps, anaerobic digestion, gas combined heat and power (CHP) and hydro
Urban Communities Energy Fund (UCEF)	Project development from feasibility to planning	2014 ->	£10 million	Wind, solar, biomass, heat pumps, anaerobic digestion, gas combined heat and power (CHP) and hydro

Table 13: Community energy funding programmes in the UK post-2010 (DECC, 2011, DECC, 2012, DECC, 2014c)

In addition to the various funding programmes and measures introduced by the UK government, there has also been a range of support for community energy in the UK from other organisations such as non-governmental organisations, businesses and local authorities. Examples of these include energy utility SSE's Community Funds (SSE, 2014), the National Lottery's Big Lottery Fund (Big Lottery, 2014) and the Co-operative group's community funds (Co-op, 2014). However, it is not within the remit of this DPhil to go through all the programmes. Instead, the next section will discuss the UK's community energy niche in terms of the kind of supporting networks and organisations that were active during the data collection of this DPhil.

4.2.2.3 Organisations and networks supporting community energy in the UK

Several national and local intermediary organisations have supported community energy projects in the UK, especially over the last ten years. Hargreaves et al. have identified three 'waves' of the emergence of community energy intermediaries in the UK (Hargreaves et al., 2013). From the 1970s onwards, the alternative technology movement included actors such as the Centre of Alternative Technology (CAT) (Hargreaves et al., 2013). From 1990/early 2000s onwards, the Energy Saving Trust and more regional energy agencies became involved in community energy, while more professional organisations and consultants, as well as networks such as the Low Carbon Communities Network (LCCN) entered the sector from 2010 onwards (Hargreaves et al., 2013).

The LCCN was set up "*to link, network and support the rapidly growing movement of climate change groups that are forming at a local and community level*" (LCCN, 2014, p. n/a). LCCN works with other networks[15] and is a member of the Communities and Climate Action Alliance (CCAA). CCAA was set up in 2010 and consists of networks working in the area of community energy (UK1, 2011). Its set up was driven by the need for a more

[15] This thesis is not aiming to uncover all of the many networks working in the community energy sector in the UK. Instead it focuses on those networks mentioned by the UK intermediary organisations interviewed for the CISE project during 2011 (and the transcript of which this DPhil thesis is using as a secondary data source).

coherent voice for community energy: "*People at DECC said there are all these local networks, we need somebody to work with*" (UK1, 2011). The CCAA members include the LCCN, Transition Network, Local United, Community Energy Wales (for Welsh Networks), Scottish Communities Climate Action Network, The Community Energy Practitioners Forum (CEPF), Pure Leapfrog (observer), Forum for the Future (observer) and The Energy Saving Trust (observer) (CCAA, 2014). For instance the CEPF is a forum of intermediaries, not a forum of communities (UK3, 2011).

The CCAA has been active in organising events for the community energy sector and lobbying the government on issues and legislation potentially affecting community energy, such as the FIT, Green Deal and Localism Act 2011 (UK1, 2011). For instance, CCAA's lobbying relating to the FIT included a survey amongst community energy groups on their views about the FIT and proposed changes to it. The results were fed back to DECC in meetings with special advisors to the energy minister (UK4, 2011). However, it was unclear to the organisations involved how much impact they had, but at least they thought it opened avenues for further co-operation with DECC (UK4, 2011). The Localism Act 2011, for instance, has meant that "*the community has a much greater say in the outcome of planning applications in their area*", and as a result "*community consultation has become imperative for the future of renewable projects, both in community led projects and privately driven ones*" (UK2, 2011).

Other intermediary actors and networks active in the context of community energy in the UK include: the Centre for Sustainable Energy (CSE); sub-regional non-governmental organisations (NGOs) such as Marches Energy Agency (MEA) and Severn Wye Energy Agency; national organisations like National Energy Foundation (NEF); Global Action Plan (GAP); and regional organisations like Regen South West (UK3, 2011). All of these organisations have slightly different roles. For example GAP takes a very practical stance and facilitates household 'Eco Teams'. These aim to change people's behaviour by recognising community leaders and encouraging them to recruit a group of people, for whom GAP then provides materials (UK7, 2011). The process of creating these teams is much easier in established groups such as schools or local businesses than in communities which are not previously organised (UK7, 2011).

The regional energy agencies tend to work closely with groups in their local areas, while CSE, for instance, has been more involved in facilitating regional networking groups (UK3, 2011). CSE has also been active over the years in talking to government, planning authorities and local councillors about community energy and providing a support framework for other intermediaries to draw on (UK8, 2011). Furthermore, organisations such as Carbon Leapfrog have emerged to provide professional services, such as legal, technical and financial advice for community energy groups (UK3, 2011).

The Energy Saving Trust, meanwhile, has been involved in several activities and has provided, for instance, an online carbon footprinting tool and a telephone helpline for groups interested in developing community energy projects (UK5, 2011). Furthermore, some intermediary actors also tailor their approach to different community groups – for example schools, faith groups and interest groups such as the Women's Institute (UK6, 2011). One intermediary actor described their aim:

> "We are trying to fundamentally be an honest broker for communities, that intermediary role between providers of products and services. [We are different from] for-profit organisations who [are] kind of trying to sell things or deliver stuff into communities. We are trying to act on behalf of communities and community organisations to enable them to make the right decisions in the right order and try to cut through this incredible complex world – full of acronyms and technologies. So we are trying to act for community groups." (UK6, 2011)

As well as advising community energy projects and providing toolkits and guidelines on best practice, intermediary organisations also have a role in highlighting to community groups what is not good practice, to prevent groups, for example, replicating mistakes from previous unsuccessful projects (UK6, 2011). Lobbying by intermediary organisations is particularly important, given that "*a lot of people in the community energy field are not very involved in lobbying and advocacy*" as some of the community groups are not politically driven and instead they just want to focus on getting their projects done (UK1, 2011). However, those organisation which are involved in lobbying at the national level, may not always actually have any experience in developing community energy (UK1, 2011). Hence, there is a need to "*get some kind of alliance or agreement between the local practitioners and the national policy focused NGOs*" (UK1, 2011).

Intermediaries can also provide moral support for projects in the early stages. One representative of an intermediary organisation commented: "*That hand holding function becomes really important when communities start to look at what can they do in their own right*" (UK3, 2011). This is especially important in terms of building confidence and helping groups to realise how they can utilise the skills they have for the good of their local communities (UK3, 2011). This can help communities become more active in local energy development and take charge, as well as receive direct financial benefit – a very different picture to, for instance, large utilities developing wind farms in communities' local areas and reaping the benefits (UK3, 2011). The UK community energy niche seems to be at a point whereby thousands of groups are involved in the sector with varied intermediary support.

4.2.2.4 A global-phase community energy niche in the UK?

According to Geels and Raven (2006), in the global niche phase, knowledge flows become two-way processes, with knowledge flowing from local projects to global niche level as well as global niche level knowledge flowing back to local projects (see also Chapter 2: Theoretical Framework of this thesis). In the global niche phase, intermediary organisations are established and operate through various actions and forums (Geels and Raven, 2006). These include, for example, the provision of advice and information on the new emerging field, organisation of specialist events such as conferences and seminars, the publication of journals dedicated to the field, and the creation of professional networks (Geels and Raven, 2006).

In terms of the community energy field in the UK, there is evidence that a global niche phase has emerged, which has been demonstrated by the establishment of policy rhetoric, funding support and dedicated intermediary actors such as the LCCN and the CCAA. However, the community energy sector in the UK still remains rather fragmented and the challenge seems to be how to move from the global niche phase to the point whereby community energy could transform the UK society (UK1, 2011). A large number of community energy projects have been established but what remains vital to the community energy niche is how projects are developed and whether and how projects can benefit from the global niche level support.

The rest of this chapter will analyse the development of two community energy projects in the UK – Hyde Farm Climate Action Network and Lyndhurst Community Centre – and reflect on the processes involved in their project development.

4.3 Hyde Farm Climate Action Network

Hyde Farm Climate Action Network (CAN) is located in Hyde Farm Estate, Balham, South London. It consists of around 1,800 houses, most of which are either two-bedroom maisonettes or two to three bedroom houses, built between 1896 and 1916. In 1996, the Hyde Farm area was designated as a Conservation Area.

In 2007, four local residents set up Hyde Farm CAN in order to arrange joint activities to combat climate change in their local area. The network has organised several activities in the neighbourhood, ranging from creating communal gardens to holding street parties and installing draught proofing and renewable energy technologies. Hyde Farm CAN has received external support from organisations such as the European Energy Programme and energy utility British Gas.

Hyde Farm CAN, its set up and development (as well as the other three community energy projects in this DPhil thesis), is analysed using a framework based on the work of Geels and Deuten (2006) and Raven et al. (2008). As outlined in Chapter 2: Theoretical Framework and Chapter 3: Research Design and Methodology, three processes of (1) local contextualisation, (2) negotiation and engagement, and (3) transferable lessons (Raven et al., 2008) are central to this analysis. These processes include activities such as choosing actions and technologies according to specific local context, adjusting project expectations following engagement with local community and key stakeholders, and providing transferable lessons for others to learn from. These processes are also outlined in Table 14 below:

Process	Key dimensions	Example activity
Local contextualisation	a) Vision of the project b) Expectations c) Local context	a) Reduce heating bills b) Geographical and cultural location of a project
Negotiation and engagement	a) Participation b) Negotiation of expectations c) Engagement	a) Project meeting b) Adjust project plan in a changing policy context c) Organise visits to other sites
Transferable lessons	a) Lessons from local projects to global niche level	a) Technology guidebooks, funding guidelines, networking advice

Table 14: Processes linked to community energy development and niche formation (a version of this table first appeared in section 2.4.5.3)

4.3.1 Local contextualisation

Local contextualisation of a niche innovation involves processes such as considering the particular local context in terms of technological or financial possibilities and being aware of the influence that project participants' varying expectations may have (Raven et al., 2008). Raven et al. (2008) note that initial expectations, which are voiced by project participants at the local contextualisation stage, form a project vision which is then adjusted in relation to further development with stakeholders. Project purpose, its motivations, voicing of expectations by project participants, as well as creating the local innovation are all part of local contextualisation (Raven et al., 2008).

4.3.1.1 Purpose and motivation for the project

Hyde Farm CAN was set up in 2007 by local residents who were interested in sustainability and wanted to find ways to make their houses more energy efficient. One of the residents, Susan Sheehan, had moved to the Hyde Farm Estate in 1994 and was living in one of the Edwardian houses. Sheehan's house had single brick walls and single glazed sash windows, it was draughty and often hard to keep warm. Sheehan, who worked as a journalist, had for some time been concerned about climate change and how her everyday life may be contributing to it. "*Six years ago, six or seven, I started really getting interested in climate change and environment, what I could do about it. I'm quite scared actually*." (Sheehan, 2012). Sheehan was aware especially that carbon emissions would have to be reduced significantly over the coming years and was keen to make her own home more environmentally friendly. However she did not really know where to start:

> "I started to think, I know that we need to reduce our carbon emissions by x amount by this time, drastically, but I don't know what my carbon emissions are, I don't know how to measure it." (Sheehan, 2012)

In order to seek information and advice, Sheehan searched the internet for potential local groups that may be able to help. She came across Lambeth Climate Action Group[16], located close to Balham. Sheehan decided to attend their meetings, which she found helpful in terms of finding out more about climate change and energy issues linked to domestic housing in particular. Following the meetings in Lambeth, Sheehan thought that there may also be neighbours in her own local area who could be interested in similar issues. Given that the Hyde Farm Estate houses were of similar construction and were likely to have the same issues as Sheehan's own house, i.e. often cold, draughty and inefficient in terms of heating, she thought that other people too must be thinking about the cost of energy and some may also have a wider interest in climate change, just like her (Sheehan, 2012). Sheehan started to talk with neighbours to see if other people at Hyde Farm would be interested in similar issues and whether there was potential to do something about it together.

4.3.1.2 Initial expectations and project vision

As a first step, Sheehan invited a few people to her house and the first meeting took place in her living room, with Sheehan interested to see if others had similar concerns to her. To her delight, a few other neighbours too had been considering ways to reduce energy bills and were interested in getting together on a more regular basis to discuss what options they may have. Soon after the first meeting, two other neighbours joined, Hugo Schonbeck and his wife Elizabeth Smith, who had moved to Hyde Farm from Holland in 2007. Schonbeck had a background in law but had been interested in and working in sustainability for several years. Smith, a journalist, had worked for several sustainability organisations and was also interested in climate change issues. Once Schonbeck and Smith had moved to Hyde Farm, they had attended a sustainability event where they heard a speech by Transition Town Brixton:

[16] This group soon became Transition Town Brixton, http://www.transitiontownbrixton.org

> "Elizabeth and me went to a sustainability event in the Royal Geographical Society and we heard a speech by Duncan Law from Transition Town Brixton, which we really really liked. So we wanted to join Transition Town Brixton, and he [Law] said that's ok, of course, but you're in Balham. So he said why don't you join Hyde Farm Climate Action Network because that's actually literally your back garden, 'cause we were living in the Hyde Farm." (Schonbeck, 2012)

The Transition Town Brixton talk inspired Schonbeck and Smith to join Sheehan and other neighbours at Hyde Farm. Sheehan, Schonbeck and Smith were all interested in how they could reduce their emissions and potentially have an impact on climate change. They all thought that it was important to start any action at home and find ways to improve the energy efficiency of their own houses first. They also realised that as a larger group they could be more effective.

Schonbeck especially had previous experience of working with community groups, having been involved in sustainability action in Holland. For example he had developed ecological footprinting[17] software back in 1997, which was used by local schools and municipalities in Holland (Schonbeck, 2012). Furthermore, Schonbeck had been involved with Dutch Global Action Plan and their household Eco Teams programme, which encourages people to take action via a membership of local groups. These are based on a solution-based approach involving information, feedback and social interaction. Schonbeck (2012) explained: "*Their programme is based on the empowerment method which is positive solution orientated, glass half full. It's not just giving information to people".* Groups were allocated a coach, who was an expert in the empowerment method, rather than an environmental expert. Furthermore, Schonbeck (2012) said that the central ethos of the programme was that people were "*supposed to find out the solutions themselves and they share solutions with*

[17] Ecological footprinting was developed by Mathis Wackernagel and William Rees in Canada in early 1990s. It measures the impact of human demand and consumption on Earth's resources, taking into account land use (Schonbeck, 2012).

each other". The Dutch Eco Teams has been recognised as a successful formula also by academic researchers (see for example Nye and Hargreaves, 2010, Staats et al., 2004).

4.3.1.3 Local innovation

The innovative aspect of the Hyde Farm activities was as much linked to the organisation of the group as to its activities, indicating both technological and social innovation (Seyfang and Smith, 2007). Sheehan especially was keen to get involved with her neighbours and create a network of people who could share information, learn from each other's experience and help each other out. Sheehan had lived in the Hyde Farm area for ten years before she had her children and she wanted to get to know her neighbours more. In other words, Sheehan was as interested in building a community as acting as a community:

> "I really didn't know any of my neighbours, and I just felt that, that sense of community was hugely invaluable and that this was something that we could really do as a community together. So I could see Hyde Farm Climate Action Network and see it re-working and doing things together, and that would enhance my community." (Sheehan, 2012)

Schonbeck and Smith too were keen to get more neighbours involved and, together with Sheehan, they started to organise regular meetings in people's homes and at the local community centre. Niche innovations often start to develop as a response to pressures at the predominant regime level (Geels, 2002). In Sheehan's case, she was locked in to an inefficient heating regime, given the physical restrictions of living in an old Edwardian house. However, she was interested in how she could tackle this problem via her own community, by getting like-minded people together to seek solutions together. This is an example of how physical problems such as old housing technology can be a starting point for community energy projects, though issues such as finding solutions together as a group also play a key part.

So, the local contextualisation of the Hyde Farm group included an initial vision to reduce emissions and improve energy efficiency of houses in the area, while also creating a meaningful community group that would engage residents in the area. Sheehan and Schonbeck especially wanted to find out what measures could work in their specific setting and which ways could make their own houses more sustainable.

4.3.2 Negotiation and engagement

At the negotiation and engagement stage of a niche innovation, initial expectations and project visions are shaped according to interaction with the local community and key stakeholders (Raven et al., 2008). In the Hyde Farm case, initial expectations were mainly centred around meeting like-minded people, finding more information about energy use in the home and emissions linked to it, and hopefully having an impact on climate change in their local area.

4.3.2.1 Initial project meetings

The first few meetings of Hyde Farm neighbours were ad hoc and mainly attended by a few people, as well as Sheehan's friends who were interested in climate change issues. Schonbeck (2012) remembered that the group was very small when he and Smith joined: "*When we joined there were just two people, Sue Sheehan and another neighbour, and then with us there were four*". However, soon the meetings became more regular and were usually held approximately once a month, with more people starting to attend and forming the core of the Hyde Farm CAN.

> "There was some publicity and people started to join the drop in occasionally so there were always different people but some of those people actually just stuck and came to the monthly meetings." (Schonbeck, 2012)

Meetings were usually held at Balham Bowls Club, which, as the name suggests, was a former bowling club that had been converted to a pub. This meant that the Hyde Farm group could meet together, eat together and plan activities at the same time. As Schonbeck remembers, meetings were unstructured, as well as enjoyable, to begin with:

> "We were starting to having talks in Balham Bowls Club and up here in Balham. Having a lot of fun and it was actually quite unstructured but we had a lot of fun and we started to do things and we actually didn't have any funding whatsoever, but managed still to have activities almost every month." (Schonbeck, 2012)

The unstructured nature of the meetings meant that people were free to suggest topics as they wished and members of the group arranged activities that they found interesting, without any formal organisation. Initial activities included, for instance, street parties and the creation of a community garden. After the first few activities, members of Hyde Farm realised that they could really benefit from external help, especially regarding what might be the best options for refurbishing their energy hungry Edwardian houses.

Through her contacts such as Duncan Law at Transition Town, Sheehan became aware of an organisation called Sea Renue (later called Carbon Descent[18]), which offered help and advice to community groups. They ran a programme called Energy Conscious Households in Action (ECHO Action), which was part of a wider European Energy Programme. The ECHO Action was a funded programme, based on a similar principle as the Dutch Eco Teams, i.e. groups of people getting together on a regular basis to discuss solutions to sustainability and climate change related issues. Sheehan was interested in the opportunity to start a group in Hyde Farm and she made an application to ECHO Action, which was accepted. At the time in 2007, the ECHO Action programme funded around 10 community groups in different parts of London. With his Eco Teams experiences in Holland, Schonbeck was keen to see if a similar concept would also work in his local area in the UK (Schonbeck, 2012). Hyde Farm did not receive actual money from the programme, but they received external help from a coach who ran a series of meetings with the Hyde Farm residents.

[18] http://www.carbondescent.org.uk

4.3.2.2 Engaging the local community

Sheehan and neighbours distributed leaflets in the Hyde Farm Estate about the ECHO Action meetings and they received good interest from neighbours to start with. The meetings were held in a local church and they focused mainly on understanding household energy use and how to reduce related emissions, though other aspects of sustainable living were discussed too. Topics in the meetings included how to deal with heat loss, how to understand and use heating controls, possibilities of insulation, sustainable transport and cycling.

Schonbeck (2012) found the ECHO Action meetings to be less focused than the Dutch ones he had been attending, as the meetings in Hyde Farm were open to everyone and different people attended at different times. However, the fact that different people attended the meetings meant that more people got to know each other and after a while a core group of around ten people evolved who regularly came to the meetings (Schonbeck, 2012). According to Schonbeck (2012), the core group also realised that in order to receive potential external funding for their activities, Hyde Farm would have to become a constituted community group with an acting committee. Schonbeck (2012) said that from his previous experience as a lawyer, he knew that funding programmes usually required groups to be constituted in order for them to be funded.

The first Hyde Farm CAN Annual General Meeting took place in November 2008 and the first committee included a chair, a secretary and a treasurer and about ten members in total (Schonbeck, 2012). The committee also started to work on formulating a wider mission and vision for Hyde Farm CAN. According to Schonbeck (2012), developing a joint vision involved a lot of discussion and took time, and some people felt that it was actually less fun than doing the small projects and practical action that people at Hyde Farm had already organised.

> "Those structured things were always the more difficult ones, and the most successful and fun things were the things where someone or a few people just started doing something, just organising something. We had street parties, we had a party in the park, and again, that wasn't the whole committee who was organising that, it was just one or two people." (Schonbeck, 2012)

As can be seen from Schonbeck's comments, the people at Hyde Farm were more interested in the actual practical work related to community energy activity, rather than the more conceptual work of formulating a common vision for the group. Local action, which is not tied by any particular rules, allows for broader and more varied types of participation. Community energy projects may, however, be requested for example by funding organisations to be able to undertake both practical and conceptual types of action. In order to develop successful projects, community groups need to involve participation at the project level, as well as the ability to think and use tacit knowledge in terms of what requirements external funding organisations, for instance, may have.

A key mission for Hyde Farm CAN was to address the issues that the majority of the residents in the Hyde Farm estate faced. Their houses were draughty, had poor energy efficiency ratings and were located in a conservation area, meaning that residents were locked-in to a housing, as well as planning, regime which prevented the installation of some technical energy efficiency solutions:

> "It was driven by the fact that all these houses in the Hyde Farm are similar and have similar problems. They're draughty, they're cold and they are [in a] conservation area so you can't do solid wall insulation on the outside or… so you have to find innovative solutions to make those houses warmer." (Schonbeck, 2012)

Furthermore, there was also the issue of expense: "*Not everyone can knock out the windows and replace them with double glazing, let alone if you are allowed to because of the conservation area*" (Schonbeck, 2012). So a key aim for Hyde Farm was to find measures that would improve the energy efficiency of the area's houses in an affordable way, taking into consideration conservation area restrictions. However, the group was keen to work on this together as neighbours, identifying how they as a community could find solutions that could be suitable for the local area. This shows that the Hyde Farm vision was as much about social innovation (Grimm et al., 2013) as finding technological solutions to their draughty houses, indicating a characteristic of grassroots innovations (Seyfang and Smith, 2007).

The number of people attending the ECHO Action meetings started to reduce after a while, despite local publicity and an active core group. Sheehan attributed this to the fact that even though several people wanted to be involved and find out more about how to save energy, a lot of the meetings were rather abstract and did not really give people an incentive to take action in their own homes:

> "We found that the attendance dropped quite quickly, lots of people wanted to be involved but the attendance dropped because basically the meetings were in church halls, were quite abstract, so we realised that we had to do something much more connected to our community." (Sheehan, 2012)

However, despite the drop in activity and interest, Sheehan was not discouraged. She decided to adapt some of the learning she had accumulated during the ECHO Action meetings. One of the topics had been draught proofing old sash windows, an issue that was topical for many of the Hyde Farm houses. However, as the draught proofing session was held in a church, which did not have sash windows to demonstrate on, the session fell short on delivery:

> "They taught us how to draught proof sash windows, which was one of the major problems that we were having and we'd recognised. But they taught us in a church hall that didn't have any sash windows, so they gave us some materials and things to go home and do this work, but everyone forgot by the time they got home 'cause they hadn't quite understood properly anyway, because we were taught in a church." (Sheehan, 2012)

Sheehan realised that even though their group had been relatively successful within the ECHO Action programme, there could have been more room for improvement to fit the activities more to the needs of the Hyde Farm residents: "*ECHO Action opened the door for us, but they weren't able to give us quite as much information as we needed*." (Sheehan, 2012). Therefore, Sheehan thought that if they really wanted to get people involved and take action, they had to do it in ways that would be much more directly linked to their community. That subsequently gave Sheehan an idea that they as a group could really benefit from an actual practical demonstration of draught proofing.

Sheehan set out to find a supplier who could show Hyde Farm residents how draught proofing can be installed. She found a supplier who was willing to come and do the demonstration, further encouraged by the fact that Hyde Farm residents would be ordering materials in bulk. Subsequently the first demonstration was held in Sheehan's house:

> "We held a Draught Busting Saturday, where we got the draught busting materials in my house and did some practical demonstrations, sold the materials, then got people helping one another as well. We had three or four people here who were there… to demonstrate directly from the supplier, and we could all have a go at draught proofing. That made it much easier for us to pass on those skills, and we've always had a proper craft person who does the training. So although I can do the draught proofing myself, I would only do it as a DIY thing, I wouldn't quite have the craft skills, patience and that kind of thing to pass it on directly." (Sheehan, 2012)

According to Schonbeck (2012), Sheehan was "*quite inventive in finding those solutions, and finding materials to make her house better for an affordable price*", especially regarding draught proofing. The materials included, for instance, professional draught proofing strips and simple secondary glazing, that people could fit by themselves. Furthermore, Schonbeck, contributed the term 'Draught Busting' as an invention of Sheehan's:

> "Sue invented the word Draught Busting which is now used by many other groups in the UK. Draught Busting as in like Ghost Busting. Children were actually watching these Ghost Busters films, so that's why she came up with the word Draught Busting." (Schonbeck, 2012)

Hyde Farm residents were very interested in the Draught Busting Saturdays and were also willing to help each other out. For example, people who had ladders would help draught proof first or second floor windows for people who either did not have ladders or were scared of using them (Sheehan, 2012).

> "I would make sure that, there was my friend there who was much more confident with a hammer and a saw and things like that, who did the crafting. But I have done it myself as well, I'm just more of a networker, get people in and get them talking to one another and learning." (Sheehan, 2012)

Schonbeck especially was helpful and together with a couple of other neighbours offered help to others: "*One or two neighbours really helped quite a few other neighbours to draught proof their homes*." (Sheehan, 2012). The Draughtbusting Saturday became a regular event and according to Schonbeck (2012), a lot of people attended, as they were keen to see what practical action they could do in their own houses, as well as buy the required materials at a reduced price. Meetings were usually held on a Saturday at someone's house, and a group of people from Hyde Farm would demonstrate how to do the draught proofing, so that the host person would get free draught proofing of their house (Schonbeck, 2012).

The Draught Busting Saturday concept shows that the Hyde Farm group indeed developed both technical and social innovation. They took an existing technology (draught proofing) and adapted its use to their community. They installed the technology in a way that brought people together to learn how to use it and share the knowledge with others, building also on the notion of the neighbourhood working together as a community. Furthermore, there was an element of networking involved from the start in the Hyde Farm activities, especially (as mentioned above) Sheehan pointing out that she was "*more* *of a networker, get people in and get them talking to one another and learning*" (Sheehan, 2012). Furthermore, for Sheehan it also meant that she felt more in control of her own emissions:

> "I'm still frightened about climate change and the things, the fact that in the future, we're not gonna be able to heat our homes, we're gonna be cold, gonna be hungrier, we're not gonna have all this excess. I don't know that I need all the excess, but, I think, there's a lot of unknowns as well. It benefited me because, personally, I was able to get my house draught proofed and reduce my own personal energy use, I would save money, but I would also start to overcome some of my fears around climate change, and feel a bit more in control and able to do something about it." (Sheehan, 2012)

At this stage Hyde Farm CAN activities were self-funded. However, following the interest from Hyde Farm residents in the Draught Busting Saturdays, Sheehan, Schonbeck and Smith wanted to extend the activity to a wider area in Hyde Farm, especially to those who were on low incomes, and they started to search external funding opportunities (Sheehan, 2012).

4.3.2.3 Applying for funding

Via their networks and contacts such as Carbon Descent and Transition Town Brixton, Sheehan, Schonbeck and Smith became aware of various information sources relating to community energy, including information on grants and funding opportunities via community networks such as Project Dirt and the LCCN. Sheehan said that it was a matter of identifying and finding the right networks, which could sometimes just be based on ad-hoc internet encounters (Sheehan, 2012).

> "There hadn't been a lot of funding around, specifically targeted to community energy, so once you get into that mind-set and you get on the right e-mail lists and things like that, you find out about them quite quickly." (Sheehan, 2012)

One of the funding programmes that Sheehan came across in her search was a British Gas[19] Green Streets programme. Sheehan had been following the news of the first round of the programme, which was aimed at communities who wanted to undertake sustainability actions in their local area (Sheehan, 2012). The first round of the programme had been mainly a British Gas marketing campaign, and they had chosen eight communities that actually had the word ‘green’ in their road or street name (Schonbeck, 2012). British Gas, however, decided to extend the programme to a second round as it had proved to be a good way to get access to community groups (Schonbeck, 2012). The Hyde Farm group decided to apply for the second round of the programme towards the end of 2009.

> “They [British Gas] said that it started as marketing [first round of Green Streets] but then they found that they had a lot of learning out of it and that’s why they decided to have a Green Streets where communities could bid themselves, because they as an energy company have this obligation to help people save energy but I think they found that they couldn’t easily get through people’s doors. They could distribute some energy saving light bulbs, but people don’t really trust the energy companies. So I think they wanted to find out whether community groups would have easier access to the people in the community.” (Schonbeck, 2012)

The Green Streets funding programme had a two-stage application process. An application form was submitted in the first round and successful candidates were chosen for a second round interview panel. Sheehan (2012) said that she generally found funding applications difficult and a barrier to start with. This was due to the fact that funding applications usually required applicants to express their case in a particular way. For instance applicants often had to outline outputs and outcomes of their project, and in order to do that correctly they had to understand the difference between these two concepts.

[19] It should be noted that a representative from British Gas was contacted several times in 2011 and invited to have an opportunity to be interviewed for this research, however, they were unable to take part.

However, Schonbeck had a different experience, as he was more accustomed to filling in funding applications, having completed several whilst he was living in Holland (Schonbeck, 2012). Furthermore, Smith was able to help with the Green Streets application, given that she had previous experience as a trustee of other organisations and had completed several funding applications in the past (Schonbeck, 2012). Her skills became especially useful in writing ‘the story of Hyde Farm CAN’ for the Green Streets application (Schonbeck, 2012).

Hyde Farm passed the first round in the application process and proceeded to the second stage, which was a meeting with an interview panel. Sheehan, Schonbeck and Smith presented their case in front of three ‘judges’ who were seated in a high table. Sheehan (2012) and Schonbeck (2012) both found the meeting daunting.

> “The presentations themselves were dragons den. They were sitting at a desk that was higher than us on a little stage. They were really senior people from British Gas, which was in a way a compliment, but we were not allowed to meet them beforehand, they didn’t introduce themselves or make friends with us at all. They didn’t smile at us, there was no encouragement. I know that they were trying to be fair, but it was hard.” (Sheehan, 2012)

Schonbeck (2012) thought that the jury had really liked the Draught Busting Saturday concept, while Sheehan (2012) found the overall experience quite hard, that they were really being judged and the approach was not particularly suited for Hyde Farm’s ethos of doing things together. For her it seemed like British Gas were “*doing it partly as an exercise to promote themselves*”, as competitions with a high number of applications were always very newsworthy (Sheehan, 2012).

Initially British Gas turned the Hyde Farm application down which left the Hyde Farm group devastated, especially since they were told the news in front of other successful applicants (Sheehan, 2012). Schonbeck (2012) thought that this was maybe due to the fact that there was also another London group chosen for the grant, from Richmond, who were more experienced than Hyde Farm and had a longer track record of running projects and working with the local Richmond Council.

However, a few weeks later in January 2010 British Gas contacted Hyde Farm and said that they had really liked the Draught Busting Saturday concept and that they had a wild card within the Green Streets programme and the jury would like to award Hyde Farm £100,000. The Green Streets programme received a total of 96 applications of which 14 community groups were chosen for funding, worth a total of £2 million (IPPR, 2011).

Understandably Sheehan and Schonbeck, as well as everyone else at Hyde Farm, were really pleased about the news, given that they thought that they would not get the funding (Sheehan, 2012). Following the Green Streets grant, Hyde Farm started to deliver draught proofing measures on a larger scale. However, it turned out that the British Gas funding was not in fact direct monetary funding, but rather funding for British Gas services over a period of one year (Sheehan, 2012). Sheehan said that they did not realise this at the time of the application, or even when they were awarded it, but it soon became clear that the money had to be spent according to British Gas terms (Sheehan, 2012). For instance Hyde Farm CAN would have to use British Gas engineers for installations and those Hyde Farm residents that would take part in the Green Streets programme would be required to sign-up for British Gas electricity and gas tariffs for one year (Sheehan, 2012). According to Schonbeck (2012), British Gas had said that the reason to sign up for their tariffs was that that way British Gas would be able to meter Hyde Farm residents' gas and electricity usage and identify potential savings during the programme. Once the Green Streets funding was in place, Hyde Farm CAN set off to establish the best way to use the £100,000 of British Gas services awarded to them.

4.3.2.4 Project delivery

Hyde Farm CAN wanted to continue the draught proofing activities in the Hyde Farm area, but they also considered other activities in order to get the best carbon savings from the British Gas services that they had been awarded (Schonbeck, 2012). However, at the time of the Green Streets programme, British Gas did not offer draught proofing. Schonbeck (2012) said that from their communication with British Gas it became clear that British Gas saw it more as a comfort issue, rather than a carbon saving one. However, as Schonbeck (2012) noted, residents at Hyde Farm had experienced that once they had installed draught proofing measures, they were usually able to turn their thermostat down by a few degrees and have a direct impact on their energy consumption. This gave Hyde Farm enough of a reason to ask British Gas if they would let Hyde Farm continue to do the draught proofing measures themselves under the Green Streets programme (Schonbeck, 2012), which they were allowed to do.

In order to utilise the British Gas grant to get the best carbon saving impacts for the residents (Schonbeck, 2012), the Hyde Farm group wanted to first establish the different energy requirements they had in their neighbourhood area. First of all, they contacted all 400 people on their email list[20] and leafleted all the houses in the area inviting people to take part in the programme. They expected around 20 participants to reply but had 40 households interested in no time (Schonbeck, 2012), indicating that in this case a community group was ideally placed to access local people.

First, British Gas surveyed the 40 interested households, to establish their energy requirements and the potential for energy efficiency improvements (Schonbeck, 2012). The survey results showed that in order to do all the required improvements, Hyde Farm would need several times more than the £100,000 awarded in British Gas services to them

[20] The email list had grown to 900 people in 2012

(Schonbeck, 2012). The group decided to divide the services so that they would be allocated as fairly as possible, especially considering those on low incomes, while at the same time optimising energy savings and choosing maximum carbon per pound value (Schonbeck, 2012). The survey results indicated for instance that solid wall insulation would be very high cost, and given that Hyde Farm was a conservation area, it would also be very disruptive as insulation would have to be installed on the inside walls (Schonbeck, 2012). A similar issue was found with solar PV, which would be too expensive, especially with the costs of planning applications and installation factored in (Schonbeck, 2012).

Instead the survey concluded that it would be more beneficial to install an array of solar PV in the local school and solar thermal in those houses which had more than four occupants (Schonbeck, 2012). Furthermore, Hyde Farm also wanted to continue the draught proofing installations and they were allowed by British Gas to do it themselves. In reality this meant that British Gas supplied the materials while two residents of Hyde Farm were paid to install a large bulk of the draught proofing measures.

> “We actually knew that a lot of people weren’t going away and doing their own draught proofing, they really wanted somebody else to come and do it. People who have the money and are time poor, rather than money poor, and they wanted people to come and do it. So we made sure that we had a couple of local people who were trained up and can actually do the draught proofing for people. And now we’d got a bit of funding for those that were also financially less well-off, so that we could draught proof their houses.” (Sheehan, 2012)

Regarding the requirement to sign up for British Gas tariffs, Hyde Farm members that took part in the programme agreed to do so. Furthermore, British Gas provided everyone with advice about which tariff would be the most suitable for them (Schonbeck, 2012). However, there were one or two residents who did not sign up to British Gas as they had switched their supplier not long before and could not move to another one (Schonbeck, 2012).

In the end, the following measures were installed in the Hyde Farm area under the Green Streets programme:

- Local primary school Henry Cavendish School received £20,000 towards insulation and solar PV under the Green Streets programme, whilst the Parents Association and School Eco Fund collected a further £11,000 for the solar PV
- Three residential houses were installed with solar thermal water heating
- Six houses received loft insulation
- Nine residential boilers were replaced
- 60 houses were draught proofed. As British Gas did not offer this service, they paid for the materials and Hyde Farm residents did the installations themselves.

Regarding the delivery of the programme, British Gas data showed that emissions per household in the Hyde Farm area actually rose (annual estimated emissions per household were 127 kilogrammes/CO_2e higher) and British Gas attributed this to the fact that so few measures were installed in the total Hyde Farm area, though the final report was not clear on this (IPPR, 2011).

However, the team at Hyde Farm thought that the project was worthwhile, even though Sheehan (2012) felt that working with an energy utility was not always conducted with the Hyde Farm community's interests in mind and that they had inconsistent support from British Gas. For instance, Hyde Farm had three different project managers from British Gas during the year-long programme and measures were required to be done according to the managers' timelines (Sheehan, 2012).

> "I know that you have to go with the community and you support them when the energy is there and sometimes that fades, so then you need to be there as well to help them and fill in some of the gaps from time to time. But British Gas did not work that way, we need this by this date, and we're going to do this." (Sheehan, 2012)

There were also several legalities involved. For example, British Gas sent participants lengthy contract documents to sign, but the Hyde Farm committee members were not always made aware of this beforehand (Sheehan, 2012).

> "Sometimes they did not tell us some of the things they were going to do, like insurance, or the legal consent forms that the participants had to sign. We did not even know they were sending those out and there were these big long contract documents. We just felt that was unsuitable really." (Sheehan, 2012)

In fact, working with British Gas was such a disappointing experience for Sheehan (2012), that it discouraged her from working with an energy utility again: *"It wasn't a great experience at all, I really don't ever wanna work with an energy company again, don't trust them*". Intermediary organisations in the UK have also noticed that sometimes it can be difficult for community energy projects and utilities to work together, even though this could also be encouraged: "*There is certainly a role for the community sector and a lot of the energy companies would recognise that but the question is how easy can they co-exist?"* (UK1, 2011).

However, the relationship with British Gas did not seem to affect the majority of people who took part in the Green Streets installations, though people indicated that they were pleased especially with the draught proofing measures (Schonbeck, 2012). So despite the difficulties involved in working with a large energy utility, there is clear evidence that the Green Streets programme was beneficial for Hyde Farm as it allowed the group to install many more energy efficiency and renewable energy measures within their neighbourhood. Furthermore, applying for the Green Streets funding and working with British Gas taught some valuable lessons to the Hyde Farm group, especially in terms of how to deal with a large energy company and its expectations. Such lessons proved to be useful later on, especially for Sheehan in her involvement with local community groups, as well as for Schonbeck who went on to organise events for other community groups – in other words creating some useful transferable lessons from the Hyde Farm experience.

4.3.3 Transferable lessons

Niche literature states that once niche actors start to share lessons with each other a network of actors starts to emerge, indicating a trans-local phase of knowledge sharing (Geels and Deuten, 2006). In the Hyde Farm case, there was a fair amount of evidence of networking with other organisations and pre-existing community energy networks. Furthermore, members of Hyde Farm were also involved in creating new networks. Sheehan was for example involved with the Transition Town Brixton network, while Schonbeck mentioned that he was involved in the online platform Project Dirt and helped set up Balham Green Drinks at the Balham Bowls Club:

> "We started what we call 'Green Drinks' there in that same place and that was also where Project Dirt was founded. People started to come to those Green Drinks and do other things." (Schonbeck, 2012)

In the area of networking and sharing lessons from the Hyde Farm experience, Sheehan's role became central. Sheehan proceeded to work in the area of communities and sustainability in her professional life. During 2008, Lambeth Council was holding elections and during door stepping campaigning the leader of the council, Steve Reed, happened to stop by Sheehan's house. Sheehan told Reed about Hyde Farm and all their activities, especially the Draught Busting Saturdays (Sheehan, 2012). Reed found the Hyde Farm activities very inspirational and according to Sheehan, Reed was also aware of other groups, such as Transition Town Brixton, and seemed very keen to support similar activities across Lambeth, with a view of making Lambeth Council a co-operative council (Sheehan, 2012).

As a result of their conversation, the council contacted Sheehan about a programme that they wanted to develop, to help local community groups to take sustainability actions. Sheehan met with the council and shared her experience and learning from the Hyde Farm group (Sheehan, 2012): "*So I got involved in helping to shape a programme that they could fund. I was not actually very involved, I just consulted and one of the cabinet* *members wrote a report on it"*. Once the programme, called Green Community Champions, was set up, a part-time job was advertised to run it. Sheehan (2012) realised that she was actually really interested in the job herself: *"Then I thought, actually I want to apply for this job. It was only a part-time job to start with, so I got the job and now it is full-time*". Sheehan was appointed as a Green Community Champions Officer at Lambeth Council in 2009 (she later became a Senior Policy Officer at the Sustainability team).

Sheehan's experience from Hyde Farm proved valuable in her job at Lambeth Council. Sheehan has been involved in setting up several community and climate action groups across Lambeth, as well as London more widely. One of these, for example, was Community Draught Busters[21], a network that is part of Transition Town Brixton and delivers draught proofing measures for fuel poor households. Sheehan has also been active in the LCCN and she was made a London leader by the Sustainable Development Commission and subsequently set up the London Low Carbon Communities Network to bring people together across London.

However, Sheehan (2012) has had to give up some of her activities due to time commitments and instead she has focused her energy in Lambeth. The biggest success in Lambeth has been around food growing and many of those community groups have also widened their interest to community energy projects.

> "There has just been such an opportunity to go really deep in Lambeth. So we have food growing projects on lots of estates, we have the Brixton Energy community energy project on one of the most deprived estates in the borough." (Sheehan, 2012)

[21] http://ttbdraughtbusters.co.uk

Furthermore, Sheehan has also noted a wider socio-demographic reach in the new networks that she has helped to set up or has been involved with, something she seemed pleased about.

> "When I was first doing the networking, it was really about quite middle class communities, networking with one another, Transition Belsize, people from Richmond and Kew, quite well-off people, and in Lambeth we have really been able to take it to less well-off people." (Sheehan, 2012)

Lambeth Council too had noted the work that Sheehan had undertaken with the local community.

> "Now the council is becoming a co-operative council and Steve Reed says that one of the main inspirations for the changes that they are making in the council, was the programme that I run called Green Community Champions." (Sheehan, 2012)

Sheehan also provided practical advice for the groups she worked with, including help on issues such as how to search for funding opportunities, how to fill in funding applications, how to speak to funders and how to meet their expectations. For instance, Sheehan recommends that groups should always try to create a dialogue with a potential funding organisation at first instance (Sheehan, 2012). According to Sheehan (2012), her experience was that open dialogue between community projects and funding organisations ensured better funding programmes and successful projects as expectations on both sides could be clarified from the start. Furthermore, Sheehan had experienced via her job at Lambeth Council that most funding organisations were genuinely interested in helping community groups, but in order to do that they also needed to know what type of help and advice community groups required (Sheehan, 2012). Intermediary organisations and policy makers need to learn too in their involvement with community energy groups, and Sheehan's experience especially shows how she was able to take her learning from a local project and translate that to global niche level guidance (Raven et al., 2008)

> "If you have networks in place, you can have more on-going dialogue and you can go into a specific network with a specific issue, or they can come to you as well, they can bring things to you more easily. There is some really good research starting to show that a lot of these projects that do not have really specific outcomes and goals, can deliver really strong outcomes, if you just let things happen, if you let people meet. I have always thought that if you get the right people in the room together, all sorts of magic happens." (Sheehan, 2012)

This suggests niche innovations, which are approached by the SNM literature as entities that can be managed to success (Smith and Seyfang, 2013), can not necessarily be, or have to be managed. There was very little external 'management' involved in the Hyde Farm project. Even the relationships with their supporting and funding organisations (ECHO Action and British Gas) were more about the Hyde Farm group trying to reap the most benefits, while having to deal with insufficient advice (e.g. ECHO Action advice on draught proofing sash windows without demonstrating on actual sash windows), as well as negotiate with a funding organisation that was very different in ethos and working structure to their own (British Gas). Hyde Farm is only one example and learning from the project, especially via Sheehan's own networks, was valuable in terms of advising others of the, sometimes unexpected, challenges that community groups may have to deal with.

As mentioned earlier, Schonbeck, as well as other members of the Hyde Farm group, have been actively involved in various community energy networks (including the previously mentioned Project Dirt and Balham Green Drinks), as well as creating space for others to get together and learn about community energy. For example, in 2008 the National Low Carbon Communities Network had a large conference in Wales, which Schonbeck and Smith wanted to take part in. However, they were not keen to go there in person due to time and costs involved in travelling to Wales. Smith thought that other groups must be in the same position and together with Schonbeck decided to hold their own event at Hyde Farm parallel to the conference in Wales (Schonbeck, 2012). Schonbeck organised a videolink from Hyde Farm to the Welsh conference and also had a programme of their own speakers. They invited other community groups from London to attend and around 20 of them came to the day.

> "There was a conference in Wales from the Low Carbon Communities Network and we were hesitant to go to Wales because of the time and costs involved. It was Elizabeth's idea to organise a similar event in Hyde Farm at the same time with a video link to the Low Carbon Communities Network event in Wales and have our own programme and speakers as well, occasionally linking up with the one in Wales, which we did. So we had a lot of groups coming to that event in London." (Schonbeck, 2012)

Sheehan and Schonbeck were also keen to see whether they could install a larger scale renewable energy project in Hyde Farm. Schonbeck was involved in organising a feasibility study to establish the potential for a community-owned district-heating network in the Hyde Farm estate (Schonbeck, 2012). However, Sheehan and Schonbeck have been keen also not to 'reinvent the wheel' and have been working with other groups with similar interests in South London (Schonbeck, 2012, Sheehan, 2012). Schonbeck became active in setting up Repowering London[22], an umbrella organisation for groups wanting to generate renewable energy in South London (Schonbeck, 2012). Repowering London offers technical, financial and legal advice to community groups and one of their most successful projects has been Brixton Energy, a co-operative which has installed three solar projects and has others in the planning stage. Sheehan has advocated Repowering London via her networks in Lambeth Council, while Schonbeck acted as a treasurer at one point for the organisation (Schonbeck, 2012, Sheehan, 2012).

> "We have had support in Brixton from an organisation called Share Energy and Carbon Leapfrog to kick start everything and not reinvent the wheel and learn how to do things right and we are now offering what we have learnt as Repowering South London to other groups." (Schonbeck, 2012)

The sharing of experience and networking activities at Hyde farm show that especially Sheehan and Schonbeck were very willing to work with others and share their learning with a wider audience. Issues such as how to speak to funding organisations, the

[22] http://www.repowering.org.uk

requirement to set up as a constituted group in order to apply for funding and practical advice on filling funding applications were lessons that Sheehan and Schonbeck willingly shared with others. Via their various networks in London, as well as some nationally, Sheehan and Schonbeck ensured that they were in a position to utilise existing networks, as well as help create news ones.

In Sheehan's case especially, as she herself noted, she was more of a networker and found that most things were possible as long as you got people together and let them get on with their ideas (Sheehan, 2012). However, she also seemed to have a skill to identify people with the right skill sets, for example ensuring that people with certain technical skills took part in the Draught Busting Saturdays. In their involvement with creating new networks, especially through Sheehan's job at Lambeth Council and Schonbeck's involvement at Repowering London, these actors took on intermediary roles for community energy in South London. The act of taking the experience from the Draught Busting Saturdays and sharing that with other networks showed that Sheehan herself was translating lessons from the project and sharing those with other groups via her intermediary role as the Green Community Champions Officer.

All these activities indicate that trans-local sharing of knowledge took place in the Hyde Farm case. The group did not only share information between themselves, but there were lessons that were translated to the global niche level, where intermediation takes place (Geels and Deuten, 2006). See Figure 12 below:

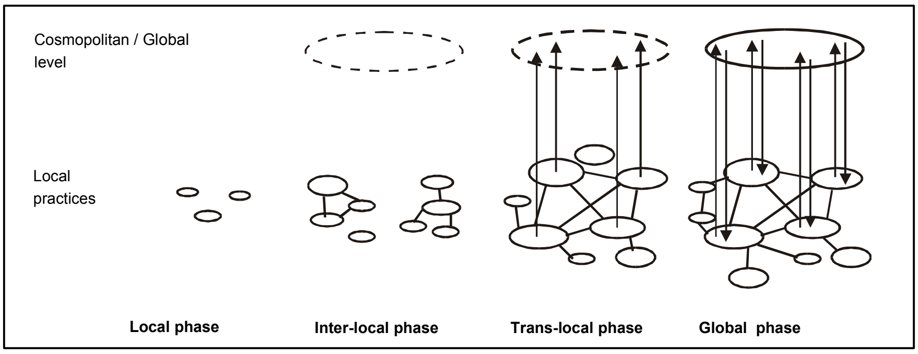

Figure 12: Different phases of knowledge sharing from local to global phase (adapted from Geels and Deuten, 2006, p.269). Note that this figure first appeared in Chapter 2 of this thesis.

4.3.4 Conclusions on the Hyde Farm project

4.3.4.1 Local contextualization

The Hyde Farm project was started by a group of local people, who were interested in improving the energy efficiency of their draughty houses, as well as working together as a community to address climate change. The Hyde Farm group has been a fairly loosely organised group, with members having had a chance to organise activities that have interested them the most. Actions such as creating community gardens, installing renewable energy at a local school and running regular Draught Busting Saturdays have involved taking the local context into account and considering what measures work best in the Hyde Farm area. The Hyde Farm group was also keen to create a community group that would have a meaning and real value to its members (McMillan and Chavis, 1986). For example by acting as a constituted group, Hyde Farm was in a stronger position to organise activities and apply for funding programmes. Members of Hyde Farm implemented a practical, accessible and social approach to energy saving, adapting the innovation to suit their purpose and their local context.

4.3.4.2 Negotiation and engagement

The negotiation and engagement processes linked to the Hyde Farm case show that these are not one-way processes. Instead it is vital that feedback from the negotiation and engagement stage impacts the community energy project in terms of adjustment of project vision, and that stakeholders take the outcomes of these processes into consideration.

The Hyde Farm experience especially with the ECHO Action and Green Streets programmes showed that even though members of Hyde Farm were considering their local context and adapting to that the best they could, the same could not necessarily be said about their supporting organisations. In the case of ECHO Action, Sheehan took the rather abstract concept of draught proofing and helped it come to life for her neighbours by installing the technology in her own house and sharing that experience with others. The funding application process with British Gas demonstrates how community energy groups to some extent can be at the mercy of the funder, from the funding application stage all the way to project delivery. This can leave community groups in a vulnerable position as, for example, they might be signing contracts that they are not fully clear on.

This demonstrates that community groups need to be listened to and those working with such groups can benefit from being flexible and taking into consideration groups' local context, expectations and visions.

4.3.4.3 Transferable lessons

The Hyde Farm group was willing to network with others and share their learning and experience from the start:

> "It was about being able to actually do something, and to do something on my house, and then share that as well, 'cause, you recognise that when you're doing these things, it's exactly the same for everyone else, and it is small steps." (Sheehan, 2012)

Hubs such as Repowering London and various other networks are important for groups developing community energy projects, especially in terms of bringing people together and groups supporting each other by sharing experience, learning and knowledge. Networks also provide possibilities for other initiatives to emerge. Networking, especially in local, face-to-face situations, ensures that people do not have to reinvent the wheel and can learn from others' successes as well as mistakes (Schonbeck, 2012, Sheehan, 2012).

Part of the initial network creation at Hyde Farm was based on chance encounters (Seyfang et al., 2013a), something that the niche literature does not clearly recognise. For example Schonbeck found out about Hyde Farm activities by attending Transition Town Brixton meetings first, while Sheehan eventually ended up helping create her new job at Lambeth Council by having the Leader of the Council knock on her door during door-stepping campaigning. These chance encounters were important for making new connections, while recognising which encounters provided significant leads and following them up strengthened the networking activities at Hyde Farm.

In the Hyde Farm case there is also evidence of lessons being translated and shared to the global niche level. For example intermediary organisations such as Repowering London and Carbon Decent were able to translate learning from Hyde Farm especially through their contact with Schonbeck; while Sheehan helped set up and provided advice to many community groups through her role as a Green Community Champions Officer at Lambeth Council.

Before moving on the next case, Lyndhurst Community Centre, the processes linked to the development of the Hyde Farm case are summarised in Table 15 below.

Process	Hyde Farm case	Empirical issues
Project vision Vision and expectations for the project in its local context	Old houses are draughty	Expensive heating, comfort
	Climate change is a problem	Domestic housing's impact on emissions
	Lack of information about what to do about emissions	Where to start with household emissions, how to measure them and what is the best way to reduce them
Negotiation and engagement Participation, negotiation of expectations and engagement	Creating a new community group	Neighbours coming together
	Several active people, core group	E.g. Sheehan active on draught proofing
	Supportive neighbourhood	People took part in several activities
	External support	ECHO Action, Green Streets
	Learning from other groups	Attending other networks and groups' meetings
Transferable lessons Lessons from local projects to global niche level	First of its kind Draught Busting Saturday project	Spreading the concept to other groups and networks
	Active networking	Creating new networks
	Translating lesson	Intermediary roles, advising other groups

Table 15: Summary of niche processes, Hyde Farm

4.4 Lyndhurst Community Centre

The second UK case is Lyndhurst Community Centre, which is located in the centre of Lyndhurst, a village in the New Forest, Hampshire. The Community Centre was built in 1962 and is owned by the charitable Lyndhurst and District Community Association (LDCA). It leases its land from the neighbouring Forestry Commission. The community building was initially converted from a barn, to which extensions such as a hall, public library and a kitchen were added over the years. The Community Centre is a popular place in Lyndhurst and is used by around 40 local groups and businesses, with regular activities including art, aviation, photography, music, various sports and farmers' markets. During 2009 and 2010, the Community Centre went through a complete, £788,000 refurbishment. The building refurbishment included improvements in the building's structure, energy efficiency and heating. For example an improved library, bigger kitchen, new meeting rooms, energy efficient windows, new doors, and a biomass heating system were installed.

Lyndhurst Community Centre became one of the first community centres in the New Forest to install a biomass heating system, creating opportunities for local wood fuel supply networks to develop. The project was funded by several organisations, including the Big Lottery, local authorities and the local community. However, in this research, the focus is on the funding from the NFNPA, which funded the biomass heating system and subsequently facilitated links between local wood fuel supply and demand, creating uses for previously unmanaged woodland.

The development of the Lyndhurst Community Centre refurbishment project, as well as the other three community energy cases, is analysed in relation to the three key processes discussed as relevant to the development of niche innovations within this research: (1) local contextualisation, (2) negotiation and engagement, and (3) transferable lessons

(Raven et al., 2008) (these were discussed in more detail in Chapter 2: Theoretical Framework). Local contextualisation of projects includes the initial expectations, as well as a vision for the project, taking into account local variations (Raven et al., 2008). Negotiation and engagement processes involve the adjustment of initial expectations and project plan in line with the project's exchanges with key stakeholders (Raven et al., 2008). Finally, successful niche innovations can provide transferable lessons that can be shared with others (Raven et al., 2008). Table 16 illustrates these processes:

Process	Key dimensions	Example activity
Local contextualisation	a) Vision of the project b) Expectations c) Local context	a) Reduce heating bills b) Geographical and cultural location of a project
Negotiation and engagement	a) Participation b) Negotiation of expectations c) Engagement	a) Project meeting b) Adjust project plan in a changing policy context c) Organise visits to other sites
Transferable lessons	a) Lessons from local projects to global niche level	a) Technology guidebooks, funding guidelines, networking advice

Table 16: Processes linked to community energy development and niche formation (A version of this table first appeared in 2.4.5.3)

4.4.1 Local contextualisation

Local contextualisation of a niche innovation includes the community energy project's initial motivations, expectations and project vision. These are influenced by the project's individual circumstances, in other words the local context that the project operates in (Raven et al., 2008). For example, community energy projects can include established technology, which is then adapted to each project's local setting. Furthermore, community energy can also be a part of, or related to, motivations that go beyond energy, for instance groups may be motivated to build on pre-existing community cohesion, create new community groups or create opportunities for volunteering (Seyfang et al., 2013b).

4.4.1.1 Purpose and motivation for the project

Lyndhurst Community Centre is owned by the charitable Lyndhurst and District Community Association, which has a committee of trustees, including a chairman, treasurer, secretary and six ordinary members. In addition, the LDCA has an external auditor.

> "[The Community Centre] is run by volunteer trustees and has to be self-sufficient in terms of income. And we have a nice basis of trustees, which is we do have a solicitor on there, who advises us, we have people who have been in all sorts of backgrounds to contribute towards this community centre, and what it can do for the village." (Charlesworth, 2012)

The daily running of the Community Centre has been in the hands of manager John Charlesworth since 2001. Charlesworth is supported by a team of four part-time staff, Claire Wickens, Ray Mitchell, Peter Davies and Alana Bubb, and between them, the team ensures that the Community Centre is open and manned seven days a week.

Charlesworth has lived in Lyndhurst since 1978 and has been an active member of village life. He is a member of various local clubs and societies, as well as a member of the local council. Charlesworth had worked at Unilever during his main career of 40 years, first as a van boy and later becoming a local director of marketing and sales. Following retirement and a short spell in consultancy, Charlesworth wanted to do something for his own community:

> "I did a little bit of consultancy work, not a lot, but then decided I should put something back into the community. So I decided that this was probably the best thing to do and came in here and have been here since." (Charlesworth, 2012)

Soon after starting at the Community Centre Charlesworth realised that the actual building was in desperate need of repair. As a result of several extensions over the years, it had a three-part heating system, consisting of one electric heater and two gas heaters. The main hall had a high ceiling and its roof was not insulated. Meanwhile, all the doors in the building were draughty and windows had single glazing. The building was inefficient and expensive to run: "*The building itself was so old that we were leaking energy right throughout the building*" (Charlesworth, 2012). Updating the heating system was one of the key motives for the refurbishment project, with the objective to "*combine all that heating system into one, in an old building*" (Charlesworth, 2012). Furthermore, there were structural building problems that needed to be addressed. In 2004 it became clear to Charlesworth that the Community Centre had two options: either to go through a major refurbishment or close down. "*It would have closed, had we not done it, it was that bad"* (Charlesworth, 2012). The Lyndhurst case indicates how physical problems and threats to existence, such as an old building or an old heating technology, can be catalysts for the development of niche innovations. This was also the case for the other community energy projects researched for this thesis.

4.4.1.2 Initial expectations and project vision

It took Charlesworth another three to four years before firm plans started to shape up for the building refurbishment, mainly due to limited funds. In the mean time he was talking with the LDCA and considering what options they could have for the building. It was clear that the charity wanted to save the community building, however at the same time they did not want to be burdened by debt and any refurbishment project would require considerable amounts of external funding (Charlesworth, 2012). Therefore, before embarking on more detailed plans for the refurbishment, Charlesworth wanted to ensure that they could secure funding beforehand.

> "We had a clear objective to raise funds before we did any work at all. We had no debt, no interest payments, and we had to raise the funds and get the money in the bank before we spent any money, which is essential. I know of projects where people have taken out a loan and they're still paying the interest. This community centre has no debt now, after spending £780,000." (Charlesworth, 2012)

Charlesworth subsequently spent quite a lot of time identifying suitable funding sources, by, for instance, speaking to his friends and local contacts, and also searching the internet for online sources. Charlesworth also saw an opportunity in the refurbishment project not only to increase revenue but also to offer services to the Lyndhurst community that did not exist in the area yet.

> "It was because we are a village that has poor public transport and no mainline station and no buses running after 6:30 at night, with a 1500 population. I wanted to be able to offer something to the village that would give them what they want to do for their leisure time, at the same time offering a business opportunity." (Charlesworth, 2012)

In other words, Charlesworth wanted to create what he described would become "*one of the best community centres in the New Forest*" (Charlesworth, 2012). Charlesworth was keen to incorporate the local community's wishes for the improved centre, taking into account the younger generation, with a view that saving the ageing community centre building was not only just about providing bricks and mortar, but also about creating a flexible community space that would continue to be a centre of village life for years to come. In other words, his vision for saving the Community Centre was also a vision about saving a space where local people and community groups could continue to meet, ensuring the continuity of community cohesion within the village.

4.4.1.3 Local innovation

Charlesworth and his colleagues Wickens, Mitchell, Davies and Bubb, had an ageing community building in their hands, which required urgent repairs in order to survive. Charlesworth in particular was innovative in his quest for finding information about potential funding sources, adjusting the refurbishment project's plans in the process, as well as applying for funding. For example he identified that there were sustainable energy grants available for local groups from the NFNPA, so in order to be able to apply for those, he contacted the NFNPA to seek advice on how they could incorporate sustainable energy in the refurbishment and potentially apply for that strand of funding. Meanwhile, the NFNPA saw an opportunity in the Lyndhurst case to develop local wood fuel supply networks, thus also creating business opportunities for local forest owners. Renewable energy was, however, unfamiliar terrain for the Community Centre project's team. *"The easiest thing to do would just have been to carry on using gas boilers"* (Dewing, 2012).

> "The fact that we had never looked at that [biomass] before as a heating source, it was innovative because no one had put one in, in this area, and it was new to nearly everyone that was involved in it. But since then it's taken off quite strongly." (Charlesworth, 2012)

This indicates that the project team were willing to take on a new experiment and thus a potential risk, not only to them, but also to the wider New Forest area. The biomass heating system that the Community Centre ended up installing certainly was new technology to everyone who was directly involved in the project. Furthermore, Charlesworth especially wanted to involve the local community in the refurbishment project, by using local contractors as well as making sure that the local community were aware of the project and its future benefits. In other words, the Lyndhurst Community Centre project was innovative at grassroots level, involving the use of the local community for social good, as well as taking an advantage of the latest sustainable technology (Seyfang and Smith, 2007).

4.4.2 Negotiation and engagement

At the negotiation and engagement stage of a niche innovation, project plans are adjusted according to meetings with the local community and key stakeholders (Raven et al., 2008). In the Community Centre's case, negotiation and engagement involved several meetings with various project partners and funders, as well as the local community. Given that the main motive of this thesis is to focus on community energy, the analysis of the negotiation and engagement processes at Lyndhurst concentrates on the meetings with the LDCA committee and meetings with the biomass funder NFNPA, only slightly touching on the engagement with other funders.

4.4.2.1 Initial project meetings

The first real steps towards the refurbishment project took place in 2008, when Charlesworth took the issue to the LDCA committee. He presented what he called a "*back of an envelope*" initial plan for the refurbishment (Charlesworth, 2012), which included ideas for improvement of the building and the heating system. Charlesworth was aware that the building was very energy inefficient, so part of the refurbishment was to improve the energy performance of the building. His initial plan included better insulation, improved heating system, double-glazed windows, new doors and extending the building to accommodate a new kitchen, library and better meeting rooms.

The committee liked Charlesworth's initial ideas: "*At the committee meeting of the executive committee, I put up a plan, they then said, 'Like that. Go and draw up your plans with an architect*'." (Charlesworth, 2012). Despite liking Charlesworth's ideas and encouraging him to speak to architects, the committee was concerned about funding. However, Charlesworth reassured the committee that "*we would raise the funding before we spent money"* (Charlesworth, 2012).

Decision making in the LDCA committee was usually quite harmonious and that seemed to have also been the case with the refurbishment project, especially given the lower projected heating costs.

> "Effectively we were offered the opportunity to have energy at a much lower cost per kilowatt hour, with someone else providing virtually all the capital investment. So it was kind of a no brainer on the basis of those numbers." (Dewing, 2012)

Encouraged by the committee to seek further information and funding sources, Charlesworth had a meeting with local architects Searle & Searle Building Consultants to talk through his initial plans for the refurbishment. He wrote to local authorities including Lyndhurst Parish Council, Hampshire County Council and New Forest District Council. He also contacted the South East England Development Agency (SEEDA)[23] and the NFNPA to enquire about possible grants. Charlesworth had seen that the NFNPA was advertising "*funds available to improve energy source and loss of energy*" (Charlesworth, 2012). Even though the Community Centre's refurbishment plans did not initially include renewable energy, the NFNPA's grants gave Charlesworth a motive to incorporate renewable energy in the refurbishment plans. In other words, Charlesworth spotted the funding opportunity first and adjusted his project plans accordingly. This indicates how important it was at this stage of project plans for Charlesworth to have access to an intermediary organisation such as the NFNPA, whom he was able to contact for further advice.

> "So it was obvious that that was the way to go to get the money, because the government were putting money aside into these groups and we could then claim it and get some." (Charlesworth, 2012)

Charlesworth contacted NFNPA for more information and advice, since he did not know much about renewable energy or what technologies he may be looking to use in the building. His main contact at NFNPA was Claire Gingell, who had joined NFNPA at its establishment in 2006 and had been directly involved in setting up a funding programme for local groups, the Sustainable Development Fund (SDF) (Gingell, 2012).

SDFs were launched in 2000 in Wales by the Welsh Government and then rolled out across English National Parks by the Department for Environment, Food and Rural Affairs (DEFRA). All national parks in England and Wales were given an additional sum of money on top of their standard grant, with which they had to set up an SDF (Gingell, 2012). Even though the National Park Authorities were able to set up SDFs largely on their own terms, they had broad guidelines from DEFRA. These specified SDF schemes had to be user-friendly and flexible, and support projects that showed environmental, community and economic benefits to the National Parks. Before setting up the SDF in 2006, Gingell's

[23] SEEDA closed at the end of March 2012 as a result of Government policy to close Regional Development Agencies.

manager at the NFNPA had been able to visit other National Parks and see how they had set up their SDFs. This had meant that the NFNPA had been able to cherry-pick aspects that they liked and leave out the elements that they did not like about other SDFs. Hence, they were able to learn from others' experiences and identify issues that had worked well and issues that had not worked so well. For instance Gingell (2012) said that the NFNPA wanted to make their SDF application process as simple as possible, not ask for any more information that was necessary and provide help and support for the applicants throughout the process.

Gingell managed the SDF grant scheme for six years as an SDF Project Officer and later moved to a role of Project Delivery Manager (she moved on from NFNPA to another organisation in 2012). Her role involved helping with SDF applications, assessing projects and evaluating them (Gingell, 2012). The role of the SDF Project Officer was very much a supporting role in terms of answering calls from people about their project ideas, talking these through, giving advice, going through paperwork, helping out with the SDF applications and visiting potential projects (Gingell, 2012). Charlesworth initially contacted Gingell for advice about the funding programme, as well as what sustainable energy measures they could consider.

> "They phoned me up and said we really want to use green energy in the new building but we've got no idea how to go about it or what that energy should be or where to get advice, can you help us?" (Gingell, 2012)

Gingell said that this was very typical of the questions they received at the NFNPA in relation to renewable energy and that there was a constant demand for independent information about various options.

> "A community group, or even a private householder often wants to put in green energy and do the right thing, but they can't get any independent advice. The solar panel companies will tell them they should go with solar, and the biomass companies will tell them to go biomass and they really struggle to get that independent advice on what is best for their situation." (Gingell, 2012)

As a first step Gingell advised Charlesworth, that they should find out what the Community Centre's heating and electricity requirements were and how those could potentially be addressed through energy efficiency and renewable energy measures. In order to do that, Gingell encouraged Charlesworth to apply for a grant from the SDF for an independent energy feasibility study to establish the building's energy requirements. Gingell also helped Charlesworth with the actual SDF application form and how it should be filled in (Gingell, 2012).

4.4.2.2 Applying for funding

On the NFNPA's advice, the Community Centre submitted a funding application to the SDF and they were granted funds for the energy feasibility study. It was the first feasibility study that the SDF had funded and initially the SDF committee had some discussions about it as they had to ensure that it was the best use of tax payers money (Gingell, 2012). The SDF committee had to consider what might happen if the feasibility study came out as negative, as in there not being a good enough case to install renewable energy at the Community Centre or in case it would spark a stream of other feasibility applications (Gingell, 2012). However, for the reason of the lack of independent information about renewable energy, the SDF committee decided that it was actually a good way to use grant money, so the Community Centre, instead of just going for the easy option and installing a gas-fired boiler, could seek that independent advice on viable alternatives (Gingell, 2012). Furthermore, as the SDF's key objective was to get people from having a great idea, to actually having a well-worked out project, funding the feasibility study also met the SDFs objectives of helping projects with their initial ideas (Gingell, 2012).

The successful SDF application meant that the Community Centre was able to have an independent energy feasibility study conducted. Energy consultant John Peaple, based at nearby town of Salisbury, undertook the feasibility study. He assessed the existing building and identified which energy efficiency measures could be put in place and then looked at various renewable energy options including solar thermal, solar PV, ground source heat pumps and biomass. First, the study highlighted several energy efficiency measures that could be incorporated into the refurbishment programme, including lowering the ceilings, changing doors and windows, and installing extra insulation. Second, the study concluded that after energy efficiency improvements, biomass would be the most economical renewable energy option[24] for the Community Centre.

Once the feasibility study had established that biomass was the best option, Charlesworth was encouraged by Gingell to apply for further funding from the SDF in order to develop detailed plans for the biomass system. The NFNPA also had its own motives for funding the project and they had discussions about them with the Community Centre. The NFNPA was interested in supporting the use of biomass energy in order to encourage sustainable management of local woodlands (Gingell, 2012). There are vast amounts of private woodlands in the New Forest National Park, some of which have not been managed for 50-60 years, mainly because there have been no incentives to manage them (Gingell, 2012). Hence the NFNPA had a motive to encourage such woodland to be managed sustainably, taking wildlife and conservation issues into consideration (Gingell, 2012).

> "I was hoping, enormously, that the answer would be biomass and the answer wouldn't come back and say ground source heat pump, because although that would be great for climate change reasons, it wouldn't meet our, desire to bring woodlands back into management and things like that. So I was really hoping that biomass was going to be the answer. I've got enough knowledge to realise that there was a fair chance it would work out as an answer." (Gingell, 2012)

The NFNPA saw that wood fuel production could give landowners an incentive to manage their woodlands and do it sustainably. The NFNPA thus had a two-fold interest in the

[24] At the time, the UK's Feed-in-Tariff, which provides revenue support for renewable energy generation and has made solar PV installations an attractive option for several community energy projects, did not exist (FIT was launched in the UK in 2010).

Community Centre's biomass project: to bring woodlands back into management and to replace fossil fuel-based energy systems with carbon neutral options (Gingell, 2012).

Charlesworth also received help and advice from the local Forestry Commission, from whom the Community Centre leases its land, as one of the members working at the Forestry Commission, Mark Street, had installed biomass in the Lake District. For Charlesworth, finding more about the technology "*was a case of gathering around all the information that you could possibly get about the project and where you wanted to go.*" (Charlesworth, 2012). At times this was difficult, as Charlesworth had not dealt with renewable energy before, let alone community energy, and for example the local architects that he spoke to were as limited as him in their knowledge to start with. However, Charlesworth was determined and had the confidence to seek advice, especially from the Forestry Commission and the NFNPA, soon becoming more knowledgeable about the possibilities for biomass technology: "*The learning curve was very quick*" (Charlesworth, 2012).

Following the results from the energy feasibility study and Gingell's advice, Charlesworth proceeded to apply for a second grant from the SDF, in order to develop design plans for the biomass heating system. Given the NFNPA's interest in biomass, they were also keen to find out how such a system could potentially work in a scale such as the Community Centre (Gingell, 2012). SDF had previously provided funding for a biomass district heating system in a more domestic setting, on Ipley Manor estate, which consists of five houses (Gingell, 2012). The Ipley Manor projects obtained their wood fuel from their own woodlands, in effect bringing their woodland back into management to provide the fuel to heat properties on the estate, along the lines of NFNPA's goals for increased woodland management in the New Forest. The supportive role of the NFNPA, as well as the Forestry Commission to some extent, was clearly to act as an intermediary organisation in the

Lyndhurst case, advising and providing guidance to the project as well as connecting projects such as Ipley Manor and the Community Centre.

The second SDF application was also successful, securing a £3,754 grant, which was 75% of the total £5,005 project costs (the Community Centre covered the rest) for detailed design plans for the biomass system and how it could be incorporated into the existing heating system (Charlesworth, 2012). This included issues such as sizing the biomass boiler, how it would fit with existing pipe works and the existing gas heating system and identifying a location for the wood fuel storage.

During the second SDF grant application, Charlesworth noted that one of the SDF committee members, Rob Dewing, also lived in Lyndhurst. Dewing had joined the SDF panel in 2009 following an advert in the local paper for SDF panel members representing the business community in particular (Dewing, 2012). Dewing, an engineer, had lived in Lyndhurst for 10 years and run his own business building websites. He had been involved in small business lobbying through bodies like the Federation of Small Businesses and he also had a personal interest in renewable energy. Dewing had been to two SDF panel meetings before the Community Centre's second application came in and he was aware that refurbishment plans were going ahead (Dewing, 2012). After the Community Centre's second successful bid to SDF, Charlesworth contacted Dewing with an aim to get him to help with the refurbishment project. Charlesworth was especially impressed by Dewing's interest and knowledge in renewable energy and thought that he would be an ideal person to help with the biomass project (Charlesworth, 2012). However, that meant that Dewing would no longer be able to deal with any future SDF applications from the Community Centre (Dewing, 2012).

> "He phoned me and said "You live in the village, you've obviously got some knowledge of both the technology and the funding process, would you join our project team?" and I said "Well, you realise that'll prejudice my ability to, in the panel role, deal with any future applications from the Centre?" and he said "Yeah, that's fine. I'd rather have you working on our team, running the project than on the panel giving us the money." (Dewing, 2012)

Charlesworth was happy with this, as for him, it was more important to have someone who lived locally and knew of renewable energy, to come and help with plans for the biomass heating system. Building networks and capabilities was important to Charlesworth at this stage of the project. Dewing and Charlesworth for example visited the Ipley Manor estate and their biomass scheme and spoke to New Forest Energy, a local wood fuel supplier (Dewing, 2012). The visit to Ipley Manor was one of the most useful ways of finding information about biomass as Dewing was able to see for himself an actual installation in real life (Dewing, 2012). This visit was particularly useful regarding information about wood fuel and Ipley Manor's experiences on aspects such as what good consistency wood fuel is like, how the wood fuel should be stored and what to expect from its performance (Dewing, 2012).

The second SDF grant allowed the Community Centre to approach potential installers for quotations for the biomass system and Dewing did internet searches for biomass boiler suppliers and contacted several companies. They also proceeded to make a third and final funding application to the SDF regarding the actual purchase and installation of the biomass boiler. The LDCA committee chose local company New Forest Energy[25] as a supplier for the biomass boiler, as well as for the woodchip fuel. They supply several other installations in the area and their quote was reasonable and they seemed to have good technical knowhow (Dewing, 2012). Furthermore, as the company was based in Hinton Admiral, eight miles from Lyndhurst, they were able to provide the wood fuel with a relatively small ecological footprint as it did not have to be transported from far (Dewing,

[25] http://www.newforestenergy.net

2012). The supply contract was negotiated for one year at a time (Dewing, 2012). The fact that New Forest had local wood fuel supply available, was a positive encouragement for the Community Centre:

> “When you look at where you're going to get your wood fuel from that is key, because there's no point in buying it from abroad in pellets, you need a local wood chip company, we're fortunate where we live, there are plenty of woodlands around us.” (Charlesworth, 2012)

The third SDF application was also successful and the Community Centre was awarded the maximum possible grant of £25,000. This covered 37% of the total biomass project costs of £67,132. Through his earlier search for funding opportunities, Charlesworth had identified several organisations in addition to the NFNPA that could be potential funders for the refurbishment project. The Big Lottery Fund and especially its Community Buildings programme seemed relevant (Charlesworth, 2012). Charlesworth thought that the Big Lottery was really worth considering as they had grants that would be large enough to fund a considerable part of the Community Centre’s refurbishment project (Charlesworth, 2012). At the same time as Charlesworth was in contact with the NFNPA about the SDF grants, he was also filling in a much larger, £434,000 funding application to the Big Lottery. The refurbishment application included details for a range of renovations such as extending the existing building to create a new multi-purpose hall, enlarging and modernising the hall’s 48-year-old kitchen area, and doubling and refurbishing the public library space.

Charlesworth spent much of his time during 2008 finalising the Big Lottery application and the other strands of funding that he had identified, mainly the SDF, local authorities and organisations. Especially the Big Lottery application took time as it required a detailed three-year business plan, making the application “*very difficult*” (Charlesworth, 2012):

> "Lottery funding was a lot of work, because you had to provide a big business plan for three years, estimate all your outgoings and income for three years, give numbers of what it would increase the usage by, by each part of the building. So, for example the library, 800 users a month were using the library, we said it would up to 1200 a month, it actually moved to 2000 a month, so we doubled our usage, more than doubled our usage, you know, and they were the sort of outcome figures that you had to put into that funding application." (Charlesworth, 2012)

Especially estimating the future usage of the building was a tricky task to do:

> "Finger in the air [laughter] I had an idea of what we would be able to get and we took all our regular user groups, we put in new activities that we thought we would get and that has come to fruition, we have got them in. It took a long time to sit down and work out the answer to the questions that were being asked and really, it was on a wing and a prayer that you got there, because you didn't really know what was going to happen, but you had to put a figure against something that was a vision, where you're going, but it worked and we did that and it worked very well indeed." (Charlesworth, 2012)

Making the funding application also took time, "*a good 104 full days of work, because by the time you contact people and they come back to you and you go back to them and you have meetings, it's a lot of work.*" (Charlesworth, 2012). Furthermore, the process of talking with contacts at the Big Lottery, as well as with all the contractors that were involved in the project (such as architects, builders and other workmen) required persistence from Charlesworth in terms of co-ordinating everything. "*You had to show quite a lot of determination. I know a lot of people give up halfway through a Lottery application or a funding application.*" (Charlesworth, 2012). Even though the funding applications took a lot of effort, Charlesworth was nevertheless in a good place to manage those, given the skills he had accrued during his working career:

> "I used to be a national account manager and used to negotiating with all the top retail accounts in the UK with their boards on trading terms. So I had the background financially to know exactly how you put bids together." (Charlesworth, 2012)

Furthermore, Charlesworth was supported throughout the various funding applications by the Community Centre's committee members, especially Dewing with the third SDF application, as well as the funding organisations that he was dealing with. Dewing himself had not been involved in similar funding application processes before, so for him it was quite a learning experience (Dewing, 2012). Charlesworth praised the Big Lottery especially for their help and support throughout the application process (Charlesworth, 2012).

> "I must congratulate the Lottery on the amount of support they gave us, because if you had a problem, you could ring them up and they'd give you the answers and tell you what to do. I found the Lottery very supportive of our application, which was tremendous really. They were on the end of a phone, on the end of an email, you could contact them and if you got back to them today and they were out of the office, they would be back to you the next day." (Charlesworth, 2012)

The Big Lottery made a decision on the Community Centre's funding application in December 2008 and the Community Centre was awarded £434,000 for the refurbishment project (Charlesworth, 2012). In addition, a further £354,000 was raised from other organisations and the local community in Lyndhurst. For example, the Community Centre received money from Rural Development Programme for England (RDPE) Leader, a European-wide initiative which provides funding to rural communities, and which is managed by the New Forest District Council. The NFNPA had encouraged the Community Centre to apply for the Leader funding too. The various organisations that provided funds for the refurbishment project are outlined in Table 17 below:

Funding for Lyndhurst Community Centre refurbishment	
Organisation	**Funding**
Lyndhurst Parish Council	£4,000
New Forest District Council	£30,000
New Forest National Park Authority	£30,000
South East England Development Agency	£50,000
Hampshire County Council	£80,000
Local community	£160,000
The Big Lottery	£434,000
Total	*£788,000*

Table 17: Funding sources for the Lyndhurst Community Centre refurbishment

Acquiring all these strands of funding required effort and even though this thesis only concentrated on the NFNPA funding, it should be noted nevertheless that Charlesworth spent a considerable amount of time securing funding from the various sources.

4.4.2.3 Engaging the local community

One of the key motives for the Community Centre refurbishment was to ensure the building's existence for future generations to come. For Charlesworth especially it was important to take into consideration the younger generation of users and how they may want to use the Centre now and in the future. So for example, the refurbishment plan included a new library which had a section dedicated to children's books and activities (Charlesworth, 2012). Furthermore, it was important for Charlesworth to have younger people involved in the running of the Community Centre and he was especially pleased that they had managed to recruit Dewing to the project team (Charlesworth, 2012). Dewing himself had not been particularly active in the Community Centre before, apart from attending some of the meetings and events (Dewing, 2012). When Dewing joined the project team he had no particular plans to become an active member of the Community Centre, but he soon found himself getting more involved:

> “I never planned this but I've ended up as chairman, because we had a retirement effectively, someone who had been chair for 10 years, something like that, decided she wanted to take retirement and no one else was rushing forward. It's interesting stuff, you know, you put a bit back into the community.” (Dewing, 2012)

Charlesworth was particularly satisfied that Dewing had become chairman, indicating the first signs of a generational shift in the LDCA committee, as well as continued building of community cohesion.

> “Lucky to get him as chairman, because one of the problems you'll find, whenever you're doing something like this, is committees are very difficult to form. Generation that I'm in all would go on committees, the younger generation are not so keen, they're very difficult to get involved. It's possibly because of their working life. I mean now, the husband and the wife work one, say, during the day, and one in the evening, they're looking after the baby. So they don't join committees, and we're finding that on a lot of the committee groups around now, the age is not getting any younger and you cannot get the younger people, because of their working situation, to join committees, it becomes very difficult. It's a society where the demands on parents today are quite high.” (Charlesworth, 2012)

The local community was involved also in the fundraising aspects of the refurbishment project. Charlesworth for example brainstormed a campaign titled “Buy a Brick”, which gave the local community an opportunity to donate money towards the refurbishment project and have a symbolic ownership of a brick in the Community Centre. This was a good way to inform the local community about the refurbishment project, as well as give people an opportunity to feel that they were building the future of the Community Centre together. Charlesworth’s marketing skills were evidently beneficial in the aspect of involving the local community in the refurbishment project.

One of the objectives for the refurbishment project was that the Centre would hold an Open Day at the end of the project, to showcase the transformation of the building (Charlesworth, 2012). In effect, the team had thought from the start that it was important to be open about their potential achievements and be ready to share those lessons with others. From Charlesworth's interview it also became evident that the village of Lyndhurst was a place where people were happy to live and take part in the local community, and this was something the project also benefited from. The village of Lyndhurst has facilities such as a theatre, a tennis club, a bowling club and three churches, and as Charlesworth (2012) described it, "*we all work together, so it's quite a big difference to some villages in some places you go to"*, indicating that there was a good amount of pre-existing community cohesion in the Lyndhurst area.

4.4.2.4 Project delivery and outcomes

Once the Big Lottery Fund and the NFNPA grant for the biomass boiler had been secured, as well as funds from other organisations, the Community Centre was able to start the refurbishment project in June 2009. The very first thing that Charlesworth did, was to set up a dedicated project team which oversaw the refurbishment project. The project team included building contractors Blaydon Developments Ltd, architects Searle and Searle, surveyors Howard Brindley Partnership and solicitors Paola Russell, as well as the LDCA committee members. The Community Centre also appointed a project manager, which Charlesworth (2012) said was "*a very good investment because he worked with the architect and contractor and attended every meeting*". Furthermore, as the project manager had knowledge about buildings and materials, he was able to advise on costs and work with the building contractor (Charlesworth, 2012). Before the actual building works started, the Community Centre actually requested the money from their funders in advance, as they did not have large cash reserves to draw on and they wanted to ensure that their cash flow was healthy during the project.

> "Cash flow is so important, because the contractor needs his money on time to pay for all the stuff he was bringing in, and if you don't do that they can't work. It was something that we had worked out way before we started the project, we had a plan and we knew exactly. We actually told the Lottery when we wanted the money and we broke it down by month, so that they knew exactly where they were." (Charlesworth, 2012)

One of the vital issues for the refurbishment project was to keep the Centre, or at least parts of it, open and functioning during the work. This was not only important for keeping income coming in, but also for allowing various groups to continue to use the Centre during the building work.

> “We wanted to keep the Centre open, so what we did we'd made certain rooms available for the contractors to work in and the other rooms were being used for meetings. We actually pulled in a Portacabin at the back and continued meetings out there, to keep the business going in the centre, so we didn't let groups down. And then it was run with running water and electricity and heating and it was a large Portacabin and we hired that for the duration of the contract. You either close the Centre down and get no revenue, but we managed to keep our revenue going which contributed towards the cost of the whole operation.” (Charlesworth, 2012)

For instance the part of the building housing the library was closed completely during the project. However, a mobile library was placed in the car park to allow people to continue lending books. Charlesworth stressed that in order to keep the Centre open during the project, it was “*essential that you plan ahead on it, if you don't plan ahead, how are you going to operate?*” (Charlesworth, 2012). In order to do that, the project team had fortnightly meetings with the aim of keeping progress and budgets in check, ensuring that any problems, risks or issues arising would be dealt with in good time: “*The plan we had went to plan because when you're having every two-week meetings, you do the plan according to what you've got going on at the time*” (Charlesworth, 2012). This was especially useful if there were small budgetary changes that needed to be agreed to. Furthermore, Charlesworth was adamant that using local contractors was beneficial in several ways (Charlesworth, 2012). They were easily contactable, flexible to small changes, and most importantly, had an interest in the local area and wanted the project to succeed (Charlesworth, 2012), as subsequently their names and hence future reputation would be linked to how the refurbishment project was carried out and completed.

Dewing too was actively involved in the refurbishment project, as in effect he was the only person on the project team who had previous knowledge about renewable energy (Dewing, 2012). This was especially helpful as the project's building designer for instance had not installed biomass before and he took some convincing by both Charlesworth and Gingell to come around to the idea of biomass and its suitability for the project (Charlesworth, 2012, Gingell, 2012).

One key stage during the biomass installation was that the Community Centre needed to apply for a planning permission for the biomass wood fuel storage building from the NFNPA. Charlesworth found the planning application fairly straightforward and the actual decision took the usual statutory required time for planning applications (Charlesworth, 2012). The NFNPA's planning team had already been informed of the biomass project by the SDF team (Gingell, 2012). However, Gingell (2012) pointed out that an SDF grant did not automatically mean that a project would also receive planning consent, but that planning regulations still applied and were considered for each project individually. For example with the Community Centre's planning application, one of the key issues was logistics and access to the wood fuel storage building by delivery trucks. The roads in Lyndhurst are narrow and hence the car park adjacent to the Community Centre proved to be the best site as it had relatively easy access and it would also be fairly empty in early mornings when deliveries could be made. Once the planning application was approved for the wood fuel storage building, the biomass installation began in January 2010. By this time, most of the building's refurbishment work had been completed. The actual installation of the biomass boiler was relatively straightforward and it was installed in one of the storerooms. However, constructing the wood fuel storage building in the car park proved more complicated. When builders started to dig a pit for the wood fuel storage building, they suddenly found an unknown water spring underneath. This meant that the project team had to purchase an extra water pump and adjust designs for the store building. The storage building had to be relined three times, which meant that it was reduced by 15% in size (Dewing, 2012).

The discovery of the water spring was a big surprise to the project team and caused an unexpected delay of about a month. Despite this set back, the project team still met their target completion date as the team's regular meetings ensured that when problems emerged they were able to deal with them swiftly (Charlesworth, 2012). Dewing was certain that without Charlesworth's involvement and dedication, the refurbishment project probably would not have happened:

> "The total project, not just the biomass side of it, but the total building refurbishment project has only happened and certainly only happened in a feasible timescale because it's had one very strong-minded individual driving it." (Dewing, 2012)

Gingell, meanwhile, was impressed by the project team's commitment to the biomass system:

> "There's so many points throughout the building work and the whole refurbishment project when it would have been much easier to just say "Do you know what? Shall we just put a gas boiler in and let's just forget this. It would be cheaper, it would be easier, and it would be quicker," but they didn't, they were absolutely committed to it from that first piece of survey work that was done that said "Biomass is your best option", they've kind of never questioned that, they've been absolutely committed to it." (Gingell, 2012)

The Community Centre also had local volunteers helping to guide users, so that in the midst of the building site, they knew where to go and did that safely (Charlesworth, 2012). Charlesworth also pointed out that using local contractors was key to the project's success, meaning that if ever there was an issue, local people were able to "*come in at short notice and meet you, and if they've got a problem they'll come and talk to you*" without adding to the overall cost of the project (Charlesworth, 2012), instead of having to "*remote control*" contractors: "*someone like a major contractor, nationally, he doesn't have the same local effect and communication that you get locally*" (Charlesworth, 2012).

As mentioned earlier, planning and regular meetings were key to the project's success, but so was good communication with the local community. The local community and users of the Community Centre were kept up to date about various stages of the refurbishment via the Community Centre's monthly magazine, and this communication was, according to Charlesworth, also an important part of the project plan (Charlesworth, 2012).

> "We used our What's On magazine to communicate to the community what we were doing each month, so they knew when we were doing the Lyndon Hall, or they knew when we were doing the library, or they knew when we were doing the Beech Room, or Pine Hall, exactly where they couldn't go and we actually asked them for their understanding and everyone did a fantastic job." (Charlesworth, 2012)

Once the installation of the biomass boiler was completed, Dewing was busy learning how the boiler and the new heating system works (Dewing, 2012). This involved learning how the system works and also learning about the importance of good quality wood fuel. Even though he knew something about renewables, he "*went through a fairly steep learning curve about biomass*" (Dewing, 2012). Dewing also taught the Community Centre's part-time caretaker Bubb how to use the heating system. However, Bubb was also able to learn 'on the job', often also surprising Dewing by how much she learnt by herself (Dewing, 2012).

At first there were some problems with the new heating system and it became apparent to Dewing that a biomass system is not a fit-and-forget installation in the way that for example a gas-fired system might be (Dewing, 2012). The biomass boiler for example requires regular maintenance - it has parts that need to be greased and parts that require brushing ash off them on a regular basis. The Community Centre experienced a number of boiler outages in the first year, which were triggered by issues such as sensors picking up wind gusting in the chimney. Running of the biomass system required, at times, a fair amount of attention and someone with reasonable awareness of engineering skills to be available to help if required (Dewing, 2012). This indicated that Dewing too had to learn new skills and ensure that it fitted with the building's requirements. Despite the initial teething problems, however, the system had overall proved to be reliable and in the first two years of its operation it had worked relatively well (Dewing, 2012). Furthermore, Dewing mentioned that there had been a big improvement on the energy performance of the building as a result of the refurbishment: "*The entire new extended centre has a lower energy demand than the old, smaller centre*" (Dewing, 2012).

The Community Centre refurbishment also largely met the objectives and expectations set by Charlesworth and the LDCA from the start. For instance Charlesworth mentioned the improved facilities at the library aimed at the younger generation:

> "The other great thing about this refurbishment was the children's corner we put in the library. The children's activities now are fantastic and they really do love it and they do reading stories there, they do little plays there, they have different people come along and talk. It's quite fantastic really, you know. And just putting that corner in there made a big difference to the community, because now the young children come in here." (Charlesworth, 2012)

The total number of users of the library had almost doubled with around 2,000 people using the library each month after the refurbishment. Furthermore, Charlesworth was pleased that the Community Centre had new computers and an internet connection installed, which also had disabled access. Furthermore, there was a small office space and meeting rooms available to hire, which had proved popular especially following the recession as firms have downsized from relatively expensive hotels to the Community Centre, which can also provide them a reasonable catering package (Dewing, 2012). Others too had noted the success of the refurbishment project:

> "I suppose one of the highest accolades is that the local councillor have said it's one of the best community centres that he goes to in the New Forest at the end of it and he'd like to see other community centres pulling together like we have here, because you can do everything here and it's really become quite a commercial operation." (Charlesworth, 2012)

Furthermore, the Community Centre had benefited from good revenue income, which has increased over the years, and Charlesworth was expecting this to continue in coming years. When he started at the Community Centre in 2001, they turnover for the Centre was approximately £35,000-40,000 a year, while in 2011 it was £110,000, and in 2012 £120,000 a year. Charlesworth pointed out that this was not a large income and most of the Centre's activities were "*low-key stuff, where table tennis pay £1 to play, or £2. Bowlers pay £3 to play bowls, with a cup of tea, for an afternoon, so it's all subsidised*" (Charlesworth, 2012). The Community Centre charges different users different rates, which means that as businesses pay commercial rates, these allow rates to remain low for other users (Charlesworth, 2012).

Charlesworth said that what really set the Lyndhurst Community Centre apart was that "*you have to have a personal contact within the centre*" (Charlesworth, 2012). The Community Centre is open and manned seven days a week, all day Monday until Friday, and then part of the day on Saturday and Sunday: "*Now, when you walk in, someone will always come and meet you in this centre, at the reception area, it's a personal touch and it makes one awful difference.*" (Charlesworth, 2012).

Despite the effort and time it took to develop the refurbishment project and run it, Charlesworth did not sit back and relax once the project was completed. Charlesworth seemed very dedicated in his role as the Centre Manager and despite several plans for retirement there were always ways to improve the Community Centre, which have kept him busy: "*I was going to retire after one year, I was going to retire last year and then suddenly our floor went, so I've just raised £33,000 to have the floor done.*" (Charlesworth, 2012). In fact, he said that he was looking at ways by which to improve the Community Centre.

> "I'm so involved in if you like pushing the centre on to other things and looking for new activities, and a vision of where it should be in three years' time. I'm a believer that you cannot sit still, you've got to change things as you go along." (Charlesworth, 2012)

His future plans included for example the installation of a projector in the Community Centre as there was no cinema in Lyndhurst and a funding application for a skittle alley. Charlesworth said that it was vital for any community centre's future that they evolved over time, especially regarding new technology and its use in community halls.

> "I think community centres are essential to villages and towns. When you look back, village halls used to be the place to go to and things to do. You've got to keep up with new technology and bring it into the centres and offer the public that type of activity." (Charlesworth, 2012)

One of the benefits from the refurbishment project was that, as Charlesworth and his team had already successfully delivered such a large project, it was easy for them to go to other funders and demonstrate that they were a good candidate to award funding to and would meet their objectives, as well as have some matched funding available (Charlesworth, 2012). This shows how the benefits from running a community energy project can reach wider than just the immediate energy project.

4.4.3 Transferable lessons

In terms of transferable lessons from the Community Centre refurbishment, there have been lessons both to the local community, as well as the biomass funding organisation NFNPA. The refurbished Lyndhurst Community Centre was officially opened on Friday 26th March 2010 and the opening ceremony was the culmination of hard work of all those people who were involved in the refurbishment project, especially Charlesworth, the project team, the LDCA committee and people from the village.

Around 200 people attended the opening, including representatives from all the organisations that funded the project. The biomass heating system especially amassed a lot of interest and people wanted to know how the technology works and where the wood fuel comes from (Charlesworth, 2012). Speakers at the event included representatives from the LDCA, The Big Lottery, NFNPA, New Forest District Council, local Member of Parliament Dr Julian Lewis, as well as Charlesworth.

Charlesworth was really touched by all the support he had received during the project, especially from his family, friends, the project team and funders (Charlesworth, 2012). Even though it was clear that the project was initiated and largely led by Charlesworth, he could not have done it all by himself and the opening event gave him a chance to thank those around him.

> “I needed the support of my family because the hours I was putting in, my wife and my children, they supported me to the hilt, which was fantastic, because when I needed help, when I wanted to discuss something, they were there as well. So, I think that the commitment is a major part and it does take a lot of work. I let myself down at the opening a little bit because when we'd finished our presentation, when I came to the bit where I had to thank my wife and family, I cried and the reason for that is you suddenly realise that you've done it, you've achieved what you wanted to achieve and that was fantastic.” (Charlesworth, 2012)

As part of their funding to the Big Lottery Fund, the Community Centre had offered to volunteer to show the building in an Open Day situation for people to come and see what they had achieved. For example in September 2011, the NFNPA and the New Forest Transition group organised an event called ‘Green Open Doors’ in which also the Lyndhurst Community Centre took part. The event mainly involved small private properties, so people were able to visit those houses and see what sustainability improvements they had installed. However, in the day the Community Centre only received three visitors, which was disappointing, given that for example one of the private house owners who had taken part in the event, had had 60-70 visitors (Dewing, 2012). With this particular event, it seemed that “*the interest was primarily in what people could* *do with their homes rather than what would be done on a larger scale with a community building"* (Dewing, 2012).

However, despite the small number of visitors to this event, the Community Centre has acted as a reference point to other visitors and the NFNPA has used it as an example for several other community groups: "*We still point people in that direction to go and look at what they've done*" (Gingell, 2012). The New Forest Transition group too has used the Community Centre as an example of biomass use in the New Forest area (Charlesworth, 2012), while more commercial operators of Southampton Airport, Southampton Council and Bournemouth Airport have visited the Community Centre to find out more about the biomass system (Dewing, 2012). Furthermore, several other community centres have been to visit and see the biomass system, while Charlesworth has talked about the project in regular meetings organised by Hampshire County Council for community centre managers (Charlesworth, 2012). These meetings have lead for example to new customers for the wood fuel supplier New Forest Energy.

Throughout the Lyndhurst Community Centre's refurbishment project, Charlesworth was very active in using his existing networks:

> "One of the benefits from my point of view is I'm on the parish council, I'm president of the bowls club, I belong to the Chamber of Trade and I run the community centre. So all of those arms that I'm on going out, communicate to people about the Community Centre." (Charlesworth, 2012)

In addition to visits from people, the Community Centre has also inspired their landlord, the Forestry Commission to consider renewable energy. The Forestry Commission applied for a grant in 2012 from the SDF to do a feasibility study on the potential of its office building to be joined into the Community Centre's biomass heating system as the Community Centre had more heating capacity than they need. According to Gingell, at the time of the initial Community Centre application, the Forestry Commission was supportive of the project as a landlord but they did not consider installing renewable energy themselves (Gingell, 2012). Gingell said that with hindsight it would have been ideal to develop a larger biomass system from the start, that would have provided heat for several buildings in Lyndhurst:

> “It would have been ideal at the time to have put in one district heating system that would have done the New Forest Centre and the Community Centre and Queen's House [Forestry Commission office], but just at that time the Forestry Commission weren't that interested, they'd got other things on their plate and sometimes you have to go where the energy is in community projects and that might not always be quite where you want it to be at the time, and when you look back, you think, “Oh well, if we'd done this at the same time, it might have been easier, but sort of go with what you've got at the time.” (Gingell, 2012)

However, having seen the positive experiences the Community Centre had witnessed, the Forestry Commission was inspired to consider options how they could potentially benefit from using renewable energy in their own heating system (Gingell, 2012). This shows how projects can be inspired by others’ experiences, but also calls for more effective intermediation in the case of Lyndhurst. Even though the NFNPA acted partly as an intermediary organisation in the Community Centre’s case, their SDF programme too was in its early stages of development at the time and it was only later that their role had became more facilitating one between projects:

> “If somebody came to us now and said “Oh, I'm thinking about putting in a biomass boiler,” we'd say “Go and talk to John Charlesworth, go and see his system, go to John Pemberton, go and see Oakley Manor”. We would do that and everybody that's had a grant from the SDF has only been too happy to share their experience with others and we try and do that across the national parks, as well. So between the national parks we meet up once a year and we visit each other's properties.” (Gingell, 2012)

The processes at Lyndhurst case indicate trans-local phase of knowledge sharing in niche development, where intermediary organisations are predominantly still translating learning from local projects (Geels and Deuten, 2006), rather than actively seeking opportunities for new projects to be developed (see Figure 13 below).

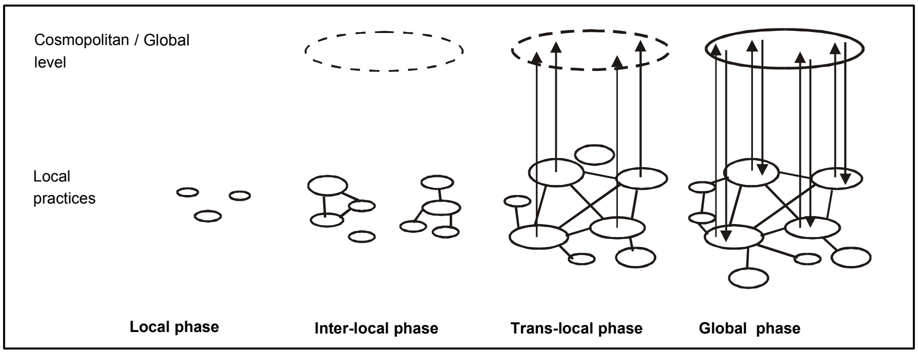

Figure 13: Different phases of knowledge sharing from local to global phase (adapted from Geels and Deuten, 2006, p.269). Note that this figure first appeared in Chapter 2 of this thesis.

One of the issues that Charlesworth especially wanted to mention in regards to how projects such as theirs could be further encouraged, was that he felt that the government was not doing enough to support community projects and more needed to be done to improve communication and information about various funding sources (Charlesworth, 2012). Charlesworth also saw the government's 'Big Society' rhetoric popular at the time as something that did not have to be created separately as it was already in existence in many local communities (Charlesworth, 2012).

> "I do not believe the government do enough to support community centres, it's out there, and the funding's out there, but they're in so many different areas, that it takes so much research to go and look at it and so much paperwork and that takes a long time. When you talk about the big society we've got the big society here now, way before it was mentioned by government, because a big society is about everyone in villages pulling together and operating as groups." (Charlesworth, 2012)

As mentioned earlier, since the data collection of this DPhil thesis, the UK government has launched a Community Energy Strategy, which outlines the government's key objectives for supporting the community energy sector in the UK, including details for improved communication about funding opportunities and advice.

It seems that especially in the case of the Community Centre, the role of Charlesworth was vital, as Dewing described it:

> "A critical success factor has been having a professional in the person of John, who's very diligent in terms of keeping an ear out for any funding opportunities and very thorough in making sure that those are followed up. I never cease to be amazed at the things for which he continues, even now, to find money from, for example, Hampshire County Council for all sorts of different things. Last year they devoted funding to activities for youth, for example and suddenly I found we were running a street dance class here, because you could get grant aid for it. So he's very good at spotting those kinds of opportunities." (Dewing, 2012)

The SDF had funded around 100 projects at the time of the interviews, and Gingell too had noticed that as in the case of the Community Centre, successful community energy projects usually had a key lead person who had a supporting team behind them (Gingell, 2012). These people were "*always really busy*" (Gingell, 2012):

> "Like that expression if you want something doing ask a busy person. They always seem to be busy people, who've got lots of different things going on yet still manage to give the time to the project in a voluntary capacity." (Gingell, 2012)

The refurbishment project in the Lyndhurst Community Centre took a lot of time and effort. However, since its completion, Charlesworth has not rested nor retired, but as Dewing also said above, has kept on finding ways to improve the Community Centre further, being on the lookout to find funding to provide services that do not exist in Lyndhurst. As Charlesworth himself said, "*You've got to evolve it all the time really, keep it going*" (Charlesworth, 2012).

The Lyndhurst Community Centre case shows that community energy projects can take a lot of personal effort, dedicated time, as well as a mix of skills and the willingness to learn new ones. Seyfang et al. (2013a) talk about the building of 'emotional stamina', which includes having "*the determination, resilience and soft skills needed to deal with setbacks* *and lengthy project development phases*." (Seyfang et al., 2013a, p.15). These soft skills, however, may not be as easily translated by intermediary organisations and transferred to other projects, as for example guidelines about how to search for funding opportunities or fill in application forms might be. Furthermore, there may be a risk that projects ground to a halt if the key lead person decides to leave or for some reason cannot continue with the project (Gingell, 2012).

4.4.4 Conclusions on the Lyndhurst Community Centre project

4.4.4.1 Local contextualisation

Niche literature states that voicing expectations is important for projects for two reasons, for (1) guiding direction for innovative activity as experience from these activities are translated to search heuristics and (2) expectations can be used strategically in order to attract resources from potential sponsors (Raven and Geels, 2010). In the case of Lyndhurst, there was evidence that the strategic positioning of expectations from the project as being beneficial to the whole community was helpful in terms of attracting external funding and this was also an experience that other projects could learn from. As Charlesworth explained it:

> "If planned correctly you could replicate what we've done here in community centres or village halls, the biggest problem is funding and knowing where to get the money. That was the hardest part of the whole project in my opinion. It wasn't the carrying out and the managing of it. Not everyone, I mean if you've been experienced in doing that sort of thing, it's quite easy to do, the hardest thing is to get those forms filled in correctly and get the right answers, because some of the questions you can easily give the wrong answer to. What we did was kept it to basics and users in the village and the benefits to those people, not about the commercial side, it's about benefits to the community and I think that's why we had been so successful, because everyone could see that they were going to benefit from it." (Charlesworth, 2012)

The local contextualisation processes in the Community Centre case show that pre-existing local knowledge, contacts and networks can be really beneficial for groups such as the Community Centre team. Charlesworth and Dewing were both very able to use information available on the internet and both mentioned that they used search engines and various websites to find information. In Charlesworth's case this was mainly information about funding sources, while Dewing's concentrated on biomass technology. Even though neither had completed any funding applications for renewable energy before, both had pre-existing capabilities that helped them. Charlesworth was in a good position to lead the refurbishment project, having accumulated a range of skills in his working life at Unilever: *Excellent company to work with, gave me all the background knowledge I needed for this, to come in here*" (Charlesworth, 2012). Dewing, meanwhile, was good at seeking and digesting technical information relating to the biomass system. Charlesworth especially had good local knowledge of the Lyndhurst area and in developing the refurbishment project he was able to tap into those sources in relation to advice on funding and project design, as well as recruiting contractors for the project from the local area.

4.4.4.2 Negotiation and engagement

The negotiation and engagement processes in the Lyndhurst Community Centre case included several meetings with key stakeholders. The intermediary role of the NFNPA especially was central to the project (as well as the Big Lottery, but given the focus of this DPhil on energy, the NFNPA was concentrated on) as they had their own motives for funding the project and provided that support to the Community Centre project from the start of the project. Throughout the funding applications to the SDF, the help and advice that Charlesworth received from the NFNPA was crucial to the biomass project, not only in encouraging for them to apply for the SDF, as well as helping with complicated funding applications, but also helping by talking through various options and putting them in touch with another biomass project in the area. Without the NFNPA's help and involvement, the Community Centre might have chosen a conventional gas boiler, as their knowledge about renewable energy was rather limited.

While the Community Centre refurbishment project offered the LDCA an opportunity to improve the building and reduce the heating costs, for the NFNPA the project represented an opportunity to create local wood fuel supply, contributing to the objectives of sustainable forest management as well as aiding the local economy. This demonstrates how intermediary organisations such as the NFNPA can aid project development and also find synergies between different actors in a wider community energy niche - such as demand and supply of wood fuel for example. Raven et al. (2008) found in their analysis that while local contexts influence niche innovations, "*the implementation of the project also changed the context*" (Raven et al., 2008, p.474). This was certainly the case to a degree also in Lyndhurst, where the installation of the biomass boiler in the Community Centre was another opportunity for the NFNPA to pursue their objectives of bringing previously unmanaged woodland under sustainable management by creating further demand for wood fuel.

Charlesworth was very good at spotting 'local talent' and encouraging local people to get involved in the project. For example Dewing's role changed during the project and he became a grant applicant to the SDF on which he had sat as a committee member before. Charlesworth was very good at using his contacts in the village and encouraged this also in the project. It was also his enthusiasm towards using local contractors and builders that lead partly to the project's success as Charlesworth was always able to speak to everyone involved in person about any matters arising. Furthermore, there was a real sense that the local people in the village wanted the project to succeed and offered their help in terms of fundraising for instance via the Buy a Brick campaign.

Charlesworth set to create one of the best community centres in New Forest and he certainly succeeded to great amount. It was not only his determination, but also his vision for the Community Centre as a warm, open and practical local space, where people would happily come to, that carried the project through. As Charlesworth noted, the Community

Centre had become central to village life and the local community also agreed: "*It is the focal point of the village. We did an actual hate it/love it campaign, and we came out as one of the love its in the top 4, which is good.*" (Charlesworth, 2012).

4.4.4.3 Transferable lessons

The Lyndhurst Community Centre case shows how learning from such projects can happen at different levels for different people involved. For example Charlesworth had some very straightforward lessons that he wanted to share about the project including for instance utilising every possible funding opportunity, ensuring that there is money in the bank before the project starts, having a fool proof project and communication plan from the start, hiring a project manager, using local workmen and doing everything through one contractor if possible. Furthermore, there were lessons for the SDF too, for example seeing how a community project could be run from an original feasibility study all the way to completion.

The role of Charlesworth was central to the Community Centre's refurbishment and he was largely the driving force behind the project. Intermediary organisations, such as the NFNPA, can take learning from community energy projects such as the Lyndhurst case, and develop best practice guidelines on issues such as where to find out technical information or how to apply for funding. However, finding and repeating the personal qualities of someone like Charlesworth in other projects may be an impossible task to do. Nevertheless, the Lyndhurst case indicates the importance of the roles that such persona can have in the successful delivery of community-led projects. Table 18 summarises the Lyndhurst case.

Process	Lyndhurst case	Empirical issues
Project vision Vision and expectations for the project in its local context	Community centre building in need of repair	Building in bad condition
	Expensive heating bills	Leaking energy through the building
	Threats to existence	Either refurbish or close the building down
Negotiation and engagement Participation, negotiation of expectations and engagement	Key lead person	Dedicated centre manager
	Supportive project team	Charity who owns building, project contractors
	Supportive local community	People supported fundraising efforts
	External support	Big Lottery, New Forest National Park Authority and other external funders
	Learning from other groups	Visiting other biomass projects
Transferable lessons Lessons from local projects to global niche level	First community centre with biomass	Pioneer and also providing an opportunity for local wood fuel supply
	Active networking	Using existing networks
	Translating lessons	Intermediary funding organisations NFNPA which used Lyndhurst as a case study in advising other groups

Table 18: Summary of key processes, Lyndhurst

4.5 Conclusions on the UK cases

This chapter has discussed the UK context for community energy and analysed the development of two projects, Hyde Farm Climate Action Network and Lyndhurst Community Centre. Community energy in the UK has been supported in various forms since the 1970s, including first as a part of an alternative technology movement and later leading to a ‘power to the people’ policy rhetoric, which sees citizens and communities becoming service providers across different sectors, including the opportunities for community energy. Different national and local government programmes and other networks have provided support for community energy projects in the form of information, toolkits, guidelines, training, grant funding and opportunities for networking. However, despite this support, community energy projects in the UK have been somewhat challenging to develop. Furthermore, there seems to be a gap between what is happening at the local project level and what the intermediary organisations are doing, especially in terms of political lobbying. The experience from both Hyde Farm and Lyndhurst show that despite receiving external advice and funding support, both projects required a dedicated team, solid leadership, goodwill and the ability to utilise pre-existing skills as well as the willingness to learn new ones. What shone through from both cases, however, was that the people involved in these projects had the drive and enthusiasm to improve the sustainability of their local areas and make their communities more coherent in the process.

This chapter is followed by the analysis of community energy in the Finnish context, including an in-depth analysis of two Finnish community energy cases, Kaakonoja Area Residents' Association and Ylä-Kivelä block of residential flats.

CHAPTER 5. Finland Case Studies

5.1 Introduction

This chapter introduces the second country of this DPhil, Finland, and the two community energy projects analysed in that context. First, the chapter starts by introducing the concept of community energy in the Finnish context and outlines what policy and/or funding support may be in place for such projects. The chapter then moves on to the analysis of the two community energy projects of Kaakonoja and Ylä-Kivelä.

5.2 Community energy in Finland

Community energy, as understood within the remit of this research as a citizen-led sustainable energy activity, is still a relatively new concept in Finland. In the last few years, there has been some interest towards local community energy projects from researchers and local authorities alike (Vehviläinen et al., 2010), and projects have included for example ground source heat pump trials and energy saving projects (SYKE, 2013). However, the number of citizen-led community energy projects has remained small and most existing projects have been developed largely in isolation from one another (Kangas, 2011). The only exception to this has been forest energy entrepreneurship, whereby forest owners have created co-operatives to produce woodchips and wood fuel, creating supply chains for biomass heating (Peltola, 2011).

As mentioned in Chapter 1: Introduction, the concept of community energy is discussed in Finland under the term 'local energy' (*lähienergia*) (Vehviläinen et al., 2010). This concept was initiated by the *Finnish Innovation Fund Sitra*'s[26] research programme "Landmarks" conducted during 2009 and 2014 (Kirkinen, 2011). One of the key objectives for the

[26] Sitra is a public fund and operates under the Finnish Parliament, http://www.sitra.fi/en/about-sitra/organisation-0

programme was to seek potential ways to develop innovative local/community energy options and services in Finland, while also creating a network of actors and stakeholders active in the area (Kirkinen, 2011). During the programme, Sitra for example organised workshops with various stakeholders including researchers, commercial partners and NGOs, with an aim to brainstorm what community energy might look like in Finland (Kirkinen, 2011). Sitra has defined local/community energy as: "*energy saved by a user or users collectively or renewable energy purchased from local production*" (Syvänen and Mikkonen, 2011, p.7). However, there is no set definition of community energy in Finland, and expert organisations interviewed for this research said that they understood community energy to mean energy saving and renewable energy projects that use local resources (Kangas, 2011) and which can have links to grassroots action (Peltola, 2011). Such projects can address both heat and electricity, though in the Finnish context the focus of such projects has often been on heat (Heiskanen, 2011). Furthermore, there have been a few community projects also regarding new-built housing. An example includes an ecovillage built in Kempele, which consists of 15 new houses that are off-grid and have shared renewable energy generation (Heiskanen, 2011). The are also several internet-forums in Finland which are dedicated to small-scale renewable energy, such as heat pumps, though these provide more virtual than physical communities (see for instance Hyysalo et al., 2013). Furthermore, other examples of more communal renewable energy initiatives include Lumituuli wind energy company, which was set up in 1998 as the first customer-owned wind energy company in Finland (Lumituuli, 2014), and the bulk purchase of solar panels in the city of Lappeenranta (Etelä-Saimaa, 2014).

There is no clear indication of how many community energy projects exist in Finland (Kangas, 2011). In 2011, Sitra and the Finnish Environment Institute (SYKE) started creating a database titled "Edelläkävijät" (Pioneers)[27], which collected information on locally-led energy efficiency and renewable energy projects. SYKE also organised

[27] The Edelläkävijät database is availble at https://wwwp5.ymparisto.fi/hinku/Aloitus.aspx

workshops for the Pioneers, in order to create opportunities for networking and activate more people to take part (Toivonen, 2011). In April 2014, the database had 268 projects listed, however as projects range from individual households to small businesses and public sector organisations such as local authorities and schools, it is not clear which projects are community-led as understood within the remits of this thesis (see Chapter 1: Introduction for definition of community energy within this research).

5.2.1 Municipal, not community, energy?

To some extent the lack of citizen-led community energy in Finland can be explained by the country's decentralised energy system largely run by municipal actors (Käpylehto, 2011). Municipal energy companies, which have a strong foothold in Finland, tend to have rather complicated ownership structures, whereby several energy companies own shares in each other (Laitinen, 2011). Many of the municipal energy companies are also large income generators for Finnish towns and cities, such as Helsingin Energia for the capital Helsinki (FIN1, 2011), so people may have also partly thought that municipal energy companies have an important monetary role in their municipal areas. This has meant that people have generally got used to the idea that services such as heating and electricity are looked after by municipal actors. Hence, culturally concepts such as community energy, whereby a group of people develops a project outside the municipal norm, may not fit the Finnish mind-set (Laitinen, 2011).

There is also a strong culture of trusting 'experts' in Finland, especially related to technical and engineering disciplines such as energy (Heiskanen, 2011) and a belief that the state and public sector should provide services such as energy (FIN1, 2011). In other words, there is almost a pre-existing consensus in Finland that certain services are best left to the authorities to deal with, as one interviewee described it:

> "Perhaps in Finland people think that it is the role of the authorities, the government and the municipalities to take care of these issues and if someone gets excited and starts to do something, people may consider that a little bit wacky." (Nikula, 2011)

For example the Finnish government's energy efficiency agency Motiva talks about 'decentralised energy' and the promotion of more decentralised solutions, but notices that even then energy utilities, rather than communities, are usually driving and owning such projects (Laitinen, 2011). People who live in the location of the municipalities will hence be involved in municipal projects as taxpayers, whether or not they want to take part. As this thesis is interested in citizen-led community energy projects, issues such as ownership and voluntary participation in projects become relevant.

5.2.2 Creating a sustainable and low carbon energy system in Finland

In Finland too there is pressure to decarbonise the existing energy system and reduce emissions. Under EU targets, Finland has a commitment to increase renewable energy generation to 38% by 2020 (EC, 2013). In 2011/2012, the country's share of renewable energy was 30.5% according to European Commission interim report on the EU renewables target (EC, 2013). Around 30% of Finland's emissions linked to energy consumption come from housing (Käpylehto, 2011). Figure 14 illustrates the trend in Finland's greenhouse gas emissions between 2008 and 2012, showing a downward trend since 2010.

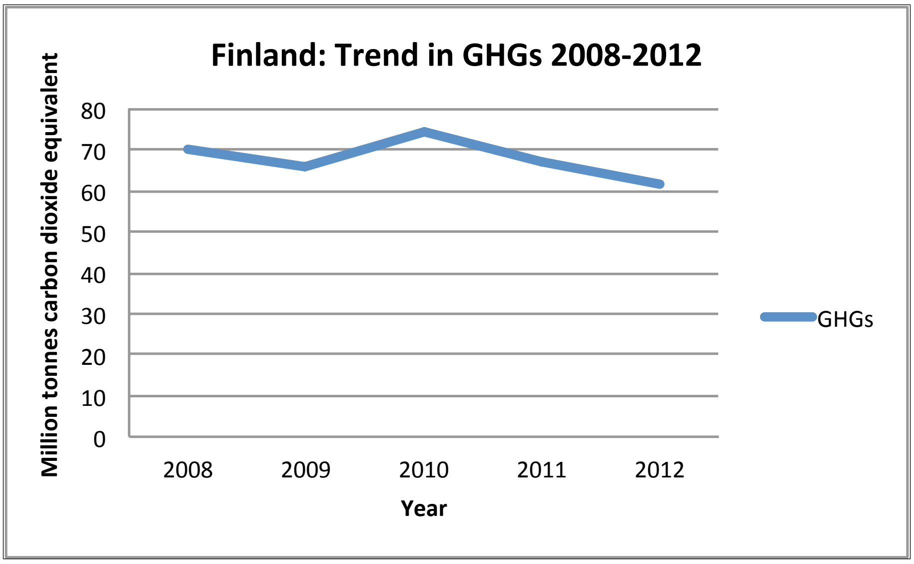

Figure 14: Finland greenhouse gas emissions from 2008 to 2012 (2012 estimated) (Tilastokeskus, 2013)

Finland has a total of around 2.85 million houses and in 2012, around 86% of blocks of flats were heated by district heating, while around 5% were heated by oil (light oil 4% and heavy oil 1%). In other words, district heating networks are very common, they have provided cheap heating across the country (Kangas, 2011), and generally the system has worked well for consumers (Heiskanen, 2011). Furthermore, the price of electricity has generally been rather low in Finland due to the requirement of keeping the country's heavy industries such as metal, forestry and paper industries supplied with affordable electricity (Laitinen, 2011). For example in March 2014, the average price of residential electricity in 23 European countries was cheapest in Helsinki at 11.74 Euro cents/kWh (including taxes and adjusted to purchasing power), compared to the average of 20.46 Euro cents/kWh (Berlin was highest at 28.48 Euro cents/kWh) (E-Control et al., 2014). For comparison, the price of residential electricity in London was 17.51 Euro cents/kWh (E-Control et al., 2014). Moreover, the role of natural gas in Finland is very small compared to the UK and it is not widely available to consumers (E-Control et al., 2014). In other words, households in Finland can be seen to be locked-in to cheap electricity, as well as district heating. Furthermore, with concepts such as energy use in the home, there seems to be a strong focus on finance and how engineering experts have taught people to calculate payback times for each energy investment, even though at the same time householders may be spending money on goods such as cars without thinking about their financial, or let alone environmental implications (Heiskanen, 2011, see also Juntunen, 2014).

Finland has outlined its main policy measures regarding its energy system in the Climate Change and Energy Strategy, which was first published in 2001 and has been updated in 2005, 2008 and 2013. The 2008 Strategy highlighted "*cost-effectiveness, increasing energy self-sufficiency as well as ensuring sufficient and reasonably priced electricity supply*" as the basis for Finland's climate and energy policy objectives (TEM, 2013a, Esipuhe, p. n/a, translated from Finnish). However, as mentioned in Chapter 3: Research Design and Methodology, the Climate Change and Energy Strategy 2008 (TEM, 2008) did not mention the role of communities, with the only reference being that "*citizens should be encouraged to take voluntary action to improve the energy efficiency of existing housing stock*" (TEM, 2008, p.65, translated from Finnish).

The 2013[28] Strategy builds on the 2008 Strategy, outlining measures pre and post 2020 EU energy and climate targets. Key measures in the 2013 strategy include for instance a 30% GHG emissions reduction target by 2020, a 20% target for renewable transport fuels by 2020 (instead of the EU target of 10% by 2020), energy saving of approximately 12% by 2016 (over the EU requirement of 9% by 2016) and achieving energy self-sufficiency from 2020 onwards through new nuclear build and increased small-scale, as well as decentralised electricity production (TEM, 2013a). Hence the 2013 Strategy makes some notions to supporting more local, smaller scale, renewable energy generation and taking into consideration local innovations in national and municipal level energy policy (TEM,

[28] The 2013 Strategy was published after the main data collection of this DPhil thesis, however, it is outlined here for contextual reasons.

2013a). However, neither the 2008 nor the 2013 Finnish strategies mention the role of communities as explicitly as the UK's policy rhetoric, especially through the Community Energy Strategy (DECC, 2014a). Furthermore, citizen-led local energy does not widely exist in Finnish energy policy rhetoric yet (Käpylehto, 2011) and the energy system in general is based on large-scale solutions (Toivonen, 2011). For example a representative of pellet supplier VAPO made a comparison between Finnish and Austrian energy policy, illustrating how Finland lags behind some other European countries in regards to supporting small-scale renewables, despite the wide use of biomass and other wood fuels for heating:

> "For example in Austria energy policy starts with citizens in mind, whereas in Finland it starts with large corporations in mind. This is the major problem. Electricity companies and energy utilities in Finland do not want that citizens tinker with pellets in their houses. Because that would mean that they [corporations] would lose their market share. For example in Austria pellet heating gets around 40% investment support and they have other support mechanisms too. So it is completely different than in Finland, where you get 15% and the money runs out as soon as it has been distributed to the municipalities. And the municipalities can freely decide who they give the funding to. So I would say that for example regarding pellets, Finnish energy policy is totally upside down." (Katainen, 2012)

As in the UK, also in Finland, electricity prices have been rising in recent years. However the Finnish electricity prices are linked to the Nordic wholesale market and are affected by water levels in the Nordic hydro generation (EMV, 2013a). Figure 15 illustrates the trend in fuel prices between 2005 and 2010.

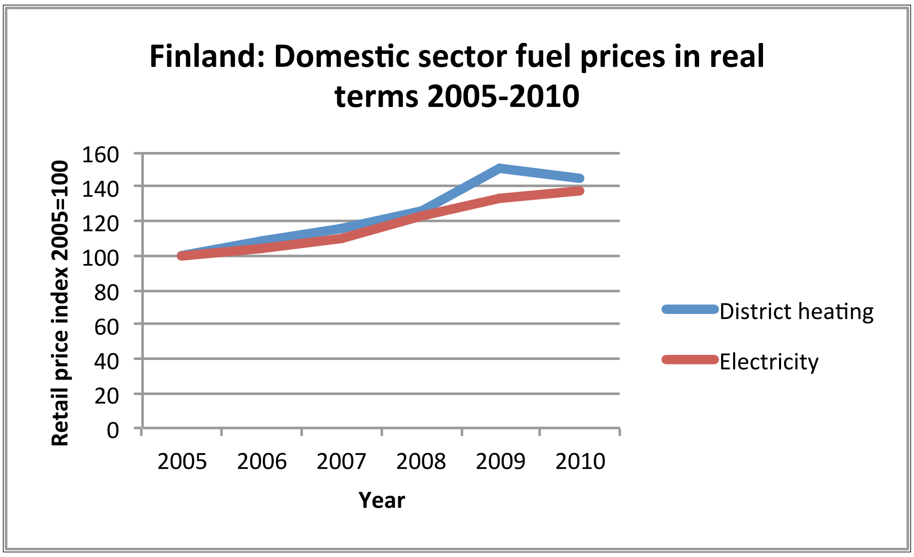

Figure 15: Trends in district heating and electricity prices Finland (Tilastokeskus, 2014)

In terms of energy prices, the upwards trend also in Finland has made people to consider cheaper alternatives for their fuel bills and one option could be locally produced community energy (Toivonen, 2011).

5.2.2.1 Funding support for community energy in Finland

The main sources of funding for community energy projects have been the Finnish government's *Energy Support*, which existing communities can access for part of the capital costs of energy efficiency measures and renewable energy. The Energy Support grant is provided by the government, but it is managed by The Housing Finance and Development Centre of Finland (ARA) and distributed by municipalities (Juntunen, 2014). In addition to the Energy Support "*a tax-deduction system allows a 45% deduction from the cost of manual installation work (service) with a maximum of €2,000 per annum*" (Juntunen, 2014, pp.3-4). In 2011, the total amount for Energy Support was 114 million Euros (TEM, 2013a). For instance the following Energy Support grant percentage as a proportion of capital costs have been allocated for renewable energy technologies during 2014 (TEM, 2014a) (Table 19):

Electricity	Energy Support (proportion of capital costs)
Small hydro	15–20 %
Landfill gas	15-20%
Small-scale wind	20-25%
Solar PV	30%
Heat	
Biomass	10-15%
Heat pumps	15%
Solar thermal	20%
Biogas	20-30%
Transport fuels	
Biogas	20-30%
Other biofuels	20-30%

Table 19: The level of Energy Support for different technologies (TEM, 2014a)

In addition to the Energy Support, Finland also has a *Feed-in-Tariff* for renewable energy. However, while in the UK the FIT was designed to support small-scale renewable energy generation, in Finland the FIT is aimed at larger producers. Technologies eligible for FIT payments in Finland include wind farms, biogas plants, forest chip plants and wood-based fuel plants (TEM, 2014b). The fact, that for instance solar PV is not included in the FIT, demonstrates that small-scale renewable energy technologies are not included in this instrument, even though it has proven successful in other countries such as Germany (DECC, 2014a). There are, however, signs that intermediary actors are emerging in the community energy field in Finland and speaking for the sector in terms of required support.

5.2.2.2 Early days for networks and intermediaries

In terms of community energy networks and dedicated intermediary organisations, these remain rather limited in Finland compared to the UK. However, there have been several projects run by various organisations. One of the most active organisations has been Sitra, as mentioned earlier. In addition to the Landmarks programme, Sitra and policy think tank *Demos* ran a programme during 2009 and 2011 titled “Peloton” (Bold) in order to facilitate workshops around sustainable lifestyles, energy reduction and social innovations with stakeholders including businesses, local authorities and households (SITRA, 2012). The programme found for instance that there is interest from people towards community energy solutions and often the technology is there too, though people do not know where to start or whom to contact for information and advice (FIN1, 2011). Furthermore, Sitra also commissioned research into attitudes towards community energy in 2011 and found that there is a relatively large amount of interest from respondents towards local and communal energy activities (Syvänen and Mikkonen, 2011). Figure 16 illustrates this in more detail.

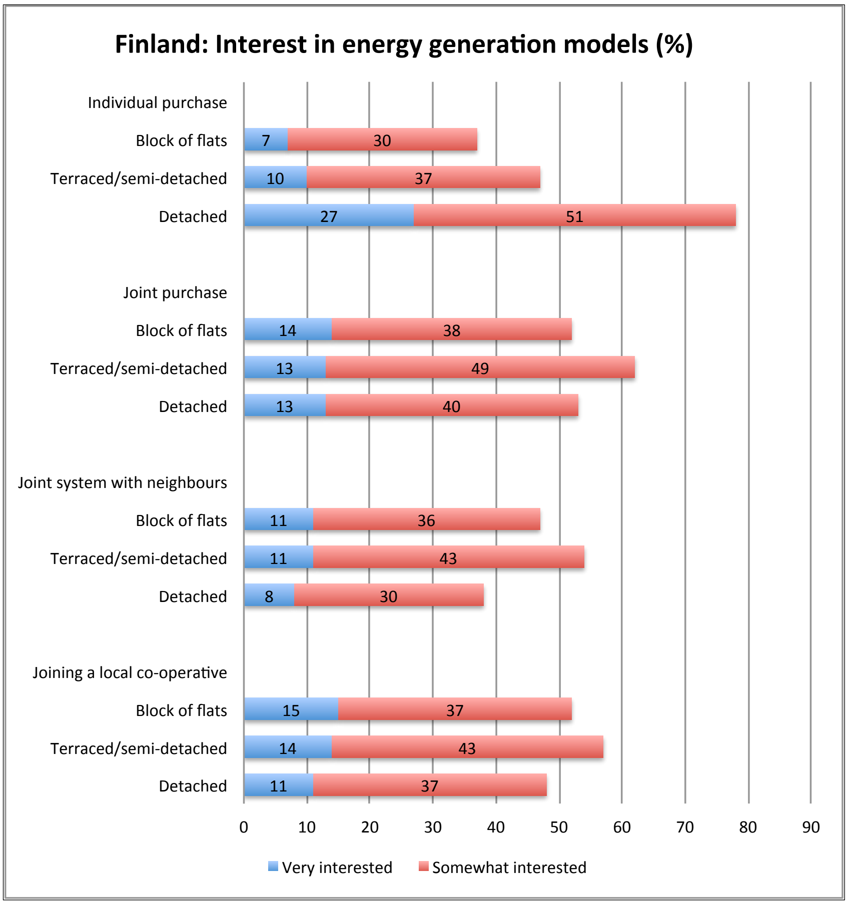

Figure 16: People's interest towards different energy ownership models (Syvänen and Mikkonen, 2011, p.33)

There have also been projects led by municipalities and research institutes, such as the Carbon Neutral Municipalities (CANEMU, HINKU in Finnish) programme, which started in 2008 with an aim of making five towns carbon neutral (SYKE, 2013). The programme is funded by the Finnish Ministry of the Environment, Sitra, Finnish Funding Agency for Innovation Tekes, Ministry for Employment and the Economy and a set of commercial partners (SYKE, 2013). The aim of the programme is to have municipalities, corporations, citizens and experts to work together to find solutions for increasing energy efficiency and reducing emissions (SYKE, 2013). Activities have included for instance the installation of technical measures, organised tours of renewable energy installations and carbon calculators (Heiskanen, 2011, SYKE, 2013).

The Finnish Association for Nature Conservation also run a project called “Negawatti” (Negawatt) during 2011 and 2014, concentrating on encouraging energy efficiency solutions and training voluntary energy efficiency experts that monitor energy consumption in their local neighbourhoods, such as block of flats or residents’ associations (Käpylehto, 2011).

More importantly, since the main data collection and fieldwork of this DPhil, Sitra has been the initiating force in the establishment of the *Finnish Local Renewable Energy Association* (*Lähienergialiitto*), which was formed in Spring 2013 to give a voice to the small-scale renewable energy sector. The Association’s aim is to promote “*locally produced renewable energy in Finland*” and they do this by collecting and sharing information about renewable energy, producing communication materials and taking part in political discussion about local renewable energy (Lähienergia, 2014, p. n/a). Issues such as the non-inclusion of small-scale renewables in the FIT are central to these. In Spring 2014 the Association had 21 organisational members, mainly consisting of renewable energy firms, research institutions and renewable energy trade associations (for heat pumps, wind energy and solar respectively), though the association also welcomes individual members (Lähienergia, 2014).

Organisations such as the Local Renewable Energy Association and *WWF Suomi Finland* are also involved in political discussion regarding community energy, and they are motivated by the desire to make small-scale renewable energy attractive in the Finnish context, whether it is developed by communities, households or businesses (Kangas, 2011). For instance WWF Suomi Finland has highlighted that the community energy and small-scale renewable energy sector in Finland would need more pilot projects and demonstrations of the concept of community energy, as well as getting "*opinion leaders to install it*" (Kangas, 2011). There is also a need for a visible one-stop-shop for small-scale renewables, from where people could get independent advice and information from (Kangas, 2011). Generally it is quite difficult to find information about various options for community energy, given that "*Finland has not been very innovative in this area*" (Kangas, 2011), so there is clearly a requirement for more intermediary and advisory actors in this area. However, it could also be argued that perhaps in the Finnish system, which has strong municipal actors (Laitinen, 2011) and a culture of trusting experts (Heiskanen, 2011), intermediaries in the municipal level could potentially be ideally placed to promote community energy. Furthermore, the popularity of internet forums means that virtual communities can also play an important part in the development of community energy projects, especially regarding sharing information and learning.

5.2.2.3 An inter-local community energy niche phase in Finland?

Niche literature, especially the niche development perspective developed by Geels and Deuten (2006), argues that at an inter-local phase of an emerging field, projects start to gradually communicate between each other and share their experiences. In the inter-local phase, circulation of knowledge between individual projects is undertaken by people who are directly involved in the local projects (Geels and Deuten, 2006). There is a limited amount of intermediation or dedicated support and infrastructure for aggregation activities (Geels and Deuten, 2006). In terms of community energy in Finland, the field seems relatively young with a limited number of projects installed. Citizen-led community energy projects especially remain limited, especially given the country's strong municipal culture. However, even though there is no concrete evidence of the number of installed community energy projects (Kangas, 2011), there is evidence that such projects exist (Heiskanen, 2011) and that there are connections being made between different actors at local projects (Laitinen, 2011). Furthermore, supporting organisations such as the Finnish Local Renewable Energy Association are actively calling for example for standardised payments for the sale of small-scale generated renewable energy back to the grid and simplifying access to the system especially for householders (Auvinen, 2014). Meanwhile institutions and research organisations such as Demos, Sitra and SYKE have highlighted the opportunity for community energy action. The rest of this chapter will analyse the development of two community energy projects in Finland, Kaakonoja Area Resident's Association and Ylä-Kivelä block of flats, both of which demonstrated innovative community energy action in the Finnish context.

5.3 Kaakonoja Residents' Association "Weighing Heat Pumps" Project

Kaakonoja Area Residents' Association is a residential community association based in Valkeakoski, a town of 21 000 people located in central Finland. Kaakonoja has around 700 houses built in the 1950s and 1960s, the majority of which are detached, though there are also a few modern tower blocks. The Kaakonoja Area Residents' Association was formed in 1983 and has approximately 250 fee-paying members (membership fee in 2011 was 8 Euros per household). It is a not-for-profit organisation and all income generated by the Association is recycled back to its activities. The Association has a committee, which is selected by the Association's members. Usually there are eight committee members who are elected for two years at a time and the committee meets once a month, with a summer break usually in July. The Association has organised several events for its members throughout the years. These have included for example summer and Christmas parties, children's theatre plays, visits to local attractions and longer trips within Finland and to neighbouring countries of Norway, Sweden, Estonia and Russia. Furthermore, each August the Association holds a Harvest Night, during which they also circulate a questionnaire asking residents' views and suggestions for further activities.

In 2008 members of Kaakonoja ran a nine-month project titled *Lämpöpumput puntarissa* (English translation *Weighing heat pumps*) in order to gain independent information on air and ground source heat pump models (AGSHPs) (see also Heiskanen et al., 2011). At the time most houses in the Kaakonoja area had electric heating (in 2011, approximately 44% of detached houses in Finland had electric heating (TEM, 2013b)) and they did not have water-based radiator systems in place, so the project only concentrated on heat pumps as the most economical option. The project cost 16,791.11 Euros, 90% of which was funded by the regional EU Leader agency Pirkan Helmi and the remaining 10% by the Residents' Association. Table 20 outlines the timeline and tasks of the project.

Timeline and tasks of Kaakonoja heat pump project		
Task	**Planned date**	**Completion**
Project planning		
Funding application	December 2007 – January 2008	Application in December 2007 (final funding decision was reached in 09.10.2008)
PR to residents	December 2007 – January 2008	Yes
Recruit project worker	January 2008	Yes
Project delivery		
Information and data collection	January –March 2008	Yes
Evaluation of heat pumps	March-April 2008	April-May 2008
PR to the public	March-May 2008	May-June 2008
Heat pump installation bids	April-May 2008	June-July 2008
Final report	August-September 2008	October 2008
Final PR	September 2008	October 2008

Table 20: Timeline and key tasks of the Kaakonoja project

The development of the Kaakonoja project (as well as the other three community energy projects within this thesis) is analysed in relation to niche theory and the way individual projects start to form in niches (Geels and Deuten, 2006, Raven and Geels, 2010, Raven et al., 2008). As outlined in Chapter 2: Theoretical Framework, three processes of (1) local contextualisation, (2) negotiation and engagement and (3) transferable lessons (Raven et al., 2008) are central to this analysis. Raven et al. (2008) found in their analysis that in relation to niche theory (for example Geels and Deuten, 2006, Geels and Raven, 2006) local, innovative projects which proved to be successful were those that adapted to their local context, adjusted project's initial expectations and vision following engagement with the local community and key stakeholders, and provided transferable lessons for others to learn from (see also Table 21).

Process	Key dimensions	Example activity
Local contextualisation	a) Vision of the project b) Expectations c) Local context	a) Reduce heating bills b) Geographical and cultural location of a project
Negotiation and engagement	a) Participation b) Negotiation of expectations c) Engagement	a) Project meeting b) Adjust project plan in a changing policy context c) Organise visits to other sites
Transferable lessons	a) Lessons from local projects to global niche level	a) Technology guidebooks, funding guidelines, networking advice

Table 21: Processes linked to community energy development and niche formation (A version of this table first appeared in 2.4.5.3)

5.3.1 Local contextualisation

Local contextualisation involves several processes. As discussed in Chapter 2: Theoretical Framework and following Raven et al. (2008), "*niche innovation occurs in relation to a particular local context*" (Raven et al., 2008, p.467). In other words, niche innovations are adapted to their local environments and shaped by them (Raven et al., 2008). The process of local contextualisation in this research is identified by analysing project motivations, initial expectations, project vision and local innovation.

5.3.1.1 Purpose and motivation of the project

Two neighbours, Hannu Mäkelä, a retired journalist and Tuomo Knuuttila, a retired electrical engineer, initiated the Kaakonoja heat pump project in the autumn of 2007. The main purpose for the project was to find cheaper options for heating. Mäkelä and Knuuttila had lived in the Kaakonoja area since the mid 1970s. Both men owned similar detached houses, which were built in the 1950s by the workers of Yhtyneet Paperitehtaat (now UPM) paper factory at Valkeakoski. The Kaakonoja area was chosen in the 1950s as a new residential area for the paper factory's workforce. The majority of the houses were based on the same design and were hand built by the workers themselves (Mäkelä, 2011). In fact, there were still some of the original people living in Kaakonoja, for example one of the interviewees, Kirsti Mäkinen and her husband, who had built their house in 1958 (Mäkinen, 2012). The Kaakonoja houses were typically detached, two-storey houses of a wooden construction with the main heating source initially being wood. Over the years, many residents had also added either oil or electric heating. According to Mäkelä, the initial motivation for the Kaakonoja project was to save money and find cheaper options for their increasingly expensive heating bills:

> "We started our project after our heating costs, or electricity prices in general, had gone up and we were wondering if there would be a solution that could help us manage our expenses." (Mäkelä, 2011)[29]

Earlier in the summer 2007, Mäkelä and Knuuttila had visited the annual Housing Fair, which that year took place in nearby city Hämeenlinna. The Housing Fair is organised by the Housing Fair Finland Co-op[30] (*Suomen Asuntomessut*) and is open to the public during the summer months. Each year one new residential area is chosen and developed in Finland for the purpose of showcasing the latest housing designs and technology, and improving the quality of housing (Suomen Asuntomessut, 2014). The Housing Fair is run in co-operation with each host municipality, architects, the building trade and the residential area's future residents. The municipality is responsible for the host area's land use

[29] All quotes regarding the Finnish cases are translations from Finnish to English
[30] More information at http://www.asuntomessut.fi/en/english-home

planning and public utilities, while developers and builders are responsible for the financing and completion of their individual building projects (Suomen Asuntomessut, 2014).

During their visit to the Hämeenlinna Housing Fair, Mäkelä and Knuuttila came across quite a few heat pumps. They were interested to find out more about the technology as it seemed as a potential option for their electrically heated houses, which did not have central heating pipes. The men also realised that the Housing Fair area in Hämeenlinna was very similar to their own neighbourhood – an area consisting of mainly detached houses. The only main difference was that the houses in Hämeenlinna were brand new while the Kaakonoja houses were built in the 1950s. However, there was very little information available about heat pumps at the Fair, with it being mainly limited to suppliers' advertisements.

The key problem that Mäkelä and Knuuttila faced was that they were aware of heat pumps in general as several models had entered the Finnish market during 2006 and 2007[31] and they had also been featured in the Finnish media, for example in a popular magazine which focused on new technologies and gadgets (*Tekniikan Maailma*)[32]. However, they felt that there was very little independent information available on various heat pump models. As Mäkelä put it: "*Tuomo and I came to the conclusion that there just was no reliable, no comparative information available from anywhere*" (Mäkelä, 2011). Furthermore, as the men were not sure which heat pump models would be the most suitable for their own area, they thought others may be in the same situation, with Mäkelä continuing that "*everyone was trying to find that information by themselves and potentially duplicating that work.*" (Mäkelä, 2011). Knuuttila, too mentioned that other

[31] The Finnish Heat Pump Association SULPU estimated in 2013 that around 540,000 heat pumps were installed in Finland between 1996 and 2012 (SULPU, 2013).
[32] Tekniikan Maailma magazine http://tekniikanmaailma.fi

residents in their area may be interested in similar options, i.e. reducing their heating costs. "*We thought that this could be an issue that may have wider interest as we have so many detached houses in our area*" (Knuuttila, 2011). In order to fill this information and knowledge gap, Mäkelä and Knuuttila came up with the idea that they, through the residents' association, could run a project to find out more about heat pump models.

> "We thought that maybe this could be something good for the residents' association to do, to seek more information and organise some sort of an event where someone would tell us more about [the technology] and could possibly give us information of its suitability and use in practice." (Knuuttila, 2011)

Mäkelä and Knuuttila's initial motivation for the project, i.e. the requirement to reduce heating costs, was largely affected by the events taking place at the socio-technical landscape level (Geels, 2002) in relation to global oil prices and their subsequent impact on the prevailing electricity regime (Geels, 2002) and electricity prices in Finland.

5.3.1.2 Initial expectations and project vision

Once Mäkelä and Knuuttila came back from the Housing Fair, they did not waste any time and started thinking how they could proceed with their project idea. Their main purpose and starting point for the project was the motivation to reduce heating costs and to deal with the lack of independent information about heat pump models. Mäkelä and Knuuttila thought that heat pumps would be the best option for their residential area, since most houses had electric heating and did not have central heating pipes installed (Knuuttila, 2011, Mäkelä, 2011). Furthermore, as Mäkelä pointed out, for example solar power was not common in Finland at the time:

> "There was not much discussion about solar panels for example, at least in Finland in general, they were used more as energy sources for summer cottages, but not so much for residential houses." (Mäkelä, 2011).

Mäkelä and Knuuttila also thought that there must be other people in a very similar situation and they were keen to make the findings of their project freely available to others, which demonstrated that they were willing to share their learning with others from the start. Niche literature states that at the start of a niche, in its local phase, small projects start to develop, often separate from each other (Geels and Deuten, 2006), as illustrated in Figure 17 below:

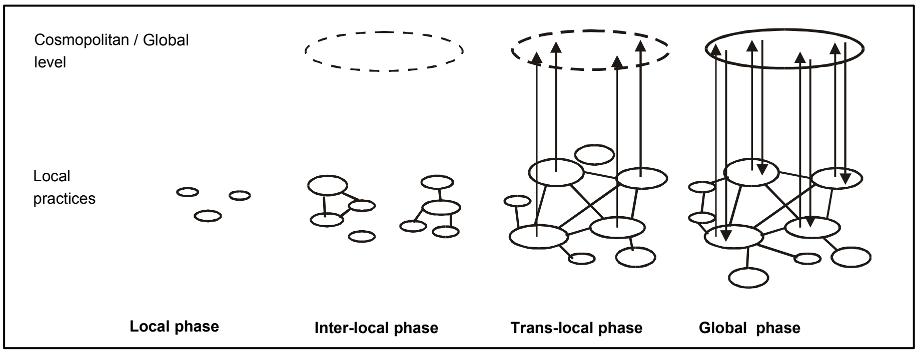

Figure 17: Different phases of knowledge sharing from local to global phase (adapted from Geels and Deuten, 2006, p.269). Note that this figure first appeared in Chapter 2 of this thesis.

Once these projects start to share their experiences with others, an inter-local phase starts to emerge (Geels and Deuten, 2006). In the Kaakonoja case, the project truly was a first of its kind (local phase). There was limited amount of evidence of inter-local phase activities during the Kaakonoja project development. However, the team at Kaakonoja were considering the sharing of their lessons from the start of the project.

Furthermore, Mäkelä and Knuuttila thought that if they could persuade their Residents' Association to conduct the project, they could then approach potential heat pump suppliers and negotiate a bulk purchase. Knuuttila especially mentioned that he thought that as a group they would be in a much stronger position to negotiate a good purchase price instead of people approaching suppliers individually (Knuuttila, 2011). This relates to arguments by Walker (2008) that setting an active community initiative can also mean more control (Walker, 2008). Even though Walker (2008) refers to the increased local control that community-owned wind energy projects may have for example over the scale of development and the siting of wind turbines, this links to the notion that community energy groups can be more powerful than individuals alone, something that the actors in Kaakonoja also realised.

5.3.1.3 Local innovation

Both Mäkelä and Knuuttila had been actively involved in the Residents' Association over the years, so they did not have any difficulty approaching the Association with their heat pump ideas. Mäkelä especially had been an active figure in the Association and according to Knuuttila, Mäkelä had for instance acted as the Association's "*travel agent*" and had organised several trips (Knuuttila, 2011). However, despite several previous activities, the Residents' Association had not been involved in anything similar to the heat pump project before, i.e. focusing in an area of technology and running a project on it. Following Rogers' (1995) definition of innovation as being "*an idea, practice, or object that is perceived as new by an individual or other unit of adoption*" (Rogers, 1995, p.12) (see also Chapter 2), the Kaakonoja project truly was something out of the ordinary for the Association. As Mäkelä noted: "*we had not done anything like this within our Association before, it was completely new to everyone here*" (Mäkelä, 2011).

The Kaakonoja project team decided to run a project on renewable energy technology, an activity which was completely new to them, especially the acts of researching, creating new knowledge and even applying for external funding (Knuuttila, 2011, Mäkelä, 2011). As Mäkelä (2011) noted, as a group they could also ensure better success for the project, especially regarding the quality of installation work: "*there have been some cowboys in the installation side"*, indicating that sharing experience between neighbours can prove very valuable. Furthermore, Knuuttila (2011) pointed out that "*community cohesion was a factor in us getting things done*" and that as a community they were stronger as "*a lone person is more on the mercy of sellers*". Knuuttila (2011) was also adamant that the

Association should create new activities in order to build on the existing community feel, encourage younger members to get more involved and create events that everyone could take part in.

The way Mäkelä and Knuuttila decided to go about the project, in other words, to run it by the Residents' Association was not only new to them, but also new in Finland. They were in effect the first residents' association to run such a project, in order to fill a knowledge gap that they had themselves identified (Heiskanen, 2010). In terms of the Finnish context, residents' associations are a common and popular form of doing activities together (Vesisenaho, 2012). However, they have traditionally centred around the up-keep of the neighbourhood in the form of activities such as autumn clearance of local landscape and summer parties, rather than tackling issues such as energy consumption and generation (Vesisenaho, 2012). It was very clear in both interviews with Mäkelä and Knuuttila that the heat pump project was started and conducted for the good of the Residents' Association, the Kaakonoja area and the wider community outside it. This reflects the findings by Seyfang et al. (2013b) that motives for community energy projects can be very diverse and projects usually have more than one motive which are shaped by their individual circumstances, further strengthening the local contextualisation of projects (Raven et al., 2008). Furthermore, the Kaakonoja team was also in effect acting innovatively at grassroots level, indicating social innovation as well as technological innovation (Seyfang and Smith, 2007).

5.3.2 Negotiation and Engagement

Raven et al. (2008) state that: "*project visions are not fixed and will change over time with the variety of social interests that become involved and the expression of a variety of alternative expectations*" (Raven et al., 2008, p.467). The negotiation and engagement processes are linked to the way the project's expectations may change over time, affecting also the project's initial vision (Raven et al., 2008). These processes involve project participants and key stakeholders, and the activities of participation and coordination can be particularly influenced by local politics and power relationships (Raven et al., 2008). In the case of Kaakonoja, the processes of negotiation and engagement are analysed empirically by identifying the key stages in project development (initial project meetings and meetings with stakeholders and the local community) and the processes involved in seeking technical advice, applying for funding and actually delivering the project.

5.3.2.1 Initial project meetings

When Mäkelä and Knuuttila took their heat pump idea to the Residents' Association for the first time, the response from the chair and committee members was positive. In fact the committee thought that this could be a very relevant project given rises in energy prices and could have wider interest in the area. Furthermore, the committee also saw a potential for raising awareness of the Association within residents and attracting possible new members: "*almost all of us in the committee thought that with this project we could even perhaps get new members to the Association*" (Mäkelä, 2011). Even though Kaakonoja residents regularly took part in the various activities organised by the Association, the actual number of people getting actively involved in the Association and the committee was rather low. Mäkelä (2011) said that they were lucky if 20 people attended the annual general meetings. Furthermore, the committee posts were "*usually retirement posts*" (Mäkelä, 2011), meaning that once you had been selected, you stayed in the role.

Knuuttila (2011) too mentioned that it had been difficult to get younger families involved in the Association. These comments by Mäkelä and Knuuttila showed genuine concern for the Association's continuity. Given that both men were past their younger years, they could see that a generational change would be needed in the Association in the future. Mäkelä (2011) had decided to step down as treasurer after 28 years and Knuuttila (2011) too said that as he was nearing 80 years old, he would be happy to give younger residents the chance to get involved. The two men certainly wanted to build on the pre-existing community cohesion that the Association had, ensuring its continuity within the neighbourhood. This demonstrates that local contextualisation of the project in this case involved not only motives for affordable energy and better information about heat pump models, but also motives for community continuation, which may not have been obviously linked to the niche innovation from the start.

During the committee meetings in autumn 2007, firmer plans for the project started to take shape. According to Knuuttila (2011), Mäkelä clearly took charge of the project and the other committee members supported this. With his 25 years of journalistic experience in Valkeakoski, Mäkelä was very knowledgeable of the local area and had a good network. Furthermore, given Mäkelä's active role in the committee over the years it was likely that the committee trusted him to take charge also of this project. According to Knuuttila (2011), Mäkelä was active also in other organisations in Valkeakoski and generally when he organised something, whether it was a trip to the local theatre or abroad, these activities always ran smoothly and according to plan. The Kaakonoja project had a clear leader in Mäkelä (even though he himself was very modest about his role), with a supportive team behind him. Geels (2004) notes that socio-technical systems are governed by certain rules (see also Chapter 2: Theoretical Framework). Normative rules include values and mutual expectations regarding the way certain social groups are expected to behave. In the case of Kaakonoja, it is clear that the Association was used to Mäkelä taking the lead in various activities, and even though he himself was modest about his role, there was no requirement for anyone within the Kaakonoja Association to contest his leadership during the heat pump project.

Despite the committee's trust in Mäkelä, both the committee and Mäkelä himself, felt that in order to run the project, they would need some external help, especially regarding day-to-day running of the project, technical expertise and funding. Even though Mäkelä was retired and keen to see the project off the ground, he did not want to do all the work by himself: "*I still had many of my book projects, I have written about twenty historical books during my retirement, and I did not want to give up all my time*" (Mäkelä, 2011). Community energy groups often rely on volunteers and those actively involved dedicating a lot of their own time (Seyfang et al., 2013b). In the case of Kaakonoja, Mäkelä seemed to realise from the start how much he would be able to commit to the project, recognising his own limitations in terms of time commitment, expertise and resources.

5.3.2.2 Applying for funding

Following a positive meeting with the Association's committee, Mäkelä started actively seeking funding opportunities for the project. Finding funding was a key stage for the Kaakonoja project, as without external funding the project would not have gone ahead. Mäkelä was aware of the local EU Leader organisation, Pirkan Helmi, and that they had grants available for local community organisations. EU Leader organisations were generally established in support of countryside development within EU countries and there are a total of 55 in Finland (Vesisenaho, 2012). Mäkelä had in fact been involved in setting up the Pirkan Helmi organisation in 1999, which has the aim to "*encourage rural residents to develop their own home communities, improve amenities and create new jobs and enterprises*" (Pirkan Helmi, 2013, p.n/a).

Mäkelä contacted Pirkan Helmi in December 2007 and spoke to Heikki Konsola, who at the time was leading the organisation. During 2007 and 2013 Pirkan Helmi was acting as the regional EU Leader organisation and funding for their grants came from EU, the Finnish government and local municipalities. Furthermore, projects were usually funded at a maximum of 80% to 90%, with the remainder matched by the projects themselves. Key themes for project funding at Pirkan Helmi fell under the following key four areas: (1) housing and entrepreneurship, (2) local and international partnerships, (3) culture and (4) the third sector (Vesisenaho, 2012). Furthermore, projects funded by Pirkan Helmi were largely categorised into investment projects, not-for profit local development projects, and training and knowledge building projects, which also had to be "*resident-oriented*", i.e. benefiting the local residents (Vesisenaho, 2012). Mäkelä was advised by Pirkan Helmi to develop a funding application for the Kaakonoja project, as it met the funding criteria for the project being a not-for profit local development project, as well as acting as a knowledge building exercise (Vesisenaho, 2012).

Mäkelä was mainly in charge of writing the funding application. He was very happy with the support he had from Pirkan Helmi, especially regarding the project's outcomes and how those should be worded (Mäkelä, 2011). However, completing the actual funding application still took time and effort. The application itself was approximately 10 pages long and required thorough thinking about what the project was about and what its key outcomes were. In Mäkelä's words "*we had to think about what we needed and what we wanted*" from the project (Mäkelä, 2011). Furthermore, Mäkelä (2012) indicated that thanks to his background in journalism, he did not find the actual writing of the funding proposal too difficult, but it was more the time that completing the application took. In several ways, writing the bid aided the formulation of the project and included a detailed action and communications plan for the project, further contributing to the negotiation process of the project (Raven et al., 2008). Furthermore, Pirkan Helmi acted partly as a funder, partly as an intermediary organisation (Geels and Deuten, 2006) in the Kaakonoja case, advising on project funding and what might be expected from successful applications.

The Kaakonoja Residents' Association submitted the funding application to Pirkan Helmi in December 2007. The decision from Pirkan Helmi followed very quickly, in January 2008, giving a positive light to the project and indicating a 90% funding for the project, the maximum possible for any project. Pirkan Helmi saw the Kaakonoja project as "*very advanced in its subject area and one could say almost revolutionary as the key objective of* *the project was to produce independent knowledge that was benefiting everyone*" (Vesisenaho, 2012).

However, the actual funding payment was delayed from the local Centre for Economic Development, Transport and the Environment, which was in charge of distributing EU Leader funds. As the EU Leader programme had only started at Pirkan Helmi, they did not have any clear guidelines about the types of projects they should be supporting. Furthermore, the Centre for Economic Development, Transport and the Environment wanted to ensure that the Kaakonoja project met the EU Leader programme's legal requirements and eligibility for funding. Despite the delay in funding, Mäkelä and Knuuttila were keen to have the project started as they felt that timing was a crucial issue. As Mäkelä described it:

> "The problem with this sector is that the technology develops so quickly. Some people were wondering why we were in such a hurry with the project, but we thought that it had to be completed while the information was still fresh. After a few months the information may be old, as old models leave the market and new ones come in. That was then and we had to get the information flowing. For example you may get better models now than what was available then." (Mäkelä, 2011)

Strapped for cash, but keen to see the project off the ground, Mäkelä contacted his local bank and negotiated a 20,000 Euro loan for the project. Mäkelä himself and two other members of the Association's committee guaranteed the loan, in effect taking a personal risk to get the project started. However, according to Mäkelä (2011), guaranteeing the loan was "*low risk as we had already been told that we were going to get the funding"* and it was more of a matter of cash flow. Rather than waiting for the funding to arrive, Mäkelä and colleagues just got on with the project. Mäkelä (2011) noted that this was also partly down to a 'cultural trait': "*as we do in the Häme-area, if you are going to do something, you just get on with it*". In the end the actual funding money was paid to Kaakonoja on 9th October 2008, ten days after the project ended.

In the Kaakonoja case, Mäkelä and colleagues clearly took a personal risk in guaranteeing the loan. It could be that thanks to Mäkelä's good reputation and local contacts, he was able to negotiate a loan, a position that other similar groups may not automatically have. The willingness to take personal risks in the development of niche innovations does not resonate clearly from the niche building perspective developed by Geels and Deuten (2006). Furthermore, even though Raven et al. (2008) argue the importance of power relationships at the negotiation and engagement stage of a niche innovation, personal risk taking is not given much scope. However, community groups such as Kaakonoja, which rely on external resources, have to be creative in the face of set backs in order to continue.

5.3.2.3 Seeking expert advice

In addition to external funding help, Kaakonoja case required expert advice on technical issues. Again Mäkelä was active in seeking advice from the local adult education college, Valkeakoski Vocational College (VVC). The VVC has over 1,000 students and Mäkelä was aware that they run a range of courses related to engineering and house building. The college recommended that Mäkelä speaks to two of their teachers, Jussi Jantola and Johanna Veijonen. At the time Jantola was teaching building construction, including heat, water and airflow technologies. Veijonen, meanwhile, is a building engineer and had been working at the college for 38 years in various roles ranging from teaching to curriculum design. In the first meeting with the college, which both Mäkelä and Knuuttila attended, they thought that it would be beneficial for the project to have someone who knew about heat pumps. Jantola fitted this as he had installed a heat pump for his house in 2003 and he was also keen to see how far the technology had developed since then (Jantola, 2011). Veijonen, on the other hand, saw a good opportunity in the project for the college to get involved as it could provide learning for students from a real life project. Furthermore, Veijonen also thought that they could widen their networks through the project and possibly even find new partnerships for student apprenticeships (Veijonen, 2011). Jantola and Veijonen suggested that they could also help to find a project worker for the project, provided that there was funding available for this. This demonstrates how people have different motives for getting involved in community energy projects, and they can see different outcomes from such activities (Seyfang et al., 2013b). For Jantola it was more about technology and its application, while Veijonen saw an opportunity for networking and partnering, potentially also influencing their expected outcomes from the project.

In addition to the VVC contacts Jantola and Veijonen, Mäkelä and Knuuttila thought that it would be a good idea also to involve the Valkeakoski Housing Fair office in the project, as Valkeakoski was due to hold the annual Finnish Housing Fair in 2009. Furthermore, they wanted to find another technical expert who had knowledge about heat pumps, i.e. someone who would know enough about the technology, what to look for in certain models and how to compare them. This was a request that proved rather difficult to fulfil. Mäkelä and Knuuttila made approximately 20 calls to organisations such as Hämeenlinna College, The Finnish Heat Pump Association SULPU, TM Rakennusmaailma magazine (building trade magazine), Tampere Heating, Ventilation and Air-Conditioning Association, Motiva (government energy efficiency agency), MTT Agrifood Research Finland, TTS Work Efficiency Institute and VTT Technical Research Centre of Finland. The majority of these organisations were not willing to get involved or offer technical expertise.

Despite the disappointment that followed the lack of support and help from these organisations, the Kaakonoja team were not discouraged but continued with the project. As Smith and Raven (2012) note in their analysis of supportive spaces for path-breaking innovations, existing regime actors can sometimes "*undermine niches and disrupt their space for development*" (Smith and Raven, 2012, p.1026). Even though there was no evidence of the regime actors being actively disruptive in the Kaakonoja case, there is clear evidence that they were not actively supportive either. Both Knuuttila and Mäkelä felt that national policy makers were not really interested in the Kaakonoja project (Knuuttila, 2011, Mäkelä, 2011). The heat pump project had contacted the government's energy efficiency agency Motiva in order to seek help with expert knowledge on heat pumps. However, the project participants felt that Motiva was not interested in their project and that their attitude towards it was more of a "*surprised and why we are doing this*" (Mäkelä, 2011). Mäkelä especially felt that the agency was tied down by civil service rules instead of wanting to know what was really happening on the ground (Mäkelä, 2011). Knuuttila (2011) had the impression that "*small scale generation is not valued in Finland. The consumer does not know enough and does not get help or information*". He added that single commentators talk about the issue but that there is no fact-based policy discussion focused on the role and potential of small-scale energy generation in Finland (Knuuttila, 2011). However, towards the end of the heat pump project, Motiva and Finnish Energy Industries were setting up a project on various household heating options and they contacted Kaakonoja to see if the project's members were interested in getting involved in the form of helping with collecting heat pump information, though this did not lead to further co-operation.

In the end, the Kaakonoja project found a technical expert contact through the Tampere Heating, Ventilation and Air-Conditioning Association, who suggested that they contact Professor Antero Aittomäki from Tampere University of Technology. Aittomäki was keen to help and became a specialist advisor for the project. As Mäkelä (2011) noted, "*we really tried hard to find that expert help*" and it seemed that there were not many external experts willing to put their name on the line for comparing the different heat pumps. Community energy groups may struggle with the issues of credibility and being taken seriously, especially if groups are doing a task, which is very new to them. For example Rogers et al. found a similar issue with the difficulty of finding expert advice in their analysis of community-owned renewable energy in the UK (Rogers et al., 2008).

5.3.2.4 Gathering information and creating knowledge base

Following the positive funding decision, Kaakonoja residents were able to start the information collection task of the project. An action plan, which had been developed for the funding application, included the following key aims and objectives for the project:

- Encourage households to get more interested in saving energy and increasing their comfort at home (more even heating in the winter and cooling in the summer)
- Increase knowledge about heat pumps, including ground source heat pumps and air source heat pumps
- Gain knowledge about different heat pump models' suitability for heating and cooling in houses which have different types of heating systems (e.g. electric heating, central heating utilising water-based radiators, solar powered heating, free airflow, mechanic airflow)
- Create reliable knowledge about different heat pump models regarding their suitability for use in a cold climate, effectiveness in different size houses, reliability and longevity, noise level, visual aspects, maintenance, costs, user friendliness and guarantee
- Encourage households in detached houses to take action on energy efficiency
- Receive comparable information about different models and their installation costs.

The bank loan meant that the Association was able to employ a part-time project worker between January 2008 and June 2008. The project worker was found with the help of Jantola and Veijonen, who recommended an old student of VVC. The project worker was based at VVC and was responsible for information collection, data organising and administration. Her main tasks were to contact all heat pump suppliers in Finland and create a database of technical variables and financial details about different heat pump models. The technical details included the following variables (Table 22):

Brand	Model	Inside unit	Outside unit	Recommended area of use (square meters)
Heating power	Cooling power	Cooling area (square meters)	Working temperature	Working temperature (outside)
Coefficient of performance (COP)	Energy Efficiency Ratio (EER)	Energy efficiency rating	Energy efficiency class	Wireless remote control
Noise level for heating	Noise level for cooling	Pipe length	Maximum height	Guarantee

Table 22: Technical criteria for heat pump comparison

Following the project worker's contact with Finnish air and ground source heat pump suppliers, a total of 82 heat pump models were selected for the desk study. Of these 46 were compared and given points based on the above mentioned technical variables. Jantola, Knuuttila, Mäkelä and Professor Aittomäki met four times to go over the technical details and undertake the comparison of the various models. Mäkelä and Knuuttila found the meetings with Aittomäki very useful, however, Jantola said that he was "*a little bit disappointed in the meetings with the professor at Tampere, as I was expecting more information from him but almost could have said the same things myself*" (Jantola, 2011). In other words, Jantola was already holding most of the information he was expecting to receive, indicating pre-existing skills and capabilities.

Some heat pump models were discarded from the start due to technical restrictions, with the main one being that several models were not suitable for the Finnish climate, especially its cold winters. Next, the study outlined a total of 13 different air source heat pump models in three different size categories according to their suitability for different house sizes ($50m^2$, $100m^2$ and $150m^2$). The number of models was further reduced to seven and these models' suppliers were contacted for price quotations. The project received quotes from five suppliers and of these, three models were chosen as the best options according to price and technical variables. The information was also complied into a booklet, which detailed the findings from the comparative desk study.

One of the challenges during project delivery was to ensure that the information that the Kaakonoja project collected and digested, was correct. Jantola, Mäkelä and Veijonen all indicated frustration towards the project worker, as she was not as useful as they had expected (Jantola, 2011, Mäkelä, 2011, Veijonen, 2011). This was due to the fact that they all realised quite soon after the start of the project that the project worker would have needed better technical knowledge. Jantola especially mentioned that it took quite a lot of his time to guide the project worker, which in some circumstances was frustrating, given the relatively short length of the project (Jantola, 2011). The collection and organising of data was a significant task in the negotiation and engagement stage of the project, as it required the ability to recognise relevant information that fitted the local context of the Kaakonoja project.

5.3.2.5 Engaging the local community

In order to highlight the project's profile within the local and wider Kaakonoja area, the project team organised three significant initiatives: a survey of Kaakonoja residents, a "Heat Pump Day" at the VVC and a smaller heat pump event for the Resident's Association members.

The first initiative was a survey of Kaakonoja residents in January 2008, which aimed to establish residents' existing knowledge base of energy saving and heat pump technology (Mäkelä, 2011). The survey had a two-way motive, to highlight the profile of the project and to acquire information about the residents in the Kaakonoja area regarding a) whether they were aware of heat pumps and b) if anyone had actually installed the technology. In order to do that, an information leaflet and an accompanying survey were distributed to around 440 houses in the area. The information leaflet was used to inform residents about the project and the survey to collect information about the community. The survey asked about the following:

1) Residents' knowledge of heat pumps
2) Residents' interest in purchasing a heat pump
3) Residents' knowledge of energy efficiency measures
4) Whether anyone had installed a heat pump and if so, whether they were willing to share their user experience.

45 residents responded to the survey and it was used to help the project team identify those who would be interested in a heat pump and those who had already had experience of the technology (three respondents). This was an important first step in the engagement process as it allowed the project team to advertise their project as well as get a better idea of who in Kaakonoja might be interested in heat pumps.

The second key task for the project was an event, a Heat Pump Day, organised together by Kaakonoja, VVC and the Valkeakoski Housing Fair office. Given their interest in creating new networks and seeking potential partners for student apprenticeships, VVC had suggested to Mäkelä and Knuuttila that the project could include a day to showcase heat pump technologies to people in Valkeakoski. The college could be used as a site for the exhibition and they could invite heat pump suppliers and experts to the event. The project team contacted several heat pump sellers and invited them to come and take part in the event. Most were very keen to attend the day and saw it as an opportunity for new clients, though there were 1-2 suppliers who did not respond at all which Jantola thought was a shame (Jantola, 2011). However, the project attracted 12 heat pump suppliers and the Heat Pump Day took place on 07.02.2008. The event included an exhibition by heat pump suppliers, Valkeakoski Housing Fair office and Pirkan Helmi, a talk by an energy engineer Jouko Airola and an expert panel, which took questions from the public.

Furthermore, the Kaakonoja heat pump project's booklet of key findings was freely available on the day.

The Kaakonoja project team, as well as the exhibitors, were prepared for around 100 people to attend but they were taken by surprise when around 700 visitors arrived on the day. According to Knuuttila, no one expected such a large turnout:

> "We were completely taken aback by the sheer number of people that came. We had expected around, I don't' really remember exactly, but say around maximum of 150 people to attend and we had close to 700 on the day." (Knuuttila, 2011)

Furthermore, Veijonen too was very surprised and said that the various events they had held at VVC had never had such a large turnout (Veijonen, 2011). The sheer number of people meant that the hall where the event was held was full most of the time, preventing some people from actually seeing the exhibitors or having a chance to hear the panel discussion. The popularity of the event was possibly spurred by two facts. First of all, there had been a general increased interest in heat pumps in Finland during 2006 and 2007 and several models had entered the Finnish market. Secondly, thanks to Mäkelä's media contacts, the event was widely publicised in local and national media, with journalists from local newspapers, radio and the national Finnish Broadcasting Corporation attending the event. However, the popularity of the event also demonstrates that in this case the Kaakonoja group, as well as their advisors at VVC and the heat pump suppliers, were overwhelmed by the unprecedented interest towards heat pumps. They had not prepared for such a large interest, and perhaps it is fair to say that no one may have expected them to do so given the project's rather small scope to start with.

The third activity that the Kaakonoja project arranged, was a more focused event for the Kaakonoja area local residents held on 02.04.2008 at a local school. The motive for the event was to tell the residents more about the project and its findings, as well as to seek those who may be interested in installing a heat pump. The 2-hour event included two expert speakers, who shared their knowledge about heat pumps and answered residents' question. Around 60 people attended the event, asking questions mainly concerning noise, heat pump costs, installation details and potential payback times. Overall the atmosphere in the event was positive and enthusiastic (Knuuttila, 2011). However, there were also a few residents who though that ground source heat pumps would make better longer-term financial sense than air source heat pumps, despite higher initial capital costs (Sairanen, 2012).

5.3.2.6 Ordering and installation of heat pumps

During spring 2008, around 120 people had shown interest to install a heat pump. Most of these were from Valkeakoski, but also from neighbouring towns and cities of Akaa, Kylmäkoski, Lempäälä, Kangasala, Ylöjärvi and Tampere. Mäkelä sent them the information booklet and heat pump recommendations either by email or by post. In the Kaakonoja area too, several people were interested. Mäkelä and Knuuttila were the first ones to install heat pumps in the summer of 2008 and soon several of their neighbours followed. Each household conducted the ordering process for the heat pumps individually, however they benefited from the fact that the Kaakonoja project team had negotiated a discounted price for their orders. Installation process was relatively easy for the customers, as the suppliers had committed to installation with user guidance. Furthermore, the installation costs were eligible for the Finnish government's tax deduction, meaning that residents were able to claim back 45% of the installation costs (Knuuttila, 2011).

By summer 2012 and four years since the end of the Kaakonoja project, over 100 houses in the Kaakonoja residential area had installed a heat pump (this was an estimate by Mäkelä as he had not kept an up to date list of actual installations (Mäkelä, 2012)). Neighbours that Knuuttila had spoken to had found acquiring their heat pumps hassle free

(Knuuttila, 2011). In fact, there were 2-3 households in Kaakonoja who were so convinced by their first heat pump, that they had ended up ordering a second one (Mäkinen, 2012). For example, Kirsti Mäkinen and her husband had their first pump installed on the ground floor of their house in 2008, costing 1,800 Euros. A second pump was fitted in the first floor of the house in 2010, costing 1,600 Euros. Mäkinen's house had previously been heated primarily by wood, but following her husband's ill health, a heat pump seemed like a much easier and lower maintenance option than heating the house with wood (Mäkinen, 2012). Mäkinen was extremely happy with the heat pumps and highlighted that they had saved around 1,000 Euros per year in heating costs (Mäkinen, 2012). Furthermore, Mäkinen mentioned that even though there were one or two neighbours, who had opted for ground source heat pumps, she did not consider it as an option:

> "As we are so old, so that is why we added these for additional heating, as you never know, the husband is ill and I am old too, so you never know how long we will still be here and with ground source heat pump you would have to live with it at least for ten years." (Mäkinen, 2012)

Mäkelä and Knuuttila both said that overall the Residents' Association was happy with the project's outcome and they had mainly heard good experiences from neighbours (Knuuttila, 2011, Mäkelä, 2012). Mäkelä (2012) especially was upbeat about the feedback, saying: "*I have not heard anything other than positive feedback. I suppose my neighbours would have come and said that what did you talk us into doing in case they were not happy*". One or two neighbours had had issues with vibration from the heat pump and Mäkelä mentioned that this may be due to the location where the pump was installed (Mäkelä, 2012). In terms of energy consumption, Mäkelä's own data collection had showed that he had saved more on heating bills than he had initially anticipated (Mäkelä, 2012). Furthermore, the heat pump he installed had added to the comfort of his house. The heating was more evenly spread and his wife, who has heart trouble, had benefited from the cooling function during the hot summers of 2010 and 2011 (Mäkelä, 2012). Knuuttila had similar positive user experiences, though he was not sure about how much electricity he had actually saved as he had not kept a log of his usage (Knuuttila, 2011).

Furthermore, Knuuttila was pleased to tell that following the project, the Residents' Association committee had also been successful attracting younger members and two women in their 40s had joined the committee (Knuuttila, 2011).

Jantola and Veijonen too were glad that they had got involved in the project, even though there were some aspects they wished they would have done differently, mainly the recruitment of the project worker (Jantola, 2011, Veijonen, 2011). However, they praised the innovative aspect of the Kaakonoja project and said that they had not come across a residents' association like Kaakonoja before, which would actively take on an energy project and consider a large purchase of technology (Jantola, 2011, Veijonen, 2011). Both Jantola and Veijonen were impressed especially by Mäkelä and Knuuttila's enthusiasm and drive for the project, as recounted by Jantola: "*at first we were thinking that what are these old granddads talking about, but soon we realised that they were pretty serious about their project*" (Jantola, 2011). Community energy groups certainly benefit from having a clear leader, but they also require a team that supports them throughout the processes of local contextualisation, and negotiation and engagement.

5.3.3 Transferable lessons

The third process linked to successful niche innovations is that of transferable lessons, lessons that "*can be taken from particular local contexts…and institutionalised into general rules on the global niche level*" (Raven et al., 2008, p.468). In the case of Kaakonoja there were several processes, which implicated inter-local transfer of activity (Geels and Deuten, 2006).

The Kaakonoja project was initiated by two men who were concerned about the cost of their heating bills. However, even though Mäkelä and Knuuttila's primary motivation for the project was to find information about more affordable heating technology for their own houses, they also had secondary motives, especially those of sharing their experience with others in order to avoid people duplicating the same work. Knowledge was created by the project itself, its participants and external expert advisors, resulting in an information booklet about various heat pump models, which was freely available to others.

An important part of the project was the relationship with VVC and the partnership with Pirkan Helmi. Jantola and Veijonen at VVC extracted learning from the project, especially regarding a community group innovating an energy project and for example Veijonen mentioned that she had used the project in her teaching at the VVC (Veijonen, 2011). For Pirkan Helmi, the Kaakonoja project turned out to be one of their exemplary projects, which was truly innovative, citizen-led, not-for-profit and benefitted the wider community (Vesisenaho, 2012). Pirkan Helmi had for example received several enquiries about the Kaakonoja project from the general public. They had also used it frequently as an example in their engagement with stakeholders, highlighting the project as an excellent example of a community developing an energy project (Vesisenaho, 2012). Vesisenaho had used the Kaakonoja case as an example in meetings with local stakeholders, as well as in meetings for example in Tallinn and Brussels with other EU Leader organisations (Vesisenaho, 2012). Vesisenaho especially highlighted the role of Mäkelä as an important factor for the project's success, especially his networking skills and the ability to gain good publicity for a project which was very topical at the time (Vesisenaho, 2012). Furthermore, Pirkan Helmi had also provided a platform for Mäkelä to come and talk about the project to stakeholders, which he did on a few occasions (Vesisenaho, 2012).

The literature on niche development states that protected spaces are necessary for niche development, providing "*learning platforms for new social networks to emerge*" (Raven et al., 2008, p.465). In the case of Kaakonoja, a small community developed a truly innovative local experiment, benefiting from external funding support as well as external technical expertise. Furthermore, they were willing to share their learning with others, demonstrated by the organisation of the Heat Pump day. The Heat Pump day provided the project participants an opportunity to widen their networks with heat pump suppliers, external experts, the media, Kaakonoja community and the wider public.

As mentioned in Chapter 2: Theoretical Framework, Raven et al. (2008) highlight that it is important for projects to be able to learn from niche actors and benefit from global niche level rules such as best practice guidance, technical standards and shared ideas. In the case of Kaakonoja, the global niche level was missing as there were no clear standards or guidelines available and the project was very much on its own and learned by doing. Even though the project benefitted from external funding (Pirkan Helmi) and advice (VVC and Tampere University), there were no dedicated intermediary actors from where the project members could have sought technical help, highlighted by the difficulty of finding technical expertise for the project.

Furthermore, there was no clear evidence that the experience and learning from Kaakonoja was being translated to global niche level resources either. The sharing of the Kaakonoja experience was mainly limited to the information booklet, the Heat Pump day and any individual enquiries that the project team received, the majority of which were related to heat pump technology. A part of creating a niche is moving from individual, isolated, projects to a network of projects (Geels and Deuten, 2006), which the Kaakonoja case, despite its excellent communication record, did not achieve. There is no doubt that the project did raise the profile of heat pumps within the local and regional area, especially thanks to Mäkelä's media connections. However, in the absence of intermediary organisations, the lessons of innovation and the benefit of acting together as a community were only shared with the project's initial partners, the VVC and Pirkan Helmi. Even though both organisations used the Kaakonoja case as an example in their engagement, there was no clear intermediary organisation involved who would have taken these lessons and actively shared and promoted them to other community groups or even encouraged people to set up such groups.

5.3.4 Conclusions on the Kaakonoja project

5.3.4.1 Local contextualisation

The Kaakonoja project's primary motive was the need to find out alternative heating options for expensive electric heating. At the time, several heat pump models were flooding the Finnish market, but there was no independent body providing comparative information about various models. There was a general consensus amongst interviewees that there needs to be more independent information and advice available to households who want to install technologies such as heat pumps. This is important in a field like renewable energy where technologies develop quite fast and households may not have the necessary technical knowledge to choose the best options.

5.3.4.2 Negotiation and engagement

Mäkelä's role was central to the Kaakonoja project, he was its driving force, keeping the project going and steering it through. However, Mäkelä did not operate alone, but had a supportive team behind him. Pre-existing knowledge, skills and expertise were important in the Kaakonoja project. Mäkelä's local knowledge and journalistic background meant that he was able to complete a successful funding application, while his media contacts ensured high interest in the local and national media. Another important team member Knuuttila, meanwhile, had a background in engineering and provided basic technical expertise.

The importance of having, or finding, the right skills base was also demonstrated by the project worker who turned out to lack technical knowledge and required a lot of guidance from others involved in the project. The niche development perspective by Geels and

Deuten (2006) assumes that professional firms are involved in niche innovations rather than community groups, presuming that skills such as applying for funding, collecting data and sharing experience, or simply having the reputation to attract technical experts to collaborate with, are skills that groups developing niche innovations automatically have. Cases like Kaakonoja show, that community energy projects may have links to professional organisations such as funding bodies and external advisors, however, the actual project leaders who initiated it were still very much footed in the community, especially in the roles that Mäkelä and Knuuttila had throughout the project. Furthermore, less attention is also paid to the issues of interpersonal trust and personal risk taking in the niche development perspective (Geels and Deuten, 2006, Raven et al., 2008), both, which were crucial for the success of the Kaakonoja project.

The team at Kaakonoja thought that as a group they would be in a better position to negotiate with heat pump suppliers, building on the strong community links that already existed in the area. Since the Kaakonoja project had finished, there has been more information available regarding heat pumps for example from Motiva, who together with The Finnish Heat Pump Association SULPU, has published guidelines (Mäkelä, 2011). However, the team at Kaakonoja did not particularly trust SULPU, as they did not consider it to be a truly independent source at the time (Mäkelä, 2011).

5.3.4.3 Transferable lessons

Through the creation of the heat pump project, the Kaakonoja team effectively built their own network of experts and information sources, despite the difficulty of finding an external technical expert. The Kaakonoja team felt that more open political discussion was needed about the potential of small-scale generation and actors like households becoming active participants in the Finnish energy system (Knuuttila, 2011). However, acting on the learning from the project's processes, such as the requirement for political discourse, may be difficult to achieve by individual projects alone. Intermediary organisations, such as professional societies, industry associations and research institutes can help in translating learning from projects to global niche level guidelines (Geels and Deuten, 2006). As Geels and Deuten state regarding the role of intermediary organisations:

> "Aggregation activities by intermediary actors do not revolve around finding technological solutions for local, specific problems, but rather around the creation, maintenance and distribution of generic, abstracted knowledge that can be used throughout a technological field." (Geels and Deuten, 2006, p.267)

However, the conceptual perspective by Geels and Deuten does not account for political dimensions, apart from recognising that they could have given "*more attention to the social and political aspects in standardisation"* (Geels and Deuten, 2006, p.273), though this is mentioned in relation to how standardisation committees operate rather than how niche innovations could apply political pressure. Raven et al. (2008) too limit political aspects of niche innovations to the power relationships that influence the negotiation and engagement processes in local projects, rather than seeing them as part of intermediation.

The Kaakonoja project demonstrated that it succeeded in its own locality largely due to a team of knowledgeable of actors: an enthusiastic leader supported by a willing team who were not put off by set backs such as delay in funding or the struggle to find expert advice. They were keen to share their learning with others and proceeded to organise two community events to do so. However, the lack of effective intermediation meant that the learning and experience from Kaakonoja mainly stayed at the inter-local niche phase. Table 23 summarises the Kaakonoja case.

Process	Kaakonoja case	Empirical issues
Project vision Vision and expectations for the project in its local context	Alternatives to expensive electric heating	Houses were suitable only for technologies that did not require central heating pipes
	Lack of information	No independent body was available to provide comparative information about technology
	Community building	Ageing association committee
Negotiation and engagement Participation, negotiation of expectations and engagement	Pre-existing community group	Previous joint activities
	Clear lead person	Experience of organising activities
	Dedicated team	Neighbourly trust
	Communication	Lead person's journalistic background
	External funding	Pre-existing knowledge of funding sources
	External advice	Difficult to find a technical expert willing to advice the project
Transferable lessons Lessons from local projects to global niche level	Organised community event	Surprised by the amount of interest from local area
	Information available to others	Willingness to share learning from the start
	Lessons to funding organisation Pirkan Helmi	Used as an example project that Pirkan Helmi has funded
	Lessons to expert organisation VVC	Used as an example of heat pump technology

Table 23: Summary of niche processes, Kaakonoja

5.4 Keuruu Ylä-Kivelä block of flats

The second Finnish case, Asunto Oy Keuruun Ylä-Kivelä is a residential block in Keuruu, central Finland. The block was built in 1975 and has 40 apartments. Approximately 50-60 residents live in the block, ranging from families with young children to pensioners in their 90s, and people have a mix of backgrounds and occupations. Two thirds of the apartments are owner-occupied, while the rest are rented out by private landlords. In 2008 Ylä-Kivelä became the first block of flats in Finland to replace an oil-based heating system with a combined pellet boiler and solar thermal heating system.

The Ylä-Kivelä project is analysed in relation to three key processes linked to niche development: (1) local contextualisation, (2) negotiation and engagement and (3) transferable lessons (Raven et al., 2008). Local contextualisation includes the processes of formulating initial expectations, project vision, as well as the influence of the local context that the project operates in. Negotiation and engagement are the processes that shape the project's initial vision and expectations following engagement with key stakeholders. Finally, transferable lessons are those that can be transferred from projects' experience and learning to global niche level rules (see also Table 24).

Process	Key dimensions	Example activity
Local contextualisation	a) Vision of the project b) Expectations c) Local context	a) Reduce heating bills b) Cheaper heating bills c) Geographical and cultural location of a project
Negotiation and engagement	a) Participation b) Negotiation of expectations c) Engagement	a) Project meeting b) Adjust project plan in a changing policy context c) Organise visits to other sites
Transferable lessons	a) Lessons from local projects to global niche level	a) Technology guidebooks, funding guidelines, networking advice

Table 24: Processes linked to community energy development and niche formation (a version of this table first appeared in section 2.4.5.3 of this thesis)

5.4.1 Local contextualisation

Initiation of the Ylä-Kivelä project took a total of around two years and involved processes such as developing a purpose for the project, identifying motivations and initial expectations for the project, which helped to shape the project's vision as well as the local innovation (Raven et al., 2008).

5.4.1.1 Purpose and motivation for the project

Ylä-Kivelä is located in a residential area of Keuruu, a town and a municipality of around 10 500 people. It is a typical Finnish block of flats[33], which is run as a limited-liability housing company. This means that residents buy shares in the housing company, which then gives them the right to either live in their flat or rent it out. Limited-liability housing companies are run according to the Housing Companies Act (1991, updated in 2010). The Housing Companies Act sets out details over how shares are allocated and managed, how maintenance fees can be used, how the building is managed and decisions made. In the case of Ylä-Kivelä, the housing company has a board, which is selected for one year at a time in the annual residents' meeting.

The Ylä-Kivelä project was first initiated by Lauri Lahtinen in 2006. Lahtinen lived in the block for 27 years between 1983 and 2010, and together with his wife had acted as a caretaker for the block for 20 years. Since 2005, Lahtinen had been working as a Technical Building Manager at Keuruun OP Kiinteistökeskus, a local building management company, which had taken over the management of the Ylä-Kivelä block. During the years 2006 and 2008, Lahtinen and the residents at Ylä-Kivelä were faced with a problem that their existing oil boiler needed replacing. Due to his role as a manager for the block Lahtinen started to consider alternative refurbishment options for the existing heating system.

> "The block of flats had an oil heater that was almost 30 years old and it had really come to the end of its road. We had to do some kind of an overhaul of the heating system." (Lahtinen, 2011)

Years leading up to 2006 had seen oil prices rise in the global markets, also reflecting heavily on the price of oil-based residential heating in Finland. As was the case in the other Finnish project, Kaakonoja, Ylä-Kivelä too was affected by the changes taking place at the landscape level of the socio-technical energy system in Finland. These changes at the landscape level, rising oil prices, put pressure on the governing electricity and heat

[33] In 2011, 43% of the Finnish population lived in blocks of flats (TEM 2013b).

regimes that were relevant to the Ylä-Kivelä project. One of the options considered in Ylä-Kivelä was joining the local district-heating network, which is very common practice in the Finnish context (Lahtinen, 2011). However, as Keuruu is one of the most expensive district-heating areas in Finland, Lahtinen therefore wanted to explore whether they would have other options available (Lahtinen, 2011). Niche literature states that pressures to the existing regimes, such as high energy prices, can result in new innovations being developed in niche spaces (see for example Smith et al., 2010). In the case of Ylä-Kivelä, Lahtinen was ready to contest the existing energy regime and seek new and alternative options, indicating innovative activity.

5.4.1.2 Initial expectations and project vision

Key motive for the Ylä-Kivelä project was to seek alternatives for expensive oil and district-heating. At the start of the Ylä-Kivelä project, thanks to his background in building maintenance, Lahtinen had some basic knowledge about fossil fuel energy technologies. However, when it came to renewable energy, Lahtinen did not really know much about the technologies or where to start searching for further information, especially regarding renewable energy technologies that would be suitable to use in a block of flats. As Lahtinen (2011) described it: "*There was very little information available, or if it was available, I did not know the right sources where to find it from.*"

To begin with, Lahtinen did some basic internet searches for renewable energy and came across contacts such as the Finnish Pellet Association, the chairman of which also lived in Keuruu and turned out to be a valuable source of technical information. Through his job Lahtinen also had access to several building trade publications, which he found useful (Lahtinen, 2011). Furthermore, through his personal local contacts, Lahtinen became aware that another block of flats in Keuruu, Metsälinna, was going through a heating system refurbishment and that they were planning to install a pellet boiler. Lahtinen was keen to find out more and thought that if Metsälinna was able to install renewable energy and steer away from district-heating, then it might also be possible to do so in Ylä-Kivelä. However, Lahtinen needed to find out more about pellet technology in order to understand it, how it might be incorporated into their existing building and at what cost. The more Lahtinen learned about renewable energy, and pellet systems in particular, the more convinced he became that it may be a possible option for Ylä-Kivelä. Furthermore, even though Lahtinen's initial motive for the refurbishment was to find cheaper heating options, he soon realised that the project could also have "*green values*" and be beneficial to the environment, as they would be replacing oil with a renewable source (Lahtinen, 2011).

5.4.1.3 Local innovation

Following Lahtinen's initial enquiries with Metsälinna and the Finnish Pellet Association, he started to talk about his ideas to the residents at Ylä-Kivelä in his daily encounters with them. As Lahtinen had been living and managing the Ylä-Kivelä block for a long time, he was well known in the block and had regular contact with the residents. Even though renewable energy technology was new to the majority of Ylä-Kivelä residents, they seemed interested in alternative options to oil and district-heating, especially if those alternatives would also save them money (Lahtinen, 2011). As discussed in Chapter 2: Theoretical Framework, innovation can be defined as an activity, technology or an idea that is new to the user (Rogers, 1995). According to Lahtinen (2011), this truly was the case in Ylä-Kivelä, where little previous knowledge existed regarding renewable energy systems. However, despite their lack of knowledge, the residents were open to Lahtinen's ideas, even though these involved heating technology that was new in the context of blocks of flats in Finland (Lahtinen, 2011).

Lahtinen was encouraged by the positive first reactions from residents and he started to explore further which renewable energy options could be possible in their circumstances. He thought that a pellet boiler would possibly be the best option for their block, even though he also considered ground source heat pumps. However, Lahtinen found it even more difficult to find information about ground source heat for residential blocks: "*I did consider ground source heat, but there was not really any information available from anywhere regarding ground source heat or possible pilot projects*." (Lahtinen, 2011). However, given the information Lahtinen had about Metsälinna, he thought that perhaps pellets would be a good option for Ylä-Kivelä too and he thought that they should potentially proceed further. The local innovation in the Ylä-Kivelä case was perhaps more oriented to technological innovation, rather than social innovation (Grimm et al., 2013), given that the pellet and solar thermal technologies that they deployed in Ylä-Kivelä were radically new to them, while their initial decision making channels through the block's board were well established.

5.4.2 Negotiation and Engagement

Negotiation and engagement activities involve the processes that shape the initial expectations and project motives, as those developing niche innovations start to engage with their stakeholders. Processes such as negotiating expectations and readjusting project plans according to the local community's requirements shape the final vision for the niche innovation (Raven and Geels, 2010, Raven et al., 2008). In the case of Ylä-Kivelä, the processes of negotiation and engagement are largely related to initial project meetings, engaging with the local community, arranging funding and delivering the project.

5.4.2.1 Initial project meetings

In the face of expensive oil and expensive district heating, Lahtinen brought up the idea of using renewable energy for the heating system refurbishment at the Ylä-Kivelä block's board meeting in the end of 2006. The Ylä-Kivelä board has five members, who are chosen for one-year posts at the residents' annual meeting. The board meets four times a year and it has a power to propose issues for discussion and decision-making at the residents' annual meeting. The annual meetings are open to all residents and each shareholder has one vote and decisions are made based on a majority of votes. Usually around 10 people (out of 40 flats) have attended the residents' meetings (YK3, 2011).

When the board discussed the heating project in their meeting in 2006, Lahtinen remembers that the board members' reaction was positive from the start and people were genuinely interested in renewable energy, even though they had little knowledge about it (Lahtinen, 2011). The board members thought that the idea of using renewable energy instead of oil or district heating sounded not only attractive in terms of potential cost savings, but they were also interested in more "*efficient technology*" (YK3, 2011).

Lahtinen told the board about the other block in Keuruu, Metsälinna, who were in the process of installing a pellet boiler and that perhaps they at Ylä-Kivelä could consider a similar option. The board members were interested to find out more and Lahtinen soon contacted the building manager for Metsälinna and arranged for the Ylä-Kivelä board to visit the block. Metsälinna is a similar block to Ylä-Kivelä, only slightly smaller in size (32 flats). The visit by the Ylä-Kivelä board was a positive experience: "*We went to look at the pellet system, to see what it was like. They were really satisfied with it.*" (Aho, 2011). Meeting residents at Metsälinna, especially as they were happy with the pellet system and found it cost effective, encouraged the Ylä-Kivelä board. Furthermore, Metsälinna residents were pleased with KSM-Lämpötekniikka too, the company that had installed the system. This shared experience inspired the Ylä-Kivelä board to also consider a pellet-based system for their block. By visiting other projects, niche innovations can start to build networks and learn from others' experience, on a range of issues such as technology, how to organise funding, how to manage projects and seek external advice (Geels and Deuten, 2006). The activity of visiting another project in Ylä-Kivelä indicates inter-local stage of knowledge sharing at the start of a niche, as can be seen from Figure 18 below. At this stage, local practices became aware of each other and start to share information and knowledge, learning from each other's experience.

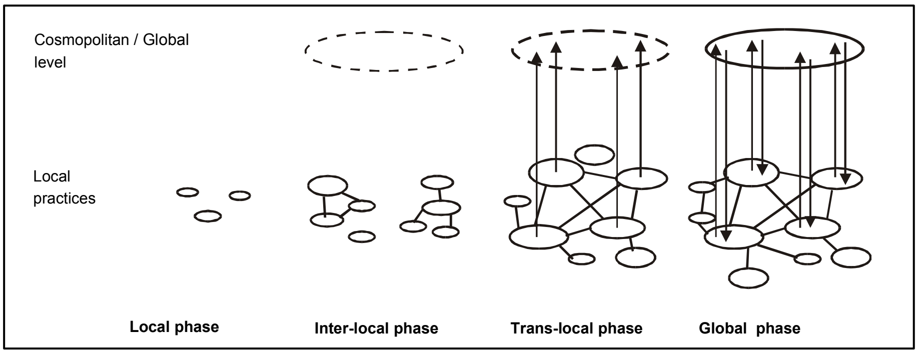

Figure 18: Different phases of knowledge sharing from local to global phase (adapted from Geels and Deuten, 2006, p.269). Note that this figure first appeared in Chapter 2 of this thesis.

Sharing of knowledge and experience between projects is especially useful in a new field such as community energy, in which projects may have little pre-existing skills or networks (see for example Seyfang et al., 2013a, Seyfang et al., 2013b).

5.4.2.2 Engaging the local community

In addition to the visit to Metsälinna, the Ylä-Kivelä board decided to seek their own residents' views on the heating refurbishment project and circulated a questionnaire to Ylä-Kivelä residents in early 2007, asking views on the project ideas, mainly the option of using renewable energy (YK2, 2011). Following responses from residents, which indicated that residents were in principle supportive of the project, though they had questions over costs and how the technology works in action, Lahtinen and the board decided to find out how much it would actually cost to install a project similar to that in Metsälinna. Lahtinen contacted pellet suppliers and invited them to bid for the work. One of the companies invited to tender was KSM-Lämpötekniikka, who proposed an idea of creating a heating system, which would combine a pellet boiler with solar thermal collectors. Lahtinen (2011) thought that this was very interesting as he had not really considered solar thermal himself. On the advice of the board, Lahtinen invited KSM-Lämpötekniikka to come to the next residents' annual meeting in 2007 to tell more about the technology. This meeting was used to allow residents the opportunity to ask questions about the project. The residents had been circulated an agenda and details of the heating refurbishment proposal prior to the meeting, giving everyone a chance to get to know the material beforehand. According to Lahtinen (2011) the majority of the shareholders attending the meetings were supportive of the project from the start. However, there were also those that had their doubts and around 1-3 shareholders were at first sceptical about the project (YK2, 2011, YK3, 2011). The shareholders raised questions regarding especially the following issues:

- Costs of the project: Residents were concerned about how the project would be financed and much additional costs it would add to their service charges.
- Costs and availability of pellets: Residents had concerns over the cost of pellets, as well as their price trends in the future. They were also concerned about the availability of pellets for the long term. According to Lahtinen (2011) there was a great deal of misinformation regarding pellet availability at the time, and he for example had come across reports in the news indicating pellet shortages in the future.
- Solar thermal technology: Solar thermal technology was new to the majority of residents at Ylä-Kivelä and they had questions regarding basic functioning, costs and reliability.
- Position and visual effects of the pellet storage building: Part of the project plan was the installation of a pellet storage building and this had to be located adjacent to the Ylä-Kivelä block. Residents were concerned what the storage building would look like and whether neighbouring blocks may complain about it.

Regarding the residents' concerns, Lahtinen was prepared and had answers ready to address these concerns. The cost of the project was likely to be around 70,000 euros and Lahtinen was aware that they could apply for a government grant for a part of it. In terms of the pellet store, Ylä-Kivelä would need planning consent from the local authority, which meant that neighbours would have an opportunity to comment on the building's plans.

KSM-Lämpötekniikka addressed the issues of pellet costs, pellet availability and technical details for solar thermal.

In addition to the meeting with KSM-Lämpötekniikka, the block had an additional residents' meeting in 2007 to discuss the project's costs and how it would affect residents' service charges (YK3, 2011). Following the residents' meetings, a decision by the shareholders was made to go ahead with the renewable energy project, as Lahtinen was able to show that it was likely to save money for the block. It should be noted that as two thirds of the flats were owner-occupied and one third rented, the decision on the project was made by the shareholders of the rented flats. In other words, those who were renting did not in effect have a say on the issue, making the decision more mandatory for those who rented their flats. The issue with ownership is an important one in decision making in block of flats, especially regarding those people who live in rented accommodation. For example a survey conducted by the Finnish Ministry of Employment and the Economy found that 32% of respondents living in blocks of flats did not know how their blocks were heated (compared to 8% in terraced houses and 0% in semi-detached/detached houses) (TEM, 2013b).

However, those shareholders that were interviewed in the Ylä-Kivelä case felt that the decision about the heating project was made on a democratic basis, following established decision-making channels, and they had been given good detailed information about it and several opportunities to comment and ask questions (YK2, 2011). One interviewee especially mentioned that "*(Lahtinen) had done the background work really well*", which had left residents feeling well informed (YK2, 2011). In fact, residents thought that the decision regarding the heating system was made as any other decision that had been made in the apartment block, using the existing decision making channels of the residents' annual meetings. One interviewee for instance said that "*We did things together and I personally informed the old ladies in the block about costs and that they would not go up* *and that things were looking good in the block.*" (YK1, 2011). Furthermore the interviewee continued that people living in the block tended to be "*rather humble and they usually agreed to the ideas that the board presented to them…and generally there were very little complaints*" (YK1, 2011). Another interviewee too indicated that relations at the block had always been open and worked well (YK3, 2011). This could of course be an indication of good relations within the block as well as the fact that residents trusted Lahtinen and had got used to him looking after it well (YK1, 2011). Lahtinen himself was proud that they had always kept the block in tiptop condition, clean and enjoyable to the residents:

> "Of course this is only my opinion, but I think that very much it was that the residents had got used to trust me and my wife, and the services we provided over the years. And when I joined as a building manager after being a caretaker and when I made suggestions for the block, they had that trust. Maybe another factor is that it was the only block for a long time that still had a personal caretaker and this may sound like I am talking myself up but we always had a clean and well functioning block and were the area's flagship in that respect. So maybe the residents felt that they also wanted to show an example with the heating system." (Lahtinen, 2012)

However, it was not only about trust, but also about clear information that the residents received, as Lahtinen continued:

> "Another factor was that the pellet system supplier knew how to present the case in layman terms, both regarding the pellet boiler and the solar thermal system. Maybe these were the factors. Of course we based the decision on euros, but also these environmental issues and that we actually wanted to be a pilot case and a pioneer." (Lahtinen, 2012)

Ylä-Kivelä was somewhat an unusual block that at the time of the heating project development they still had their own caretaker who also lived in the block. Historically blocks of flats used to have a caretaker, but the majority of them have been outsourced to external building maintenance companies. The caretaker usually lived in the block and looked after the building, as well as to some extent the residents. The caretakers usually knew their buildings inside out. Their role was often a trusted one and what added to that was their physical presence in the building. For instance if a resident locked himself out of his apartment, a chance was that he would be let in fairly soon by the caretaker rather than having to wait for an external company to arrive and most likely also charge for the service. Finnish author Miika Nousiainen describes the role of a caretaker in his novel Maaninkavaara as:

> "A caretaker has a brush in one hand and morale in the other. Caretaker is a social welfare office and a renovation firm in one person, he fixes broken eaves and haggard souls. Caretaker knows first and knows best." (Nousiainen, 2009, p.31, translated from Finnish)

Lahtinen too seemed to fit this role. As Lahtinen described, he was sometimes as much involved in the residents' personal lives as he was in looking after the bricks and mortar of the Ylä-Kivelä block, ranging from collecting pharmacy prescriptions for some of the retired ladies at the block, to letting people into their flats in the middle of the night and occasionally solving domestic disputes (Lahtinen, 2012). The important role of the caretaker was also reflected in the Ylä-Kivelä interviews. One interviewee said that "*a caretaker is a force which brings togetherness*" (YK3, 2011), while another one added that "*a caretaker is important*" (YK2, 2011). Furthermore, the Ylä-Kivelä residents had been asked some years earlier by the board whether they wanted to still keep a caretaker and the answer, especially from the older people living in the block, had been a very supportive yes (YK1, 2011). There was a clear sense of loss amongst the interviewees over the fact that Lahtinen and his wife had moved out of the block in 2010 (Aho, 2011, YK1, 2011, YK2, 2011, YK3, 2011). Lahtinen too said that they more or less had no choice as his wife had to retire on health grounds and she required ground floor level accommodation (Lahtinen, 2012). However, as one resident said they were pleased that "*Lasse (nickname for Lahtinen) is now our building manager, good that he stayed in that role*" (YK2, 2011). So even though Lahtinen had physically moved out of the building, his presence was still very much felt as being 'there' via his building manager role. Other interviewees too mentioned that joint activities had decreased since Lahtinen had moved out of the building and that communal activities usually needed someone, like a caretaker, to lead them (YK1, 2011, YK3, 2011):

> "I feel that previously when Lasse was our caretaker we did things. But now we had not had so many, times change. When I moved here about ten, eleven years ago we used to have all sorts of activities like parties and summer parties. But now that has changed." (YK2, 2011)

From the interviews with Lahtinen and the residents, it is clearly evident that the pre-existing community cohesion and residents' trust in Lahtinen's ability to look after the block were part of the positive decision to embark on the renewable energy project. Despite their initial lack of knowledge, the residents were willing to try something new and wanted to take on the role of being a forerunner by installing a heating system that was new not only to them and their local area, but also in the wider context of Finland. They were perhaps behaving (as a community) in the same way as before, but showing innovativeness by taking on a new kind of a project, which had not been done before. As Lahtinen (2011) described it: "*The shareholders were brave in this case, because this was a pilot also on a national scale, that a block this big installs pellets and solar thermal*". Factors such as personal trust and interpersonal roles within a project team are not given much foothold in the niche development perspective by Geels and Deuten (Geels and Deuten, 2006), which focuses largely on professional organisations undertaking niche innovations. In the Ylä-Kivelä case, meanwhile, the trust that residents had in Lahtinen was particularly of importance. Not only were the residents faced with technology that they knew nothing about, but they were also in a situation whereby they had to do something about their ageing oil heating boiler. The project secured success with Lahtinen's vision for cheaper heating provision (which was also based on a renewable and local resource) and the trust that residents had in him.

5.4.2.3 Arranging funding

Once the decision to proceed with the project was made, Lahtinen started to finalise details for project funding. He had received several quotes from pellet boiler suppliers, but decided to proceed with KSM-Lämpötekniikka as their inclusion of solar thermal had really got the interest of the residents (Lahtinen, 2011). Furthermore, their price for the complete system including installation was reasonable and it was going be completed on a turnkey basis. The total cost for the project was 77,552 Euros, including 59,746 Euros for the pellet system and 17,806 Euros for the solar thermal (Lahtinen, 2011).

Lahtinen was also aware through his building maintenance contacts that Ylä-Kivelä could apply for the government's Energy Support grant (see also section 5.2.2.1), which allocates capital grants to energy projects especially those using renewable energy (Lahtinen, 2011). Lahtinen contacted the local authority in Keuruu for more details and received an application form, which he said was easy to complete as "*it only involved filling in a form which was very straightforward*" (Lahtinen, 2012). Another interviewee also mentioned the ease of the funding application as it mainly had to include details of the plan and its projected costs (Aho, 2011). The Energy Support grant subsidy decision was made relatively quickly, and while Lahtinen did not remember the exact days that they were told about the decision, he did not think that it took a long time (Lahtinen, 2012). Ylä-Kivelä received a subsidy of 15% of the projects' capital costs, totalling 10,200 Euros, which left the Ylä-Kivelä block to pay 67,352 Euros (Lahtinen, 2011).

The project payment was arranged as a two-tier system. The Ylä-Kivelä board suggested that residents would be given the opportunity to either pay their share of the new heating system with a one-off payment or pay it as a loan over five years. The payment that each shareholder had to pay was calculated according to the square meter area of their flat. Around one third of residents paid their share by the one-off payment, while two thirds chose the loan option (Aho, 2011). The Ylä-Kivelä block guaranteed the loan for the five-year payments and these were charged through the monthly service maintenance charges (which worked out around 0.70 Euros/square meter) (Aho, 2011). Interviewees felt that funding for the project was relatively easy and low risk, as the loan was guaranteed by the apartment block (Aho, 2011, Lahtinen, 2011, YK2, 2011, YK3, 2011). The government funding was mentioned as a positive addition by interviewees, though they also added that it was not a prerequisite for the project, as it would have most likely gone ahead without it (Aho, 2011, Lahtinen, 2011, YK2, 2011, YK3, 2011), especially since they really needed to refurbish the heating system (YK3, 2011). One interviewee added that there is not enough government funding available for these types of projects and that may be a reason why there had not been many other similar installations, adding that for them the loan was a good option, as it was low risk (YK3, 2011).

Once funding was organised, Lahtinen also contacted pellet suppliers. The best deal came from local supplier VAPO, located in Vilppula, 35 kilometres from Keuruu. VAPO was an established pellet supplier in the area and also had other larger customers, for example local Hotel Keurusselkä as well as the Metsälinna block. In 2011, 80 million euros of VAPO's 720 million annual turnover came from pellet sales (Katainen, 2012). One resident at Ylä-Kivelä mentioned that it was really important to them that the supplier for the pellets was a local company, so that they were able to "*reach them in case we had to, instead of just having them somewhere at the end of the phone*" (Aho, 2011), adding that "*if we would have chosen oil, the oil could have come from who knows where*" (Aho, 2011). Another interviewee too felt that local supply was important: "W*ith the pellets, they are always available as they come from Vilppula and they (the supplier) make sure that we always have enough*" (YK1, 2011). This indicates that amongst globalised oil markets, energy security can become an issue for those energy regimes, which lack their own resources. Finland for example does not have its own domestic crude oil resources and oil is mainly imported from Russia, Norway and other EU countries (Finnish Energy Industries, 2014). Biofuels, such as pellets, meanwhile, is a largely domestic energy resource, due to the fact that much of it is produced as a by product of the Finnish forestry industry (Finnish Energy Industries, 2014). In 2011, 5% of Finland's heat production came from oil, while 33% came from biofuels (IEA, 2011a). In the case of Ylä-Kivelä, having a domestic and local energy resource certainly was an important factor.

5.4.2.4 Project delivery and outcomes

The Ylä-Kivelä project delivery was started in the summer of 2008, with completion on 27th August 2008. This involved the removal of one of the two old oil boilers, the installation of the pellet boiler and the installation of the solar thermal collectors. Lahtinen remembers that the installation of the pellet boiler in particular made him somewhat uneasy, as they had to make a large hole on the side of the Ylä-Kivelä building in order to get the pellet boiler in (Lahtinen, 2011). As Lahtinen described the process:

> "This was not in any way an easy project to install, the difficulties were not insurmountable, but we had to make a large hole to the side of the block. First we dug an underground tunnel, so that we could reach the ground floor level boiler room. We then made a large hole on the wall of the block and used that to get the old boiler out and the new one in. Then we also had the hot water tanks and a problem with them was that the boiler room was becoming too small, so we could not use one large hot water tank, but installed three smaller ones." (Lahtinen, 2011)

The whole installation of the pellet and solar system took around a month. Despite the complicated nature of the project installation, the residents did not remember it being intrusive or problematic. As one resident described it:

> "We did not have any rubbish in the courtyard or anything else. You know some projects can take a whole summer to install and they have lots of rubbish everywhere, but we didn't have that. Everything was done pretty quickly and there were no large machines. We lived our normal lives." (Aho, 2011)

Overall the Ylä-Kivelä interviewees seemed happy with the installation of the project. In terms of operation, Lahtinen said that at the beginning they had to do technical adjustments with the pellet system, but that this was normal and expected from this type of installation (Lahtinen, 2011). Other Ylä-Kivelä interviewees mentioned that there had been some noise issues with the pellet system to begin with (YK1, 2011). This was solved by building the pellet storage adjacent to the Ylä-Kivelä block, which had been part of the project plans (YK3, 2011). Pellets were then hoovered from the new building almost silently (Lahtinen, 2011). For the pellet storage Ylä-Kivelä required a planning permission and Lahtinen (2011) said that this was straightforward and simple to do, with decision made quickly and the local council supporting the project. In addition, Ylä-Kivelä had to inform the local council about the change in the heating system, which was more of a notification than anything else (Lahtinen, 2011). In the end both residents and neighbours were happy with the design of the storage building, which was built one year after the pellet-solar system was installed (YK1, 2011).

One aspect of the project that the residents were especially pleased with was the solar thermal system and several specifically mentioned that, especially since it was an automated system so that the solar thermal collectors would be first to operate if there was enough solar radiation and the pellet boiler came second (Aho, 2011, YK1, 2011, YK2, 2011, YK3, 2011). In fact, hot water in Ylä-Kivelä was heated using the solar thermal collectors from May to October. The system was backed up by leaving one of the old oil boilers in place and Lahtinen said that they had had to use it once or twice during maintenance (Lahtinen, 2012). In terms of regular maintenance, the pellet boiler requires regular sweeping about once a month (which Lahtinen said was about the same as with the old oil boiler) and potentially some new parts would be needed every 2-3 years (Lahtinen, 2011). Lahtinen estimated the lifecycle for the pellet boiler at around 15 years, especially due to the rapid technological development of pellet boilers (Lahtinen, 2011).

In terms of costs, the residents were content with the way the project was funded and that it had saved them money in its first two years. For example one resident who had chosen the loan option, said that the heating project had only added 20-30 Euros to the monthly service charge and that the apartment block was affordable to live in (YK3, 2011). Lahtinen estimated that compared to the neighbouring block, which had the same specifications and was in the local district-heating network, Ylä-Kivelä's heating system had saved around 8,400 Euros in the first year. Prior to the renewable energy project, the Ylä-Kivelä block had used around 42,900 litres of oil in 2007, costing approximately 32,000

Euros (Lahtinen, 2012). In comparison, Ylä-Kivelä had used 72,5 tonnes of pellets in 2009, at a cost of 14,500 Euros (Lahtinen, 2012). Lahtinen (2012) estimated that they would pay off the investment in about 5-6 years.

Furthermore, as the price of pellets is negotiated with the supplier for one year at a time, their costs would also be more predictable for each given year (Lahtinen, 2012). Voicing expectations is important for the development of niche innovations (Raven et al., 2008). Raven and Geels (2010) point out, that expectations can guide direction for other local projects and they can also be used strategically to attract resources from potential sponsors (Raven and Geels, 2010). The experience from Ylä-Kivelä shows that in terms of expectations, the project team had initial expectations regarding finding cheaper alternatives to oil-based heating. Furthermore, during the processes of negotiation and engagement, consequent expectations arose in Ylä-Kivelä regarding the ability to repeat the success of the pellet boiler experienced in Metsälinna. However, there is no clear evidence of voicing expectations outside the boundaries of the Ylä-Kivelä project, given the limited evidence of engagement with outside organisations or projects other than Metsälinna.

5.4.3 Transferable lessons

As mentioned in the negotiation and engagement section above, one key stage in niche development is the process of sharing learning between projects, as well as the general lessons that can be aggregated from individual projects and transferred to the global niche level (Geels and Deuten, 2006). Through the process of aggregating learning from previous projects, knowledge and experience from those projects can input into subsequent projects (Geels and Deuten, 2006). Aggregation is normally conducted by intermediary organisations such as professional bodies and standardisation committees (Geels and Deuten, 2006) (see Figure 19).

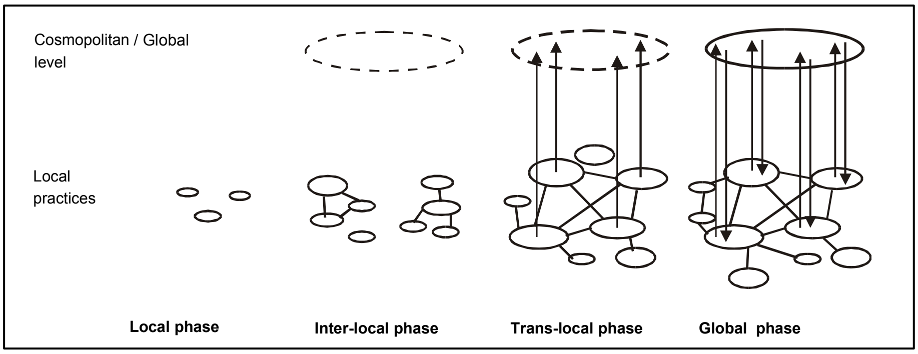

Figure 19: Different phases of knowledge sharing from local to global phase (adapted from Geels and Deuten, 2006, p.269). Note that this figure first appeared in Chapter 2 of this thesis.

In the case of the Ylä-Kivelä project, there was evidence of projects sharing lessons between each other, especially in Ylä-Kivelä's relations with the Metsälinna block. However, once Lahtinen had successfully installed the project at Ylä-Kivelä and shared his positive experience with two very similar buildings he manages in Keuruu, he was met with resistance (Lahtinen, 2011). Lahtinen was personally involved in these projects via his building manager role and he shared his positive experience of Ylä-Kivelä with the two blocks, one of which was located next door to Ylä-Kivelä. This involved visits to Ylä-Kivelä and showing real data on the savings that they had made. Despite Lahtinen's efforts, the residents in the other two blocks were not interested in renewable energy, but instead chose district-heating as a replacement for old oil-based systems in 2011 (Lahtinen, 2011). Lahtinen was surprised by the two blocks' decisions, given that he had proof of real savings from Ylä-Kivelä, especially in relation to the expensive district heating in Keuruu. He believed that the reason for this was that there was a lot of misinformation surrounding pellet systems and their maintenance at the time. As he put it: "*Some strong characters were involved, who took the [negative views] to the blocks' decision makers and we could not convince them even though we had all the strong Euro-facts.*" (Lahtinen, 2011). This confirms also Raven et al.'s (2008) findings that local power relationships play a role in the development of projects and their visions (Raven et al., 2008). Furthermore, Lahtinen himself thought that perhaps the decisions were also affected by the fact that the residents in those two blocks did not have the trusted relationship with him that the Ylä-Kivelä residents had had (Lahtinen, 2012).

Too high expectations, or not meeting expectations can be detrimental to a new field. For example Katainen (2012) mentioned that at the beginning of a new field, expectations can be very high and there may be a lot of interest and buzz about a new technology. He mentioned for example heat pumps going through a surge of interest in Finland (Katainen, 2012). Meanwhile, with pellets, the initial interest had died down somewhat, due to expectations that had not been met:

> "That happened to pellets, that promises were not kept. Pellets were marketed as a flat rate, cheapest fuel. Of course this cannot be true. There is no commodity in today's world that can start with a notion of having a flat rate price. So the way they were marketed was not right. There was a backlash, disappointment, when prices had to be raised due to the price of raw materials rising. So once that interest is diverted elsewhere, it is really difficult to get it back again." (Katainen, 2012)

In terms of networking, key networks in the Ylä-Kivelä project mainly consisted of those between the block's residents, Lahtinen, local pellet supplier VAPO and the pellet supplier KSM Lämpötekniikka. Furthermore, Lahtinen's own network also included his colleagues in the building maintenance trade. At the time of the project's development Lahtinen was also undertaking a professional qualification in technical building maintenance and he had residential courses with peer students, which provided a useful discussion forum and a chance to share his ideas on the project (Lahtinen, 2011). He said that none of his fellow students were involved in similar projects, but that they were very interested and he was certain that similar projects would start to appear elsewhere (Lahtinen, 2011).

In terms of intermediaries aggregating lessons from the Ylä-Kivelä project, there is some, though limited evidence of this. In 2009, Ylä-Kivelä was chosen as the Housing Company of the Year in an annual competition organised by The Finnish Real Estate Federation

(Uusimaa area), The Finnish Real Estate Magazine and KIINKO Real Estate Education. Ylä-Kivelä received a 1,000 Euros reward (the residents celebrated with coffee and cake). Lahtinen for example had newspaper clippings of Ylä-Kivelä being featured in the local newspaper Suur Keuruu (Lappi, 2008), a building trade magazine Rakennusmaailma (Kaskinen, 2009), a science blog (Heiska, 2009) and a publication by Motiva, the Finnish Energy Agency (Laitinen, 2010), though all of these focused on the technology aspects of the project.

There was evidence of Ylä-Kivelä being featured in trade magazines and government publications, however, there was no evidence of aggregation of lessons from the Ylä-Kivelä being actively shared by an organisation that could act as an intermediary actor for community energy in Finland. The interviewees of Ylä-Kivelä felt that the potential for community energy and projects such as theirs is large in Finland, but that there are still barriers to development (Lahtinen, 2011). Key issues mentioned for supporting such projects included political support, funding and creation of knowledge. Lahtinen (2011) in particular felt that political decision makers do not have enough information or knowledge about local renewable energy projects. Furthermore, he felt that most decisions were made without sufficient knowledge on these issues (Lahtinen, 2011). He called for more demonstration projects, in order to show political leaders what works in real life and he had been in contact with the local authority in Keuruu to tell his views (Lahtinen, 2011). For instance, Sitra indicated that cases like Ylä-Kivelä were not necessarily the most exciting ones in their eyes:

> “The requirement for funding has to be that it is innovative and a new way of acting, so if a block of flats wants to change a heat pump, so actions that have already taken place - and we also have to consider the market opportunities - these may not have added value. I am not saying that we do not see them as valuable, but the projects that we have funded have been usually a bit more complicated cases. They have to have an innovative aspect.” (Kirkinen, 2011)

This is an interesting view given that there are over 63,000 block of flats in Finland that still have oil heating in place (Katainen, 2012) and they could benefit from learning from projects such as Ylä-Kivelä.

5.4.4 Conclusions on the Ylä-Kivelä project

5.4.4.1 Local contextualisation

In terms of local contextualisation of the Ylä-Kivelä project, the team involved in the project, i.e. Lahtinen and the block's board, as well as the residents, were truly embarking on an innovative project in their local area. The technology especially was new to them, and interviewees mentioned that the innovative aspect of their project was linked to the use of new technology such as renewable energy, and using it in a new setting (i.e. their own community). Interviewees also said that their pellet-solar system itself was innovative, as it needed specific installation and adjustments in order to fit their own specific circumstances.

5.4.4.2 Negotiation and engagement

The negotiation and engagement processes at Ylä-Kivelä were largely based on the trust that residents had towards Lahtinen and the community's decision-making process that was fully established prior to the heating system project. Lahtinen acted as the board's key point of information for the project, the technologies it involved and contacts such as pellet suppliers and boiler installers. In other words, Lahtinen was acting as an information source to the residents. All interviewees said that they had little previous knowledge about renewable energy before the project started and that they regarded Lahtinen as an expert who had more knowledge on the issue. Furthermore, Lahtinen and his wife had been active in the block not only by looking after its maintenance, but also by organising events, including spring clearing and summer parties, all of which added to the pre-existing community cohesion that aided the project.

5.4.4.3 Transferable lessons

The transferable lessons from the Ylä-Kivelä project were largely limited to being selected as an exemplary project and showcased in various media. One clear lesson from the Ylä-Kivelä block (as well as from the other Finnish project Kaakonoja), was the roles of pre-existing community cohesion and a trusted project leader that aided the project's success. These, however, were not evidently picked up in the communications about Ylä-Kivelä, which mainly focused on pellet and solar technology. Furthermore, in the case of Ylä-Kivelä, there was no clear evidence that the lessons from it were being aggregated by dedicated intermediary organisations. Perhaps this is an indication that such actors were lacking at the time in Finland. Table 25 summarises the Ylä-Kivelä case.

Process	Ylä-Kivelä case	Empirical issues
Project vision Vision and expectations for the project in its local context	Ageing oil heater requiring replacement	Expensive oil prices, reliance on 'foreign fuel'
	Expensive local district heating option	Keuruu is one of the most expensive district heating areas in Finland
	Lack of information about alternative technology	Renewable energy new to the residents, little information about technology's suitability for block of flats
Negotiation and engagement Participation, negotiation of expectations and engagement	Pre-existing community group	Some previous joint activities
	Clear lead person	Trusted role as a caretaker of the block
	Supportive team	Trust in caretaker/building manager
	Low risk funding and external funding	Residents loan guaranteed by the block, building manager had pre-existing knowledge of funding sources
	Learning from others	Visit to other block Metsälinna
Transferable lessons Lessons from local projects to global niche level	Example project	Visits from local actors, award from national organisations, media stories

Table 25: Summary of niche processes, Ylä-Kivelä

5.5 Conclusions on the Finland case studies

This chapter has discussed the Finnish context for community energy and analysed the development of two community energy projects, Kaakonoja Area Resident's Association and Ylä-Kivelä block of flats. Community energy, as a citizen-led activity, is still in its infancy in Finland. There is some government funding support for such projects mainly via the Energy Support grant, however, funding programmes specifically dedicated to community energy remain limited. Furthermore, there is only a handful of intermediary organisations, namely initiated by the work of the Finnish Innovation Fund Sitra. Information, toolkits, guidelines and training specifically tailored to community energy, however, are also limited, especially compared to the sector in the UK. However, despite the limited community energy activity in Finland in general, projects such as Kaakonoja and Ylä-Kivelä show that there are people who are willing to act as pioneers and develop sustainable energy projects within their neighbourhoods, with the aim of creating better energy options for themselves as well as improving their communities in the process. As was the case with the UK projects of Hyde Farm and Lyndhurst, the Finnish cases also show that the projects benefited from clear leadership, supportive team, goodwill, the ability to utilise pre-existing skills as well as the willingness to learn new ones. This demonstrates that even though the content for the four cases was different, there were also quite a lot of similarities across the cases. These are discussed in more detail in the next chapter, which brings together the analysis of the four cases and draws cross-case conclusions on community energy development in the contexts of Finland and the UK.

CHAPTER 6. Community energy as grassroots innovation: Cross-case analysis of community energy

6.1 Introduction

The aim of this DPhil was to research the innovations linked to local activities, using the field of community energy in two different countries of Finland and the UK as an empirical domain. This study was undertaken by analysing four individual community energy projects, two in Finland and two in the UK, as well as interviewing expert organisations that are either directly involved or have an interest in community energy in those countries. This chapter brings together the community energy projects discussed in Chapters 4 and 5, keeping in mind the key research question of *Why and how do community energy projects develop and how do they contribute to niche development?*, and discussing how well the cases fit the theoretical framework formulated in Chapter 2, and whether there are parts that the framework misses.

6.2 Framework for analysing community energy activity

Niches can "*provide opportunities for society to learn about: the functionality of alternative designs, user preferences, appropriate public policies, and so on*" (Genus and Coles, 2008, p.1439). Community energy in Finland and the UK is approached as grassroots innovation, which operates in niches rather than in the main predominating energy regimes.

In the context of the UK, community energy as a niche has been developing for over ten years and is supported by the establishment of projects, shared knowledge, learning between projects, establishment of networks and events dedicated to the field (DECC, 2014c, Walker, 2008, see also Chapter 4). However, community energy still remains as a radical innovation, away from the mainstream energy regime.

In Finland, meanwhile, it could be argued that community energy as a niche is only starting to emerge. Pioneering projects have been established and researchers are starting to get interested in the field (Vehviläinen et al., 2010), while a limited number of networks and intermediaries have started to form (see Chapter 5).

The four community energy cases were analysed in Chapters 4 and 5 in relation to three processes of (1) local contextualisation, (2) negotiation and engagement and (3) transferable lessons (Raven et al., 2008). It should be noted that even though these processes were analysed in a linear order, these processes can also overlap. Furthermore, the analysis also reflected on the process of how knowledge flows within niches from local phase, to inter-local, trans-local and finally global phase, gradually building the niche (Geels and Deuten, 2006). The rest of this chapter draws a comparison between the four cases and discusses the processes linked to local project development, how knowledge flows developed and whether there were considerable similarities or differences between the cases. Summary of the cases and key processes are outlined in Table 26.

	UK		Finland	
Project and process	***Hyde Farm***	***Lyndhurst***	***Kaakonoja***	***Ylä-Kivelä***
Local contextualisation	- No pre-existing group - Mix of skills - Cold houses - Climate change concern - Draught-proofing Saturday	- Pre-existing group - Mix of skills - Building refurbishment needs - Expensive heating - Installation of a biomass boiler	- Pre-existing group - Expensive heating system - Information gap - Heat pump information study	- Pre-existing group - Heating system required modernisation - Expensive heating - Installation of a pellet boiler and solar thermal heating
Negotiation and engagement	- Clear project initiator - Regular project meetings - Engaging local community - Fundraising - Networking	- Clear project leader - Regular project meetings - Engaging local community - Fundraising	- Clear project leader - Regular project meetings - Engaging local community - Fundraising	- Clear project leader - Regular project meetings
Transferable lessons	- Networking - Organising events - Sharing of experience - Replicating actions	- Organising events - Sharing of experience - Acting as an example for funder	- Organising events - Sharing of experience - Acting as an example for funder	- Sharing of experience - Acting as an example

Table 26: Summary of cases and key processes

6.2.1 Local contextualisation

Local contextualisation summarises the project's initial expectations and vision. Raven et al. (2008) concluded in their analysis of local projects, that projects which were successful had a degree of local contextualisation, i.e. they were local reinterpretations of an emerging niche trajectory and embedded into their local contexts (Raven et al., 2008). In the four cases of Kaakonoja, Ylä-Kivelä, Hyde Farm and Lyndhurst, all projects showed a considerable degree of local contextualisation, showing that the cases were a good fit for the framework in this aspect. The key content relating to local contextualisation were physical problems, lack of information and local innovation.

6.2.1.1 Physical problems and lock-in to existing regimes

All four projects showed a degree of local contextualisation, for example by using existing technologies, which were adapted to their individual circumstances. The projects had clear expectations and motives, though there was variation regarding which motives were more dominant ones. Raven and Geels (2010) argue that expectations can guide direction for innovative activity, as well as for other local projects, as they are translated to search heuristics (Raven and Geels, 2010). In the case of Kaakonoja, Lyndhurst and Ylä-Kivelä, the projects were very clear about their expectations from the start, in other words they wanted to find alternative options for expensive fossil fuel heating. In Kaakonoja, the aim of the project was to find information about suitable alternative heating technologies that would fit the area's houses. In Lyndhurst, meanwhile, a community building, as well as an expensive heating system, were in desperate need of repairs. Ylä-Kivelä too had an expensive heating system that required modernisation. In other words, the initial expectations for the cases of Kaakonoja, Lyndhurst and Ylä-Kivelä had a technology focus. In Hyde Farm, meanwhile, the initial expectations were centred more around what residents in the Hyde Farm area could potentially do together to reduce emissions linked to climate change, i.e. how they could build a community that could take action together.

Innovation within niches can start as answers to the problems in the overarching landscape or dominating regimes. Occasionally events at the landscape level put pressure on existing regimes (Geels, 2002), which can lead to new innovations being developed in niches (Verheul and Vergragt, 1995). In all of the four cases, the community energy projects were motivated by problems that stemmed from the dominating regimes, especially those related to heating and housing. For example in Kaakonoja, the existing heating regime was based on electric heating which had been getting increasingly expensive, following rises in oil and subsequently energy prices for several years in a row.

In Ylä-Kivelä too, the price of oil was a dominating factor, which influenced the block's decision to seek alternative heating options. The dominating heating regime in their local area, that of a district-heating system, however, was considered to be too expensive by the Ylä-Kivelä team. In Hyde Farm, meanwhile, residents were locked into old housing technology, which meant that their houses were inefficient in terms of heating. In Lyndhurst too, the building was old, which meant expensive heating bills due to inefficient technology. In all four cases, despite the differing local contexts of each projects, one dominant landscape factor, that of the increased price of oil in the global energy markets, had an effect on the communities' heating bills (whether or not they used oil-based heating), motivating these particular communities to seek cheaper alternatives. What makes these cases interesting is that they decided to act on their expensive energy bills, via their own communities and neighbourhoods, rather than accepting the prevailing energy system and the impact it had on them.

Physical problems, such as an ageing heating or building that is in desperate need of repairs, can be a motivating and starting factor for community energy action. In all of the four community energy projects, an issue with a physical problem or an existing technology initially led to community energy action. In all four cases, heating bills and the price of energy were mentioned as a motivating factor.

At the stage of local contextualisation, personal relationships, such as friends and neighbours are important for further ideas and potential information. For instance Mäkelä and Knuuttila, who had been neighbours for over 30 years in Kaakonoja, were thinking alternative heating options together, while in Ylä-Kivelä too Lahtinen spoke to his neighbours and local friends at the start of his project ideas. In Hyde Farm, Sheehan was keen to get her friends and neighbours together, while in Lyndhurst Charlesworth mentioned that friends and family were important sources of support from the start of the project. This shows how important personal relationships were for the projects, which is something that the niche development literature does not seem to embrace. Raven et al. (2008) mention personal relationships at the negotiation and engagement stage, though they only touch on those briefly. However, they do note the influences of local power relationships and the influence of potentially competing expectations (Raven et al., 2008).

Key outcome: Physical problems and lock-in to existing socio-technical systems such as an inefficient heating regime initiated community energy action in all cases, fitting the theory that niche innovations can start as answers to problems in the prevailing regime and landscape level factors. Furthermore, the analysis shows that in these cases, personal relationships were important in the early stages of project development.

6.2.1.2 Lack of information

In all four cases lack of information was an issue, whether this was about what options projects had in terms of technology, funding or specific advice. Interviewees mentioned that they lacked knowledge and information when they first started to explore renewable energy options (all cases), how to measure emissions (Hyde Farm), funding options (Hyde Farm) and external expertise (Kaakonoja). The residents especially in Hyde Farm, Ylä-Kivelä and Kaakonoja felt that they did not know where to start when it came to finding information about sustainable energy and especially what they could do in their own homes. As Mäkelä (2011) at Kaakonoja said they had to create information themselves, whilst Sheehan (2012) in Hyde Farm said that she was completely oblivious as to how to measure her personal emissions. In Lyndhurst too, information was limited at the start of the project: "*They really wanted to use green energy in the new building but they had no idea how to go about it or what that energy should be*" (Gingell, 2012). This indicates how at the start of a niche development, in its local phase when projects develop largely in isolation (Geels and Deuten, 2006), information and knowledge flows remain limited. Table 27 summarises the key concepts that projects initially struggled to find information about.

Project	Technology options	Emissions	Funding	External expertise
Hyde Farm	✔	✔	✔	
Kaakonoja	✔			✔
Lyndhurst	✔			✔
Ylä-Kivelä	✔			

Table 27: Initial lack of information

First points of call for acquiring further information for all projects were usually internet searches (all cases), trade associations (Kaakonoja, Ylä-Kivelä) and local companies operating in the field (Hyde Farm, Lyndhurst, Ylä-Kivelä). There was also lack of knowledge amongst those involved in the community energy projects regarding which type of information is reliable and trustworthy. This was especially the case in Kaakonoja, where people felt that there was no independent information available in Finland at the time regarding various heat pump technologies. In Lyndhurst too, people involved in the project, from the architects to the building contractors, had limited knowledge about renewable energy. The varying range of information available about different types of technology models for instance can be confusing and overwhelming to those who are not directly involved with renewable energy technologies and do not have prior knowledge about the field.

The Geels and Deuten (2006) conceptual perspective predicts that in the inter-local phase of niche development, circulation activities start to take place and knowledge flows between projects aid the sharing of learning between projects. However, the perspective does not go into detail about whose experience, learning and information are the most relevant and trustworthy at this phase of niche development, or who are the key actors involved. As the four community energy cases show, projects that have little previous experience about renewable energy technology options for example, have to rely on external help to gain this information. However, if that information is not easily available to the initiating individuals or community groups, as was the case with the four projects, projects may struggle to choose the most suitable options for them. For instance, there is information about community energy available in the UK, but not all community groups are aware of it or know how to access it.

Key outcome: Independent information and advice is important for communities who wish to develop grassroots innovations. This is important in a field like renewable energy where technologies can develop quite fast and communities may not for example have the necessary technical knowhow of how to choose the best options. However, niche theory falls short as to whose information is trustworthy in the early phases of niche development, when independent intermediary or advisory organisations are limited in the field.

6.2.1.3 Local innovation

In order to gain knowledge and information about alternative heating options or improved energy efficiency, as well as to seek practical ways to install such technologies or measures, all four projects embarked on activities, which were new to them. Following Rogers' definition of an innovation as "*an idea, practice, or object that is perceived as new by an individual or other unit of adoption"* (Rogers, 1995, p.12, quoted also in Chapter 2), key interviewees from all four projects felt that what was innovative about their projects was the use of technology new to them, such as renewable energy, and using it in a new setting (i.e. their own community).

The innovation at Hyde Farm was as much linked to the organisation of the group, as well as the activities that they took. Sheehan especially was keen to get involved with her neighbours and create a network of people who could share information, learn from each other's experience and help each other out. In other words, Sheehan was as interested in building a community, as acting as a community. In addition, Sheehan was very innovative in terms of finding affordable materials that she could install herself, in order to make her house more energy efficient. Furthermore, she adapted the existing concept of draught proofing to fit her own area and made it more tangible to others by organising a demonstration with neighbours.

In the case of Kaakonoja too, the most innovative aspect of the project was the way by which key people formed the project and saw it through. Mäkelä and Knuuttila identified a knowledge gap regarding heat pump models and utilised their residents' association to run a project, which would fill that gap but was also a new activity to them. Furthermore, the Kaakonoja team was also keen to have the results available to others, indicating grassroots innovation which combines both technological and social objectives (Seyfang and Smith, 2007).

In Ylä-Kivelä, the pellet-solar system itself was innovative, as it needed specific installation and adjustments in order to fit the block of flat's specific circumstances. The system for example was set up so that solar thermal heating is used as a primary heating source, followed by pellets and backed up by oil. Interviewees at Ylä-Kivelä mentioned several times that they were doing something new by taking part in a renewable energy project, with Lahtinen (2011) specifically pointing out that "*you need to be brave to do a project like this*". However, it was not only about technological innovation, as residents could also see the benefits of renewable and local energy supply to their neighbouring area. Furthermore, the residents at Ylä-Kivelä were perhaps behaving as a community in the same way as before in looking after the block of flats, but showing innovativeness by taking on a new type of a project.

This was also the case in Lyndhurst, where the Community Centre refurbishment project was partly linked to the creation of a wood fuel supply networks in the New Forest. By installing a biomass boiler, Lyndhurst Community Centre created demand for wood fuel, which subsequently gave the NFNPA a motive to approach forest owners and bring previously unmanaged forests back into management by creating wood fuel supply. This also demonstrates how the project team at the Community Centre were willing to take on a new experiment and thus a potential risk, not only to them, but also to the local New Forest area. Furthermore, the New Forest area, with its plentiful wood fuel potential, provided a favourable context for the biomass niche innovation to emerge, with organisations such as the NFNPA providing intermediary support and guidance.

Key outcome: Community groups can develop innovative energy projects by adjusting existing practices to their own individual circumstances. Community groups, which are flexible in their approach and also willing to take risks, can be very successful in developing energy projects, which suit their local contexts. Furthermore, all of the four cases could be approached as grassroots innovations, as their focus was not only technological, but they also took into account social motives in their local area, either by acting together for the greater good of the local community or developing a stronger community through their community energy project.

6.2.2 Negotiation and engagement

Negotiation and engagement involves the processes that take place during project participation with the project's local community and key stakeholders (Raven et al., 2008). Projects interact with their community and key stakeholders during which initial expectations, project plans and visions are adjusted (Raven et al., 2008). Projects' expectations for example can change as projects seek advice on certain technology or funding options from external organisations. In the four community energy projects concepts such as community leadership, resources, pre-existing skills and community cohesion were important part of negotiation and engagement processes.

6.2.2.1 Community leadership

One of the key findings from the four community energy cases is the role of leadership and those people who initiated the community energy projects. In both of the Finnish cases of Kaakonoja and Ylä-Kivelä, and in the British case of Lyndhurst, a trusted member of the local community initiated the projects and their roles were central throughout the projects, from early ideas stage to project delivery, completion and sharing their experience with others.

In Kaakonoja, Mäkelä who initiated the heat pump project was an active figure in the residents' association and the wider community even before the heat pump project was developed. According to his neighbour of over 30 years Knuuttila, Mäkelä was an active figure in the residents' association, organising events and trips (Knuuttila, 2011). Mäkelä also had extensive local and tacit knowledge, having worked as a journalist for the local newspaper for 25 years. He had previous knowledge for instance about potential funding sources and local contacts. The Kaakonoja project had a clear leader in Mäkelä (though he himself was very modest about his role), with a supportive team behind him.

In Ylä-Kivelä, Lahtinen, having been a caretaker and building manager for of the block of flats for many years, was a trusted figure in the block and other interviewees talked about him as "*our Lasse*" (Aho, 2011). Lahtinen, as well as his wife, had been looking after the block, and to some extent its residents, for a long time and his reputation was very good. As one interviewee described it "*our caretaker took good care of us and knew the building inside out*" (YK2, 2011). Furthermore, Lahtinen had also been active in organising communal activities for the residents, such as summer parties and seasonal garden clearing sessions, which had clearly, to the disappointment of the residents, reduced in number since he and his wife moved out of the block.

In Lyndhurst too, Charlesworth's role for the project was central. He was a local man who had lived in Lyndhurst since the 1970s and had been active in village life, hobby clubs, voluntary societies and the local council. Charlesworth was also keen to have other, younger people involved in the running of the Community Centre and he was pleased for example having found Dewing to help with the biomass project and later becoming Chairman of the LDCA, the charity owning the Community Centre.

Hyde Farm was the only case, which had less of a clear leader from the start of the project. Sheehan, who initiated activities in Hyde Farm, descried herself more of a networker, who liked to get people together in the same room, learning new things and sharing that learning with others (Sheehan, 2012). Soon like-minded people like Schonbeck and his wife Smith joined and the group organised activities together, as well as individually.

In Lyndhurst, Kaakonoja and Ylä-Kivelä, the project initiators were trusted and active members of their communities. The analysis shows that these people were not only trusted because they 'got things done', but also for the way they approached various projects. They for instance spent a considerable amount of their own time finding information, digesting it and sharing it with others in the community. It was clear that the projects probably would not have happened without the active role of these figures. This thesis describes the types of people as Charlesworth, Lahtinen, Mäkelä, and to some extent, Sheehan as 'community leaders'. The cases show that these are people who are not self-appointed rulers, but instead they operate with supportive friends, neighbours and project teams around them. These community leaders are not one type of a person, but they have common traits. They generally care about their neighbourhoods and want to enrich it not only for themselves, but for others too. They are keen to work with others and can spot other talent when they see it, not hesitating to seek help for their projects and set up project teams with people who possess relevant skills. They also have concern regarding the future of their neighbourhoods, which they want to preserve for future generations. Furthermore, they tend to be involved in several activities and generally have a lot going on in their lives. As Gingell described such community leaders:

> “Like that expression if you want something doing ask a busy person. They always seem to be busy people, who've got lots of different things going on yet still manage to give the time to the project in a voluntary capacity.” (Gingell, 2012, also quoted in Chapter 4 of this thesis)

One of the challenges for community energy projects can be though, that if a project relies heavily on one person to see it through, there could be serious consequences for the project’s continuity if that person decides to move on - both Gingell and Vesisenaho had witnessed such instances in their engagement with community projects (Gingell, 2012, Vesisenaho, 2012). For example in the cases of Lyndhurst, Kaakonoja and Ylä-Kivelä, the projects most likely would not have materialised without the active input of Charlesworth, Mäkelä and Lahtinen respectively. Raven et al. (2008) discuss the importance of negotiation and engagement with the local community and stakeholders in order to test the project’s initial expectations and project visions. Even though they mention the role of different actors in the negotiation and engagement process, their perspective is vague regarding the role of leadership. Furthermore, the SNM literature does not seem to recognise the role that leadership can have in the early phases of niche development (see for example Schot and Geels, 2008). When people like Mäkelä and Lahtinen decided to embark on niche innovations amid limited information and knowledge, they effectively created first steps towards niche development (which was also the case at Hyde Farm and Lyndhurst). SNM instead concentrates on niche internal processes, i.e. the learning and networking between different projects.

Key outcome: So-called community leaders can be vital for community energy projects’ successful delivery. People who are proactive, can bring people together, are able to generate ideas for communal activities, spot funding opportunities and are generally keen to improve their neighbourhoods, can spur community energy projects. Analysing

the role of leadership, especially regarding the initiation of niche innovations, could be a useful addition for developing the niche literature further.

6.2.2.2 Resources and pre-existing skills

All four cases demonstrated that developing a community energy project takes time, effort and persistence, as well as skills in areas such as finding information about technology options and funding opportunities. Pre-existing skills, which are skills that people have accrued and learned for example during their working or personal lives, can become very relevant when community energy projects are being established. In all four cases, key project team members had a considerable level of pre-existing skills that were useful to the projects. These included both more practical skills such as the ability to conduct internet searches on a new topic, read technical information, seek information about funding or fill in funding applications. Furthermore, the more soft skills, such as tacit knowledge, especially relating to issues such as how to organise meetings, how to speak to funders or how to network with others are skills that may not be as obvious as practical skills but can be nevertheless central to projects' success.

Geels and Deuten (2006) discuss how practical work takes place in local projects, which is then aggregated by intermediary actors to global level niche guidance. This practical work requires practical skills, such as for example conducting internet searches about technology options or speaking to neighbours about project aims. However, what seems to factor across the four cases was that people actively involved in the projects also benefited from tacit knowledge. As discussed in Chapter 2: Theoretical Framework, tacit knowledge is the knowledge that people have, but which is not taught or openly expressed (Wagner and Sternberg, 1985), and it cannot be easily codified (Gascoigne and Thornton, 2013). In other words it is not readily transmitted to written form in reports or guidelines for instance. In the four cases analysed, people involved in the projects used their softer skills, such as how to network with others, how to arrange meetings and encourage others to join. Table 28 outlines key skills that key people across the four cases had, with an indication of whether they were practical skills (Geels and Deuten, 2006) or tacit knowledge (Gascoigne and Thornton, 2013, Wagner and Sternberg, 1985).

Project	Person	Pre-existing careers	Key pre-existing skills	Type of skill
Kaakonoja	Hannu Mäkelä	Journalist	Research Investigation Networking Local knowledge Media contacts	Practical Tacit and practical Tacit and practical Tacit Practical
	Tuomo Knuuttila	Electrical engineer	Technology Knowledge of energy issues Digest technical information	Practical Practical Practical
Ylä-Kivelä	Lauri Lahtinen	Caretaker and building manager	Building management Local knowledge Digest technical information	Practical Tacit Practical
Hyde Farm	Susan Sheehan (Elisabeth Smith)	Journalist (x2)	Research Investigation Networking Local knowledge Media contacts	Practical Tacit and practical Tacit and practical Tacit Practical
	Hugo Schonbeck	Lawyer, sustainability consultant	Legal issues Knowledge of energy issues Sustainability	Tacit and practical Practical Practical
Lyndhurst	John Charlesworth	Marketing & sales director	Marketing Sales Networking Local knowledge	Practical Tacit and practical Tacit and practical Tacit
	Rob Dewing	Engineer	Technology Digest technical information Knowledge of energy issues	Practical Practical Practical

Table 28: Key skills in the four community energy cases

Key skills that featured across the cases were local knowledge, skills in conducting research into new areas and the ability to digest technical information. Active networking skills featured in Hyde Farm, Lyndhurst and Kaakonoja, while there was less evidence of active networking skills in the Ylä-Kivelä case. For instance Charlesworth at Lyndhurst was very good at spotting funding opportunities, as well as marketing, and secured £780,000 funding from external sources. Mäkelä too, in Kaakonoja, was knowledgeable about funding options and with his journalistic background he was aware of actors, such as the VVC, in his local area, and he was also accustomed to asking questions and seeking answers. This came especially handy when the Kaakonoja team was looking for an external advisor for the heat pump project. This took a lot of effort and phone calls to several organisations, the majority of which were not supportive. Furthermore, Mäkelä was not averse to risk taking, as demonstrated by the loan that some of the Kaakonoja members took in order to ensure that the project went ahead before their funding from Pirkan Helmi came through.

Sheehan in Hyde Farm was good at getting people together and networking, and she too benefited from her journalistic background. Lahtinen at Ylä-Kivelä, meanwhile, was knowledgeable in building management and was able to digest technical information, as was Dewing in Lyndhurst. However, all cases also required the learning of new skills, especially regarding areas such as details about technology, how to fill in funding applications and where to seek external advice from.

All the projects had external funding, which meant that they had to fill in funding applications. Sheehan at Hyde Farm for example said that to begin with, she found funding applications very difficult to do, even with her journalistic background (Sheehan, 2012). The processes linked to filling in funding applications were rather time consuming and sometimes tricky, as applicants had to for instance differentiate between concepts such as 'project output' and 'project outcome' (Sheehan, 2012). Schonbeck, however, had a different experience at Hyde Farm, but he had been accustomed to filling in several funding applications in his previous roles as a lawyer and a consultant. In Lyndhurst and Kaakonoja too, funding applications took time and effort. However, these two projects benefited from external help with the actual applications. In Lyndhurst, the NFNPA acted as an intermediary organisation and helped the Lyndhurst project not only with technical information and advice, but they also helped with the actual filling of the funding applications that the Community Centre submitted to the SDF. This was also the case in Kaakonoja, where Pirkan Helmi acted in a similar role, helping the project team with the funding application, especially in terms of project objectives and expectations. In Ylä-Kivelä, however, Lahtinen considered the funding application to the Energy Support grant to be fairly easy and straightforward to do (Lahtinen, 2012).

Funding applications can often be long and require thorough thinking of what the project is about, what its key motivations are and how expectations will be delivered. However, these four cases also demonstrated that the ease of the application process may depend on what the relationship between the applicant and the funder is. In the cases of Kaakonoja and Lyndhurst, Pirkan Helmi and the NFNPA respectively acted as an intermediary organisation and they also had their own motives to deliver funding programmes that were easy for the projects to apply for (Gingell, 2012, Vesisenaho, 2012). Pirkan Helmi and the NFNPA were involved in the funding applications from the start of project design and engaged with the projects positively. These reflect on the 'hand holding' roles that intermediary actors can have, as noted in Chapter 4. In the case of Kaakonoja, the arrival of the monetary funds were delayed by several months, an issue which the Kaakonoja team solved by taking a personal bank loan to cover the project's costs. This was however, exactly the type of risk taking that Charlesworth in Lyndhurst wanted to avoid, though it should be noted that the Kaakonoja project was much smaller in scale.

The relationship between Hyde Farm and British Gas was very different. It was much more top down, beginning with a judgement panel style funding application and continuing with British Gas largely aiming to direct the flow of the project delivery. If it would not have been for Hyde Farm residents' persistence to deliver the Draught Proofing Saturdays by themselves, their most innovative idea may have been excluded from the project.

The conceptual niche development perspective adapted in this thesis, especially from the work of Geels and Deuten (2006) does not highlight the importance of pre-existing skills in niche innovations. Geels and Deuten (2006) recognise that practical work takes places in local projects, from which lessons are aggregated to the global niche level. However, there is no clear guidance from the theory as to what type of skills that practical work may require. The four community energy projects, however, demonstrate that projects run by civil society groups may have less 'given' professional skills, than projects run by businesses for example, and they have to rely on a mix of skills that they can amass from the local community around them (see also Seyfang et al., 2013a, Seyfang et al., 2013b).

Key outcome: Pre-existing skills can be very valuable for community energy projects, which generally rely on volunteers. Both practical and tacit skills are useful as projects start to develop from ideas into plans and delivery. Intermediary organisations can aid projects especially with information and guidance related to project funding. However, whether or not projects benefit from intermediary guidance, persistence and belief in the project idea by the core team can prove vital for projects' success. Furthermore, projects in these cases benefitted from a mix of 'can do' and 'will not take no for an answer' attitude.

6.2.2.3 Community cohesion and building a community

Community cohesion and working together as a community are areas central to community energy development. In the three cases of Lyndhurst, Kaakonoja and Ylä-Kivelä, a pre-existing community groups developed a project together. In Kaakonoja, the Residents' Association had a history of local action and organising various events and activities for its members. In Lyndhurst too, the Community Centre was part of village life, acting as a host and providing a space for local groups and users. In Ylä-Kivelä, meanwhile, the block of flats had acted as a community together in the past, in the form of various events and gatherings. In other words, all three cases had pre-existing community cohesion, which meant that people had acted together before. However, running an energy project was new to all of them.

In Hyde Farm, meanwhile, one of the objectives for the Hyde Farm CAN was to start acting together as a community, in other words they were creating a community group in the process of taking action on climate change and soon neighbours were helping each other with various tasks, ranging from arranging meetings to technical help with the installation of draught proofing measures.

A sense of fun and creativity shone through especially from two cases, Hyde Farm and Lyndhurst. For example Lyndhurst's 'Buy a Brick' campaign came across as a fun way to involve people in the saving of the Community Centre. This gave people an opportunity to donate to the Community Centre's refurbishment project and have a symbolic ownership of a brick in the building. Sheehan at Hyde Farm, meanwhile, was creative with her Draught Busting concept, not only in terms of its content and delivery, but also by creating a catchy name after the 1984 comedy film Ghostbusters[34]. These two initiatives had names with a sense of fun built into them, aiming to engage local communities in a positive way. Charlesworth's vision for the Lyndhurst Community Centre, as a space where local people and community groups could come to meet, organise activities, use the library, or watch a film, was his way of ensuring the continuity of community cohesion within the village. Furthermore, Charlesworth was constantly seeking ways how to improve the Community Centre further and provide services that did not exist in Lyndhurst.

Niche development literature focused in the past on the development of technological niche innovations (Genus and Coles, 2008, Shove and Walker, 2007, Smith et al., 2010). However, the conceptualisation of grassroots innovations, which operate in green niches,

[34] In the film Ghostbusters, a team of three parapsychology professors set up a service for ghost removal.

has brought aspects of civil society action, community-led projects and social innovation in to the literature (Seyfang and Smith, 2007). For instance Seyfang and Haxeltine (2012) concluded in their analysis of the Transition Town movement, that a key step for theory concerning grassroots innovations "*is an understanding of how identity, belonging, purpose, and sense of community underlie niche growth and the evolution of goals and priorities over time*" and that grassroots innovations involve more social than technological innovation (Seyfang and Haxeltine, 2012, p.396). In the case of Hyde Farm, Kaakonoja and Lyndhurst the community energy projects also led to increased community cohesion. In Hyde Farm, Sheehan wanted to get to know her neighbours better and provide an opportunity for others to do so too. In Kaakonoja and Lyndhurst, meanwhile, the community energy projects were also about securing the local communities for future generations – in the case of Kaakonoja, the residents association and its activities, while in Lyndhurst the Community Centre building. These projects were innovative grassroots action, involving the use of the local community for social good, while taking advantage of the latest sustainable technology. However, in the case of Ylä-Kivelä interviewees noted that there had been less communal activities since Lahtinen had moved out of the block. In addition to Seyfang and Haxeltine's (2012) findings about the importance of the sense of community within grassroots innovations, the case of Ylä-Kivelä also highlights the importance of a community leader in creating that sense of community in this case.

Key outcome: Community energy projects can build on pre-existing community cohesion, or projects can be used to build communities. Grassroots innovations, such as community energy projects, which operate at the civil society level, are developed for the benefit of the community. However, it is not clear from the grassroots innovations literature as to who creates that 'sense of community' and what the role of community leadership for example might be in that process, and it could be one challenge for that area of research.

6.2.3 Transferable lessons

Transferable lessons are the global niche level practices and guidance which intermediary actors have aggregated from local project learning. As discussed in Chapter 2: Theoretical Framework, aggregated knowledge includes for example advice, best practice guidance and technical standards (Geels and Deuten, 2006). Subsequent projects can then benefit from this guidance and adjust global niche level rules into their own local context (Geels and Deuten, 2006). The role of intermediary organisations and actors is central to the creation of transferable lessons. In this thesis, the analysis of transferable lessons from the cases is approached through two processes, which are central to the development of niche innovations: networking and learning.

6.2.3.1 Networking

Networking activities ensure that projects have the opportunity to share their experience and learn from others. In the four community energy cases, three cases were active in their networking (Hyde Farm, Kaakonoja and Lyndhurst), with one case (Hyde Farm), especially using it as a tool to share their experience of developing a community energy project to others, as well as seeking to learn from others' experiences. Sheehan and Schonbeck were both active in local networks and they were also involved in setting up new networks. Sheehan (2012) in fact described herself as a networker, who liked to get people together and she was skilful in this activity.

The Hyde Farm team were involved in organising events and meetings in their local community, as well as between different community groups – for example organising a community energy event to coincide with an LCCN event in Wales. Instead of people having to travel to the conference, Hyde Farm organised a videolink to the Welsh event and their own set of additional speakers, providing a space for networking and learning for other community groups. Networking by the Hyde Farm team was strengthened by the ability to grasp opportunities from ad-hoc meetings. For example Sheehan told about the Hyde Farm activities in her unplanned encounter with the local council leader, which led to Sheehan helping the council to create her own future job, which subsequently allowed her to share the experience from Hyde Farm to other groups across South London. Schonbeck, meanwhile, could see the synergies that different groups could bring for each other in terms of learning about technology, funding and project development. He saw this as being really important so that people do not 'reinvent the wheel' and can learn from each other's successes as well as mistakes. The Hyde Farm case shows how community energy networks can form by chance meetings, seeing opportunities in certain connections and actively engaging with other groups.

In the case of Kaakonoja, the project team effectively created their own network of experts in order to get reliable and independent information regarding various heat pump models. Again, as in the case of Hyde Farm, Mäkelä especially was skilful in utilising his existing contacts and seeking new ones. For example in their search for finding suitable expert advisors to help with the project, Mäkelä was able to use his contacts in the local area and speak to the VVC. Furthermore, having helped to set up the Pirkan Helmi organisation, Mäkelä was familiar with the organisation even before he contacted them regarding funding opportunities. In Lyndhurst too, Charlesworth was in a similar position as Mäkelä in Kaakonoja. Charlesworth had lived in the Lyndhurst area for a long time and was involved in several local activities and organisations. This allowed him to use his existing local contacts regarding setting up the Community Centre project and searching funding opportunities.

In Ylä-Kivelä, Lahtinen was willing to network with others and he did so to some extent in his local area with the local council and local organisations, for example through attending a few meetings and inviting people to come and visit the Ylä-Kivelä block. However, time availability put limitations on what was practical for Lahtinen to do. There was less 'active' networking activity in Ylä-Kivelä, but instead, networking took place on a more ad-hoc basis, in meetings with other apartment block caretakers and local council officers.

These four community energy cases show how the projects used networking in different ways. For a group such as Hyde Farm, it was clear that they saw that being part of a wider network gave them the opportunity to learn form others as well as share their own experience. In Kaakonoja and Lyndhurst, meanwhile, networking was perhaps more about means to an end, in other words, initially finding people and organisations that could help them.

Key outcome: Networking activities within the four cases show how such activities can be based on ad-hoc meetings, as well as for more strategic seeking of potential partners to share learning with. Tacit knowledge plays a part in networking activities, not only regarding whom to contact, but also regarding how to speak to other groups and stakeholders, such as funding organisations.

6.2.3.2 Learning and sharing learning

Learning processes are important in the theorisation of SNM (Schot and Geels, 2008). Learning forms an integral part of the Raven et al. (2008) perspective of local project development, as well as Geels and Deuten's (2006) perspective for the role of knowledge flows within niche development. Even though learning across the four cases of this thesis is analysed in the context of transferable lessons, it should be noted that learning happens at all phases of niche development (Schot and Geels, 2008). However, what is relevant to a wider niche development is the way by which local learning can be translated to global niche level practices that new projects can draw from (Geels and Deuten, 2006).

Across the four cases, learning linked to technology, working with external supporting organisations, seeking external advice and networking were relevant. Projects had to for example figure out how certain energy saving (draught proofing) or renewable energy (biomass heating, solar thermal, heat pumps) technology works and how those technologies could be adapted to the projects' individual circumstances. Working with funding organisations too was a learning curve especially for Hyde Farm, Lyndhurst and Kaakonoja. They had to understand funders' expectations and ensure that project delivery met those expectations, negotiating their project plans in the process. Tasks such as filling in funding applications can seem like a simple thing to do. However, as mentioned earlier, despite possessing a range of pre-existing skills, members at Hyde Farm, Lyndhurst and Kaakonoja found funding applications complicated to begin with, which demonstrates that even community groups who benefit from a range of pre-existing skills, still have to be willing and able to learn new ones as their projects develop.

Identifying external funding and advice sources can sometimes be a challenging learning curve for community groups, as was the case with Kaakonoja in relation to them finding a technical expert for their study. Networking with other community groups and external organisations can aid groups towards direction to sources of information and advice. As discussed in Chapter 2: Theoretical Framework, knowledge flows between different projects increase as more actors become involved in the niche, including intermediary organisations (as illustrated in Figure 20, which has been used throughout the analysis of the cases).

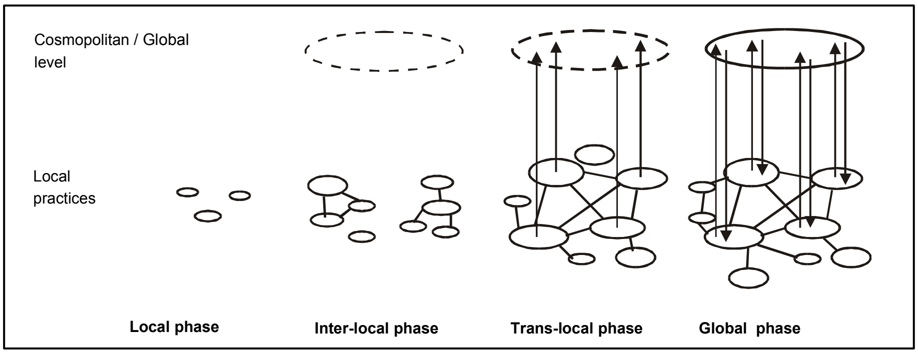

Figure 20: Different phases of knowledge sharing from local to global phase (adapted from Geels and Deuten, 2006, p.269). Note that this figure first appeared in Chapter 2 of this thesis.

The four community energy cases show different phases of knowledge flows and learning. Table 29 below outlines these in more detail.

Project	Phase	Empirical evidence
Kaakonoja	Inter-local	Limited evidence of project-to-project sharing Some evidence of lessons to other stakeholders
Ylä-Kivelä	Inter-local	Evidence of sharing between two projects Evidence of lessons showcased to stakeholders
Hyde Farm	Trans-local	Evidence of active project-to-project sharing Evidence of lessons being shared to intermediary actors
Lyndhurst	Trans-local	Evidence of some project-to-project sharing Evidence of lessons being shared to intermediary actors

Table 29: Evidence of niche phases

The Kaakonoja case was a first of its kind and even though the team at Kaakonoja were willing to share the lessons from their project, especially via the guidebook that they produced about heat pump models, actual project-to-project level sharing of learning remained rather limited. Furthermore, Mäkelä, despite having had plenty of enquiries regarding the guidebook, had not come across other similar projects where a community would have embarked on a project similar to theirs. An important element of Kaakonoja was the partnership with VVC and funding organisation Pirkan Helmi. Veijonen at VVC for instance had showcased the Kaakonoja project and the heat pump day in her engagement with other colleges, and she had also received several enquiries about heat pumps from individual households (Veijonen, 2011). The Kaakonoja case was used as an example of a successful community-led project by their funder, Pirkan Helmi, in their own engagement with the general public and stakeholders such as other EU Leader organisations. Pirkan Helmi also provided a few opportunities for Mäkelä to present the project to stakeholders. Pirkan Helmi showcased Kaakonoja as an example of an innovative, citizen-led, not-for-profit project, which benefited the wider community. Furthermore, Vesisenaho (2012) especially highlighted the importance of a dedicated project leader and supportive team in the Kaakonoja case. However, the learning shared from the Kaakonoja project was mainly about both the VVC and Pirkan Helmi showcasing a project in which they had been involved, rather than with an aim of facilitating other communities to follow the Kaakonoja lead.

Once niche innovations start to share their experiences with others, an inter-local niche phase starts to emerge (Geels and Deuten, 2006). In the case of the Ylä-Kivelä project, there was evidence of projects sharing lessons between each other, especially in Ylä-Kivelä's relations with the Metsälinna block. However, once Lahtinen tried to suggest a similar project to the block of flats next door to Ylä-Kivelä, he met resistance. Perhaps if a dedicated intermediary organisation would have been facilitating the communication with the neighbouring block, they may have had more success than Lahtinen, who did not have the same trusted position with that block as he had with the Ylä-Kivelä residents. The lessons from Ylä-Kivelä were mainly shared on an ad-hoc basis, in Lahtinen's meetings with local people, his colleagues in the building trade and local media reports. Lahtinen clearly would have wanted to be more active in spreading his experience, however, due to time commitments he was unable to do so. An active intermediary organisation could have helped the flow of learning from the Ylä-Kivelä case to other projects. The Finnish government's energy efficiency agency Motiva for example featured the Ylä-Kivelä case in their communications (Laitinen, 2010) and has also provided other information materials on renewable energy. However, at the time, Motiva was not taking an active lead in the facilitation of citizen-led community energy, even though they were aware of individual projects here and there (Laitinen, 2011). As mentioned in Chapter 5: Finland Case Studies, This was partly attributed to the strong position of municipalities in the energy business in Finland, as well as the "*slight old-fashioned state of the Finnish energy system*" (Laitinen, 2011), where energy companies dominate the system and citizens take a less active role (Laitinen, 2011). As Lahtinen too had noted, the district-heating system is especially strong in Finland and for many communities it may be difficult to break away from that (Lahtinen, 2012), demonstrating the lock in of the socio-technical energy regime.

While the Finnish cases indicated an inter-local niche phase, in Lyndhurst and Hyde Farm, it was evident that those projects had more support from intermediary organisations. In the UK cases there was more evidence of sharing lessons between projects, and between projects and intermediary organisations, indicating a trans-local phase of niche development (Geels and Deuten, 2006). At this phase, intermediaries are aggregating knowledge from local projects and translating that learning to best practice guidelines (Geels and Deuten, 2006). However, active facilitating of new projects emerges in the global phase (Geels and Deuten, 2006). Intermediary organisations such as funding bodies help to facilitate community energy projects. They do not only provide financial resources, but also help to create knowledge, build networks and assist with strategic project management. In the case of Lyndhurst for example, the NFNPA not only provided financial resources and help at different funding stages, but their role was also about facilitating projects within the niche, by bringing wood fuel users and producers together. The experience from the Lyndhurst project was especially valuable for the NFNPA in terms of testing biomass use in a large building and seeking opportunities for local wood fuel networks to develop. Furthermore, the NFNPA was also able to test their SDF programme through the Lyndhurst Community Centre project, given that the SDF was in relatively early stages at the time and the Lyndhurst project involved for instance the first feasibility study that they had funded.

In the Hyde Farm case, sharing of learning from the project was evidenced in Sheehan and Schonbeck's activities throughout the project. Both were involved in setting up other local community networks and they were very keen to share learning from the Hyde Farm experience, especially in terms of how to organise groups, seek funding opportunities and speak to funding organisations. Furthermore, Sheehan in her new role at Lambeth Council became involved in facilitating other community groups, in effect becoming an intermediary actor. Her experience with the Draught Busting Saturdays had provided useful lessons regarding how to get the people with the right skills in the same room to network, how to deal with funders' expectations and how to deliver projects that may be completely new in concepts to the local community in question. Sheehan was a great believer in networking and providing people the opportunity to gather and talk about their ideas, indicating the importance of physical spaces for communities to come together in. Furthermore, as Sheehan had herself struggled with funding applications to begin with, one key learning for her from the Hyde Farm project had been to establish dialogue with funding partners from the start, in order to understand what funders' expectations are and what outcomes they may want from projects. Furthermore, the partnership with British Gas had taught Sheehan, that differing expectations between the community and the project funder may cause challenges during project delivery.

However, it should be noted that there were also lessons that might not be that easily translated and shared from these four projects to others. Concepts such as community leadership, identifying and obtaining necessary skills, tacit knowledge and awareness of local cultural norms can be issues that may not easily travel between projects. For example in the case of Lyndhurst, Charlesworth was particularly well-equipped in his local knowledge and pre-existing skills, while in Hyde Farm, Sheehan's networking skills became useful in spreading the learning beyond the boundaries of the Hyde Farm project. Intermediary organisations, which can help to translate such lessons from local projects, will also require tacit knowledge and soft skills to recognise the more nuanced aspects of community energy projects and how those features could be shared with others.

Key outcome: Learning was prominent in all four cases, especially regarding new technology and information relating to funding. In Kaakonoja and Ylä-Kivelä there was less evidence of active intermediation, while in Lyndhurst and Hyde Farm, lessons from both projects were aggregated by intermediary actors and shared with others. The cases show that learning was not only confined to the community energy projects, but learning also took place in the organisations that interacted with the community energy projects, such as the funding organisations. In other words, local contextualisation, negotiation and engagement as well as transferable lessons are also relevant to intermediary organisations, which can demonstrate the ability to adjust relevant knowledge to each organisation's individual circumstances and local setting. For example, funding institutions can learn from others' experiences and adjust this learning to their local area.

6.3 Conclusions of cross-case analysis

The cross-case analysis above shows that there were several similarities across the cases, despite their different contextual settings of being located in Finland and the UK. Raven et al. (2008) found in their analysis that local projects, which involve niche innovations, had certain characteristics and these are also tested in this analysis:

Projects were local reinterpretations and reinventions of a more generic concept of an emerging niche trajectory (Raven et al., 2008, p.473). All the four cases analysed for this research involved a form of existing sustainable energy, which was adjusted to the cases' local contextual settings. However, in the context of community energy in Finland, where the emerging niche trajectory was relatively weak at the time of data collection for this DPhil research, it is perhaps impossible to say whether that niche trajectory will emerge further, even though there are positive signs with the establishment of further intermediary organisations for instance (see also Chapter 5: Finland Case Studies). In the UK context, meanwhile, evidence since the data collection of this thesis has shown that indeed the community energy sector is growing, new projects are being developed and also parts of the niche are entering the dominating energy regime, as evidenced by the publication of the Community Energy Strategy in 2014 (DECC, 2014a).

These local variations were the result from differences in contextual setting and the way projects engaged with their local stakeholders (Raven et al., 2008, p.473). All the four community energy cases involved negotiation and engagement activities with their local communities and key stakeholders. Concepts such as pre-existing skills, community cohesion and community leaderships all played an important part in the development of the projects, from seeking technical information to filling in funding applications and delivering projects. However, the niche literature falls short for instance on the role of leadership and its importance in initiating niche innovations. This seems to be especially key to community energy projects, which often rely on volunteers. Furthermore, pre-existing skills, which were transferable to an energy project, played a key part in all four cases. Not only were pre-existing skills of those who were actively involved in the projects important, but also acquiring new skills and spotting people with certain skills became important as projects developed further. Often it was down to the community leaders to spot those people who would be able to help with their projects and complement the project teams' pre-existing skills.

The project and the context coevolved, i.e. the context influenced the projects' variation, while the implementation of the project itself also changed the context (Raven et al., 2008, p.473). The implementation of the project changing the context was evident in the case of Lyndhurst, where the installation of the biomass system also provided opportunities for the NFNPA to manage local woodlands and help create a local wood fuel supply networks in the New Forest area. In the case of Hyde Farm, taking part in activities such as the ECHO Action programme encouraged local people to get involved, creating a core group of people who went on to develop other projects and ideas such community gardens and the Draught Busting Saturday concept. There was less evidence of the local context evolving in the cases of Kaakonoja and Ylä-Kivelä, potentially indicating a lack of a prominent niche space in Finland at the time.

Projects provided generic lessons that were aggregated and shared with others (Raven et al., 2008, p.474). Learning was part of all four projects, however, there was variation to the extent to which lessons were aggregated and shared with others. This was evident from the UK cases of Hyde Farm and Lyndhurst. Hyde Farm especially was active in networking and sharing experience to others, while also feeding this learning to the local council. In Lyndhurst, meanwhile, networking was mainly local, but the support of the NFNPA ensured that lessons were shared by the NFNPA to other groups and park authorities. In the case Kaakonoja, networking was active in the local area and there was some evidence of lessons being shared by Pirkan Helmi, which acted as an intermediary actor. There was limited project-to-project sharing in Ylä-Kivelä, and the sharing of lessons was mainly limited to the Ylä-Kivelä team organising visits to local organisations. However, the facts that Motiva used Ylä-Kivelä as an example in their communications and that Ylä-Kivelä were awarded Housing Company of the Year indicate that the project was also recognised by external organisations.

The projects also acted as examples for other projects, providing some transferable lessons to the global niche level (Raven et al., 2008, p.474). The Kaakonoja and Ylä-Kivelä cases demonstrate that in those two instances, the knowledge flows from the projects was still in the early phases of niche development, i.e. in the inter-local phase, where there is a limited amount of project-to-project sharing of lessons and no clear intermediation by dedicated organisations. This is reflected by the interviews with expert organisations in Finland, which saw that citizen-led community energy in the Finnish context is relatively sparse (see Chapter 5: Finland Case Studies). In the UK cases, there was evidence of the Hyde Farm and Lyndhurst cases acting as examples for other projects, and sharing their learning with other community groups. At Hyde Farm, Sheehan especially in her new role at Lambeth was able to aggregate lessons from the Hyde Farm case and circulate those lessons to other groups. Meanwhile, the NFNPA acted as an intermediary organisation for Lyndhurst and aggregated lessons from them such as the importance of funding support in early stages of project development. The Hyde Farm and Lyndhurst projects demonstrate how learning from local projects can be translated to the global niche level. However, there was less evidence of these two projects learning from the global niche level. The Lyndhurst project did learn from biomass experience in the Lake District area, though only after the NFNPA had directed them to that source. This could indicate that despite the community energy niche being relatively established in the UK, individual projects can still find it challenging to access global niche level guidance and subsequently adjust it to their own individual circumstances.

The analysis above shows that the four cases fitted the theoretical framework developed in Chapter 2 to a certain extent, especially in relation to projects being locally embedded, learning in the project development process, sharing their experience and providing lessons for others. However, there were aspects to the cases too that the niche literature discussed in Chapter 2 does not seem to take into consideration. Despite the different country contexts of the projects, it seemed that the UK projects were not necessarily any easier to develop than the Finnish ones. Projects in both countries found the early stages of project development challenging, especially regarding gathering information about different technology options and to some extent raising necessary funding. Furthermore, projects also seemed to have similarities, which aided their project development, despite the different contextual settings. These include (1) the role of leadership especially in the initiation stage of new projects in emerging niches, (2) the importance of pre-existing skills and community cohesion for groups such as communities, which cannot necessarily take professional skills for granted in the same way as for example commercial organisations can, (3) the importance of being able to access independent information related to niche innovations, and (4) even though networking is central to niche development, networking for groups such as communities are not always straightforward or strategic, but can be ad-hoc and based on 'accidental' encounters. The following chapter concludes the analysis of this thesis by answering the research question and making recommendations for policy as well as further research.

CHAPTER 7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The main objective of this thesis was to analyse local innovations that are developed by civil society actors. The analysis of local innovations was approached via the concept of sustainable community energy projects, which address either heat or electricity generation or energy saving, and which are developed and owned by civil society actors such as volunteer groups, residents' associations and co-operatives.

The development of community energy projects was analysed using theories from the sustainability transitions literature, especially the literature about developing novel socio-technical configurations in niches and ideas from Strategic Niche Management (Chapter 2). This thesis developed a novel framework based on the niche literature of Geels and Deuten (2006) and Raven et al. (2008), especially in relation to the development of niche innovations and how they are developed through the processes of (1) local contextualisation, (2) negotiation and engagement and (3) transferable lessons (Raven et al., 2008). A case study methodology was chosen (Chapter 3) and an in-depth analysis of four community energy projects was conducted in two different country contexts, Finland and the UK (Chapters 4 and 5). Theoretical conclusions were drawn through cross-case analysis (Chapter 6). All four projects fitted the perspective that niche innovations can start as answers to problems in the prevailing regime and landscape level factors, and they can be embedded in their local contexts (Raven et al., 2008). All of the four cases could be approached as grassroots innovations (Seyfang and Smith, 2007), as their focus was not only technological, but they also took into account social motives in their local area, either by acting together for the greater good of the local community or developing a stronger community through their community energy project. This chapter provides conclusions for the thesis, by answering the research question, making policy recommendations and identifying opportunities for further study.

7.2 Answering the research question

This DPhil research set out to analyse grassroots innovations developed by communities by posing the following key research question:

Why and how do community energy projects develop and how do they contribute to niche development?

The overall research question was broken down to three sub questions, which are answered in more detail below. Before moving to these questions, it is important to note how helpful a socio-technical perspective has been for revealing the social aspects of community innovation, especially given that the projects analysed have all involved people, technology, knowledge and learning in a certain context.

1. Why and how do community energy projects develop in Finland and the UK? What are their contextual settings? What initial motivations, expectations and visions do they have?

Niche literature argues that at the local contextualisation stage of a niche innovation project participants have certain initial expectations and motives which shape the project's vision (Raven et al., 2008). The communities at Hyde Farm, Lyndhurst, Kaakonoja and Ylä-Kivelä were all motivated by *existing physical problems* with their heating systems, which meant that they were also locked-in to existing socio-technical systems such as an inefficient heating regime.

The initial project vision is subsequently adjusted in relation to the project's further development and engagement with the local community and stakeholders (Raven et al., 2008). The analysis of the four community energy cases shows that projects started initially with the vision of being able to address their expensive and inefficient energy systems. All projects had a vision for *cheaper heating bills*, and they also wanted to take *action through their local communities*, rather than address the issue as individuals. Project visions were adjusted in negotiation and engagement with the projects' local community and key stakeholders, key examples of which are highlighted below:

- In Hyde Farm, the engagement with the ECHO Action team made Sheehan realise that she needed a more locally embedded approach to demonstrating energy efficient technologies, to make a measure such as draught proofing more tangible to her and her neighbours. In order to do that, she set up her own local innovation, the Draught Busting Saturday concept, and encouraged others to get involved. In other words, Sheehan's vision of acting together as a community to reduce carbon emissions was adjusted in the sense that she realised that to make a difference, the community had to create their own initiative. Her vision was strengthened by neighbours joining in the Hyde Farm activities, taking part in the Draught Busting Saturdays and hence building the community.
- In Lyndhurst, engagement with the NFNPA, especially in the form of the first feasibility grant, gave Charlesworth an opportunity to learn about different renewable energy options for the Community Centre building and consider technology that was completely new to him.
- In Kaakonoja, Mäkelä and Knuuttila set out to find information about heat pumps, with limited knowledge regarding what they could find. In their quest for external technical expertise and support they had to be persistent as they soon realised that most organisations that they contacted were not able to help them. Furthermore, the Kaakonoja team had a set back with the delay in receiving their funding grant. This demonstrates how expectations could be easily dampened and groups such as Kaakonoja require persistence to keep going.

- In Ylä-Kivelä, Lahtinen set out to find cheaper heating options for their expensive oil-based heating system that was also in need of refurbishment. During his engagement with local contacts, Lahtinen learnt that in fact they had an option to install renewable energy in the block of flats that was not only cheaper than the oil-based and district heating options, but would also have environmental credentials. This indicates how the choice of technology is not just about artefacts, but link to wider socio-technical implications.

The cases show how initial expectations and visions can change as projects start to learn about the different opportunities available to them, as well as realising the ability that they themselves have in relation to creating opportunities for learning and knowledge building.

2. To what extent do community energy projects network, learn from others and share experiences with other groups and actors?

As mentioned in Chapter 2: Theoretical Framework, niches are created by "*a network of actors which share a common problem definition in relation to the innovation*" (Verheul and Vergragt, 1995, p. 322). Networking is an important aspect of niche development as actors within the emerging field start to share experience and learning. In terms of the four cases analysed, there were two types of networking identified, networking within the projects and networking between projects. Highlights of these are summarised below in relation to all four cases, illustrating the type of networking, learning and sharing of experience that took place.

- Project-based learning was prominent in all four cases, especially regarding information related to new technology and funding opportunities. In Hyde Farm, learning was prominent in relation to energy efficiency measures and issues such as how to set up as a constituted group and how to fill in funding applications. In Lyndhurst, Dewing for example learnt to use the biomass boiler, especially in terms of adjusting the technology to the building's requirements and ensuring that a routine maintenance plan was put in place. In Kaakonoja, the project team had to gather information about heat pump technology and learn how to fill in a lengthy funding application. Lastly, in Ylä-Kivelä learning was mainly related to new technology and how to use it in the block and ensure smooth operation.

- The analysis also shows that learning is not only confined to the community energy projects, but learning can also take place in the organisations that interact with the community energy projects. This was especially the case with the NFNPA, which could partly test their newly initiated SDF programme with the Lyndhurst case, but also they were able to learn about the possibilities of biomass heating in the New Forest area. Furthermore, the British Gas funding for Hyde Farm provided British Gas an opportunity to get access to a community group and thus to households, providing British Gas an opportunity to learn new ways by which to engage with communities and householders.
- Networking was an activity that all four projects used to their advantage. However, as the evidence shows, quite a lot of the networking activities in the four cases were based on ad-hoc meetings, i.e. chance meetings that were not necessarily planned or strategic, but which nevertheless proved useful and sometimes led to other contacts. In the case of Hyde Farm, Sheehan and Schonbeck were both active in their networking, but it was not necessarily strategic, but more about recognising opportunities when they arose. For example this was the case of Sheehan's encounter with the Lambeth Council leader and her subsequent role at Lambeth Council.
- Networking is not always easy and takes time and effort. While Sheehan was a self-proclaimed networker, Lahtinen for example mentioned that due to time constraints he was unable to network with as many people as he would have liked to. Furthermore, in Lyndhurst and Kaakonoja, networking was mainly confined to existing avenues and contacts, indicating that perhaps the success of these

projects was down to who they knew rather than who they got to know during the project.

- Project-to-project networking can include for instance the sharing of knowledge on practical issues such as where to find information about new technology, where to seek funding opportunities from, how to set up group structures or utilise pre-existing skills. Furthermore, community groups can also share learning in relation to more 'soft skills' such as how to engage the local community, how to network with other groups and how to identify funders' expectations.
- All of the four cases were early pioneers in their own right, who developed grassroots innovations in the field of community energy. They were also willing to share their learning with others: Hyde Farm organised events for other community groups; Lyndhurst invited over 200 people to their launch event and took part in an open day; Kaakonoja organised a heat pump day visited by 700 people and created a guidebook that was freely available to others; and Ylä-Kivelä invited local actors such as the local municipality to visit their renewable energy installation. By being open to visits and sharing their experience with others (whether they were community groups or not), all four projects contributed towards a niche space (Geels and Deuten, 2006).

Previous research has shown that many community energy projects aim to reach wider audiences, encouraging others to engage with sustainable energy and take action (Walker and Devine-Wright, 2008), while others are happy just to act within their own neighbourhood and community (Seyfang et al., 2013b). In the four cases analysed here, the team at Hyde Farm was clearly keen to get others involved in sustainable energy and they became active in networks such as Project Dirt and the LCCN, while the other three projects of Kaakonoja, Lyndhurst and Ylä-Kivelä mainly networked for the benefit of their own projects, even though they were willing to share that experience with others. However, the three latter cases demonstrate how the role of intermediaries becomes relevant when projects, which are successful and willing to share their experience, may not necessarily have the tools or know the best avenues for that sharing.

3. Is there evidence of transferable lessons and sharing of those by for example intermediary organisations?

At the trans-local and global phase of a niche, intermediary organisations aggregate learning and experience from local projects and translate it to global niche level rules, advice and guidance (Geels and Deuten, 2006). In an emerging field such as community energy, intermediary organisations can aid community energy projects especially with information and guidance related to issues such as how to engage effectively as a community group, advice on networking, providing tools such as handbooks, guidance on funding and offering professional services such as legal advice (Hargreaves et al., 2013). Intermediaries also have an important role in building confidence and helping community groups to realise how they can utilise the pre-existing skills that they have for the good of their local communities (UK3, 2011). Intermediaries can also conduct a role by brokering relationships with actors who are outside the community energy sector (Hargreaves et al., 2013). In relation to the four community energy projects, the following outcomes were evident in terms of intermediation:

- In Hyde Farm, the ECHO Action programme was initially in a role of an intermediary organisation, offering advice and guidance on a range of sustainable lifestyle issues. They supplied a template and materials for local action such as draught proofing. However, the success of the Draught Busting Saturday required local adaptation to really make it work in the Hyde Farm context. Later on in the project, Hyde Farm got involved with intermediaries such as Project Dirt and the LCCN, which provided an infrastructure of codified knowledge and direction of search for community energy projects (Geels and Deuten, 2006). Furthermore, Hyde Farm also had to broker and negotiate directly with the Green Streets funding provider British Gas for instance, in order to fit around the utility's inflexible corporate approach. What was interesting from the Hyde Farm case was

Sheehan's role of transferring from a community energy actor at Hyde Farm to an intermediary actor at Lambeth Council, demonstrating perhaps some of the less obvious transferable lessons from the project (Raven et al., 2008). Issues such as how to learn about technology options, how to organise meetings and how to speak to funders and respond to their expectations were lessons that Sheehan took from the Hyde Farm project with her to her new role in Lambeth.

- In Lyndhurst, the NFNPA acted in an intermediary role and aided not only the development of the Community Centre project but also facilitated a new supply chain for wood fuel in the New Forest area. Without the support from the NFNPA, the Community Centre would have probably opted for a conventional gas boiler, given the limited knowledge that Charlesworth and his team had regarding renewable energy options. However, the Sustainable Development Fund provided by the NFNPA offered Charlesworth an opportunity to explore alternative options for the Community Centre's heating system, helping build a community energy niche. Issues such as the importance of funding for feasibility studies, biomass technology in a large building and wood fuel specifications, as well as logistics, became transferable lessons from the Lyndhurst project that the NFNPA could take on board and translate to best practice guidance for others to learn from.
- In Kaakonoja, Pirkan Helmi helped the Kaakonoja team with their funding application, effectively taking on an intermediary role. Furthermore, the VVC helped the Kaakonoja team with technical advice and guidance, and provided a space for the Heat Pump Day. However, there was less evidence of active intermediation compared to the Hyde Farm or Lyndhurst cases. There was no clear evidence that the experience and learning from Kaakonoja was being translated to a global niche level. The sharing of the Kaakonoja experience was mainly limited to the information booklet, the Heat Pump Day and any individual enquiries that the project team received, the majority of which were related to heat pump technology. The lessons of innovation and the benefit of acting together as a community were only shared with the project's initial partners, the VVC and Pirkan

Helmi, which despite using the Kaakonoja case as an example, said that they had not come across or encouraged other similar projects.

- In Ylä-Kivelä there was some, though limited evidence of lessons being aggregated from the project by intermediary actors. In 2009, Ylä-Kivelä was chosen as the Housing Company of the Year and there was evidence of Ylä-Kivelä being featured in trade magazines and a few government publications. However, there was no evidence of aggregation of the lessons from the Ylä-Kivelä case being actively shared by an intermediary organisation.

A part of creating a niche is moving from individual, isolated projects to a network of projects (Geels and Deuten, 2006). Raven et al. (2008) note that some lessons from local projects are easier to transfer to global niche level than others. As outlined above, there was evidence especially from the Hyde Farm, and to some extent from the Lyndhurst case, of lessons being shared at global niche level. Furthermore, these two cases also showed that intermediary organisations can have different roles. For instance in the case of Hyde Farm, the team's relationship was very different to their funding organisation British Gas, compared to the relationship that Lyndhurst had with NFNPA. This could be an indication also of the challenges that community energy groups may face when working with profit-oriented companies like utilities. In Kaakonoja and Ylä-Kivelä, meanwhile, there was much less evidence of lessons being shared at a global niche level.

This thesis set out to test the theoretical framework developed in Chapter 2 by analysing whether it was somehow 'easier' for the UK community energy projects to be developed than the Finnish ones, given that there is a more prominent community energy niche in the UK with evidence of more intermediary organisations, networks and information available than in Finland. Analysing the development of community energy projects in two different contexts, with different types of community energy niche phases, enabled the research to identify whether there were potential similarities or differences across the four community energy projects. Following a theoretical replication logic (Yin, 2009), the

UK cases should have been easier to develop; however, this was not the case. The analysis shows that despite the two different contexts of Finland and the UK, the four community energy projects shared more similarities than differences, which can be partly attributed to the internal factors of the projects, rather than to the context that they operated in. For instance issues such as leadership, pre-existing skills and high levels of motivation to undertake a sustainable energy project were shared between all projects. Furthermore, despite the different niche phases in both countries, all four community energy projects nevertheless initially found it difficult to find relevant information about different options available to them. In other words, despite the more established community energy niche in the UK, the UK communities chosen for analysis in this thesis did not find it 'easier' to develop a community energy project than the Finnish counter parts. This indicates that the existence of intermediary organisations alone has not been sufficient to create an effective global niche phase for community energy in the UK. The analysis shows that factors such as community leadership and tacit knowledge played an important part in all projects.

7.3 Contribution of this thesis

This thesis makes the following specific contributions to knowledge:

1. ***Theoretical contribution.*** This thesis makes a theoretical contribution to the SNM literature by highlighting that issues such as the role of leadership, the importance of pre-existing skills and tacit knowledge, and even trust within local communities, are aspects that previous literature on niche development does not take into account, especially the niche development perspectives by Geels and Deuten (2006) and Raven et al. (2008). As the analysis of this thesis shows, despite the different phases of niche development in Finland (inter-local phase) and the UK (global phase), all four community energy projects faced challenges in their project development. This indicates that a global niche phase may not be as helpful for project development as

the niche literature (e.g. Geels and Deuten, 2006) suggests, but issues such as leadership and the ability to utilise pre-existing skills and tacit knowledge play a more important part than is recognised by the niche literature.

The role of leadership. The four community energy projects showed that at the initial stage projects' personal relationships are particularly important. The role of so-called community leaders was vital in successful project initiation, as well as delivery, especially in the cases of Kaakonoja, Lyndhurst and Ylä-Kivelä, and to some extent in Hyde Farm. People such as Charlesworth, Lahtinen, Mäkelä and Sheehan were proactive not only in bringing people together, but they were also able to generate ideas for communal activities, spot funding opportunities and were keen to improve their neighbourhoods. They were not dictating to others what to do, but instead wanted to create opportunities for neighbours to join together and benefit from each other's skills, experience and enthusiasm. Leadership within the projects did not just appear, but Charlesworth, Lahtinen and Mäkelä had long careers behind them, during which they had had opportunities to deal with a range of people and develop their interpersonal skills. However, despite having those qualities, the cases also showed that initiating and leading a community energy project is not necessarily an easy thing to do and requires persistence. The niche development literature does not recognise the role of leadership (Geels and Deuten, 2006, Raven et al., 2008), especially in the emerging stage of a new field. However, as the four cases in this analysis show, key actors in those early projects can help shape not only their own projects but subsequently also other projects and the wider niche.

The theory on niche development literature could be extended and complemented by drawing on research from outside the SNM literature, especially literature on leadership. For example Onyx and Leonard (2011) have suggested using Complexity Leadership Theory (Uhl-Bien et al., 2007) for analysing how leadership emerges in communities. According to Onyx and Leonard (2011) communities can be seen as complex systems which are not necessarily defined by boundaries such as geographical location and are open to different participants. Complexity Leadership Theory is not focused on top down, hierarchical leadership, but it can be used for analysing leadership in a community setting, which often have leaders that are embedded in both formal and informal networks in their local communities (Onyx and Leonard, 2011). According to Complexity Leadership Theory, community leadership is not a hierarchical phenomenon, but forms as a result of grassroots action within communities, especially through interactions between members of a community and events within a community (Onyx and Leonard, 2011, Uhl-Bien et al., 2007). Furthermore, this type of leadership does not necessarily involve only one individual but can also consist of groups of people. Uhl-Bien et al. (2007) discuss adaptive leadership as an "*emergent, interactive dynamic that produces adaptive outcomes in a social system*" (p.306), which emerges from interactive changes and can be used especially for dealing with problems which require learning, new behaviours and innovation. In their analysis of five communities, Onyx and Leonard (2011) identified seven elements of successful community leadership: (1) leaders were embedded in the formal and informal networks of the community; (2) leaders did not make decisions alone but decision making was shared; (3) leaders were operating in an open system, engaging with others; (4) leaders had a vision about the future of the community; (5) leaders had practical management skills; (6) leaders had planning in place for their potential successors; and (7) leaders had commitment, persistence and energy (p.503-505). These elements are also very similar to the qualities that the key people and groups involved in the four community energy projects analysed for this thesis had. Onyx and Leonard (2011) also continue that the reason for successful community leadership can also be partly explained by active local networks and existence of social capital. Complexity Leadership Theory could provide a useful research avenue and addition to the SNM literature, especially for analysing how leadership emerges in communities who decide to develop grassroots innovations such as community energy.

Tacit knowledge, pre-existing skills and community cohesion. Community energy projects can build on pre-existing community cohesion, or projects can be used to build communities. Grassroots innovations, such as community energy projects, which operate within civil society settings, are developed for the benefit of the community. However, it is not clear from the grassroots innovations literature as to who creates that 'sense of community' and what the role of community leadership for example might be in that process (Seyfang and Smith, 2007). All the four cases showed that pre-existing skills are very valuable for community energy projects, especially when projects have to rely on volunteers' time and may have limited access to financial resources and professional skills. Both practical skills and tacit knowledge become useful as projects start to develop from ideas into project plans and actual delivery. Successful projects often have leaders who are dedicated and can get the right people involved, with the right skill sets. In other words, those who benefit and how they benefit from a community energy project becomes relevant for each project's definition and boundaries. In the four cases analysed for this thesis, all projects were flexible in their approach, and utilised their pre-existing skills. Sheehan and Mäkelä at Hyde Farm and Kaakonoja respectively were journalists. Schonbeck at Hyde Farm had a law background and years of experience working with sustainability projects. Charlesworth at Lyndhurst had a marketing background, while Dewing knew about technology. Lastly, Lahtinen at Ylä-Kivelä was an experienced building manager. Furthermore, all of the projects also involved people who wanted to learn new skills, as well as share their learning with others. This demonstrates also how much work community groups need to do before they can begin to access information, knowledge, external funding and advice.

The niche development literature (e.g. Geels and Deuten, 2006, Raven et al., 2008) discusses the role of actors, however, its focus is more on the processes of learning, networking and expectations, rather than what skills the actors who drive those processes may have or be required to have. Furthermore, these processes are often presented at higher-level, aggregated, processes compared to the micro-level interpersonal activities that this thesis has revealed to be of importance. According to previous SNM literature intermediary organisations undertake dedicated cognitive work translating knowledge and experience from existing projects, which can be turned into codified knowledge at the global niche level (Geels and Deuten, 2006). Local contextualisation, negotiation and engagement as well as transferable lessons are also relevant to intermediary organisations, which can demonstrate the ability to adjust relevant knowledge to each organisation's individual circumstances and local setting. For example, funding institutions can learn from others' experiences and choose aspects from other organisations that can be adjusted to their local area. The four cases show that key people involved in the projects had a varied mix of very useful pre-existing skills and tacit knowledge. However, some of the skill mixes were very specific and they may not be easily replicable in other projects, given the importance of local contextualisation of niche innovations. Tacit knowledge, which is the knowledge that people have, but which is not easily taught, openly expressed (Wagner and Sternberg, 1985), and cannot be easily codified (Gascoigne and Thornton, 2013), may not be as easily codified as for example details about a certain energy technology or information on funding sources would be. Thus the existence of intermediary organisations alone does not necessarily equate to a successful niche space for community energy, but concepts such as the use of tacit knowledge, pre-existing skills and community leadership have an important role in explaining the successful development of community energy projects.

2. ***Empirical contribution.*** This thesis makes an empirical contribution by providing in-depth analysis of four community energy projects, two in the UK and two in Finland, within the context of the differing community energy niches in the two countries. Community energy in the UK has been supported in various ways since the 1970s. Different national and local government programmes and other networks have provided support for community energy projects in the form of information, toolkits,

guidelines, training, grant funding and opportunities for networking. However, despite this support, community energy projects in the UK are still challenging to develop. As the Hyde Farm and Lyndhurst cases show, issues such as finding independent information about technology options, accessing funding sources and working effectively with funding organisations were at times challenging. Furthermore, there seems to be a gap between what is happening in local projects and what the intermediary organisations are doing, especially in terms of political lobbying.

Community energy, as a citizen-led activity, is still in its infancy in Finland. There is some government funding support for such projects mainly via the Energy Support grant, however, funding programmes specifically dedicated to community energy remain limited. There are only a handful of intermediary organisations, namely initiated by the work of Sitra. Information, toolkits, guidelines and training specifically tailored to community energy remain limited, especially compared to the sector in the UK.

The four cases demonstrate that even though they operated in different contexts and the niche space in Finland and the UK is different, there were also quite a lot of similarities across the processes in the development of the projects. The experience from both Hyde Farm and Lyndhurst show that despite receiving external advice and funding support, both projects required a dedicated team, solid leadership, goodwill and the ability to utilise pre-existing skills as well as the willingness to learn new ones. This was also the case for the Finnish cases of Kaakonoja and Ylä-Kivelä, and they were willing to act as pioneers despite the limited community energy activity in Finland in general. What shone through from all cases, however, was that the people involved in those projects had drive and enthusiasm to improve their energy systems and make their communities more coherent in the process, resources which are not easy to supply via grants or external advice, and policy measures may not easily pick up on.

7.4 Policy recommendations

One of the aims of this thesis was to make policy recommendations in the field of community energy. As the thesis compared four individual cases in two different country contexts, recommendations are made for both countries separately. The following highlights became evident in the course of the analysis.

1. Policy recommendations for the UK

- Since the main fieldwork and data collection of this DPhil, there has been a lot of activity in the UK community energy field, notably evidenced by the publication of the UK's first Community Energy Strategy in January 2014 (DECC, 2014a). The experience from Hyde Farm and Lyndhurst show that despite an existing network of intermediary actors in the UK, community energy projects can still struggle to get started and lack independent advice on what options may be the most suitable for them. Hence there is a clear need in the UK to help community groups access the information that is available on options such as technology, business models, funding and how to write funding applications, and how to engage effectively as a community group. This is also something that has been recognised by the Community Energy Strategy (DECC, 2014a).
- In the UK, energy policy decisions are made at the national government level, which can seem far away for grassroots innovations such as community energy, which operate in local communities. The Community Energy Strategy (DECC, 2014a) mentions that a new Community Energy Unit will be set up at DECC, which will work with other government departments, community groups and local authorities in implementing the Strategy. However, there is no indication of what the structure of that working will be and how much local authorities or community groups will have a say on decision making. Community energy is based on local action and co-ordinating it from the top-down government level may change the way community energy is defined and perceived.

- One aspect to UK policy could be the identification of community leaders, who could work with more locally distributed Community Energy Units. Funding could be directed to identifying and employing people like Charlesworth and Sheehan, who have qualities to make positive changes in their communities, to drive community energy projects in local areas. They could also help with issues such as networking, helping to build confidence, organising local groups and identifying other people with the right skills set or capabilities.
- The identification of community leaders could also aid the transition of community energy to wider audiences, rather than leaving it as a 'middle class' activity. This could ensure that poorer communities, which may not be so seemingly interested in sustainable energy or have the pre-existing capabilities to initiate such projects, could also access the benefits of community energy and have more say regarding their energy consumption and generation.

2. Policy recommendations for Finland

- The cases of Kaakonoja and Ylä-Kivelä demonstrate that developing community energy projects in the context of Finland is still a relatively unique and new experience. Given the country's strong municipal energy system, community energy has not been as widely considered by citizens, researchers or policy makers as in the UK. However, as in the UK, there is a clearly a need in Finland for more independent information and advice for those who are interested in community energy solutions. As the teams at Kaakonoja and Ylä-Kivelä noted, community groups in Finland could benefit from an independent organisation which would provide trusted information especially about various technology options and funding opportunities. This is important in a field like renewable energy where technologies can develop quite fast and community groups may not have the necessary technical knowhow of how to choose the best options.

- The establishment of more intermediary actors in Finland, such as the Finnish Local Renewable Energy Association in 2013, could provide opportunities for networking, sharing experience and developing the community energy niche further in Finland. Intermediary actors could for instance identify existing community groups, which have pre-existing community cohesion and a history of doing activities together, to encourage them also to consider sustainable energy projects. Identifying community leaders such as Mäkelä and Lahtinen who are already active in their area, and using the trust that has already been built in these communities, could provide the opportunity to diffuse the concept of community energy in Finland.
- In terms of support for projects such as community energy, one of the issues lacking in Finnish energy policy is the support for smaller scale renewable energy and the exclusion of small-scale renewables such as solar PV from the Feed-in-Tariff. Without adequate financial support, small-scale renewable energy measures could remain in the fringes.

7.5 Opportunities for future research

There are several potential areas that could build on the analysis of this DPhil thesis and could benefit from further research. These are discussed in more detail below.

One of the key findings from the analysis of this thesis is the role of community leadership and how important it was for the projects analysed for this research. As the sample size in this research was small due to the in-depth case design and resource limitations of DPhil research, it would be fruitful to conduct further analysis of the role of leadership in community energy projects with a larger sample size. For instance Seyfang et al. (Seyfang et al., 2013b) conducted a survey of 190 community energy projects in the UK and even though they covered issues such as group structure, the survey did not go further in terms of the role of leadership in community energy projects.

Another research avenue, especially in the UK context, could be analysing the opportunities for grassroots innovations, such as community energy, from their 'middle-class' origins to also include other socio-economic groups, especially those that may have less pre-existing skills. Like the experience with Sheehan at Hyde Farm showed, middle class people tended to dominate the community energy meetings when she first started attending those, but through her role at Lambeth Sheehan had also encouraged other socio-economic groups to take part in sustainability action. Future research could focus on issues such as how to mobilise all communities, not just those interested in sustainability, and how to aid them in project design and development (see for example Light, 2014).

Another possible interesting research opportunity would be to go deeper into the process of local contextualisation of community energy projects and analyse which lessons can be translated from that process to the global niche level, and which are the lessons that are less transferable. For example aspects of project development such as local knowledge, tacit knowledge and social relations are all important for the development of community energy projects, however they are also concepts that may not be easily transferable or quantifiable. Recognising the key processes of local contextualisation could also aid policy development in the field of community energy, by providing more tailored support for projects. Given the right support measures, community energy could become an attractive choice and a choice for influential local action, especially amid constant energy price increases, emissions linked to climate change and the substantial power of companies presently dominating the energy markets.

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YK3 2011. Personal interview with a resident, Ylä-Kivelä. Keuruu, 15.09.2011.

Appendices

Appendix A: Overview of the UK's Energy System

The UK gas and electricity markets were privatised in the 1980s. Retail electricity markets opened up for competition in 1998, while price controls were removed in 2002 (Ofgem, 2013b). The energy supply markets are now largely dominated by the "Big Six" utilities (British Gas, EdF Energy E.On, RWE nPower, ScottishPower and Scottish and Southern Energy), that were formed after privatisation of electricity from the original 14 suppliers – these were distribution companies that could also be retailers (Ofgem, 2013b). Main sources of electricity generation in the UK in 2012 were coal (40%), gas (28%) and nuclear (19%). The share of electricity from renewable sources of wind, solar, wave, hydro and bioenergy accounted a total of approximately 11% (DECC, 2013e). Figure A.1 illustrates the share of sources in UK electricity generation.

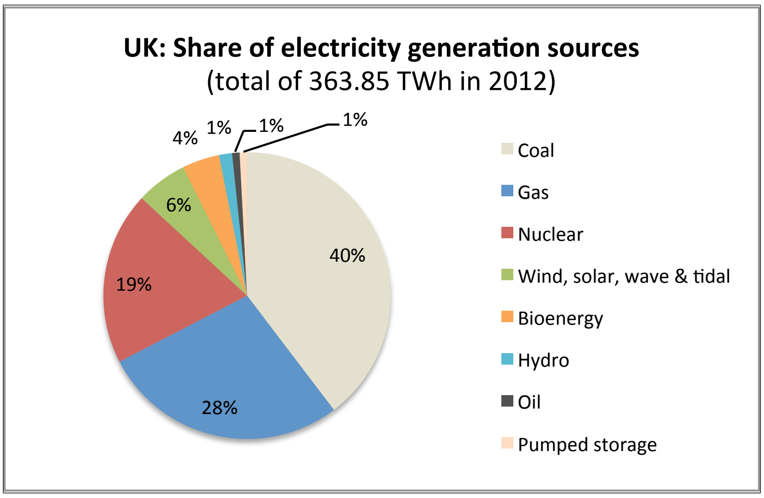

Figure A.1: Electricity generation in the UK by source, year 2012 (DECC, 2013e)

Data for the UK's electricity sector between 2011 and 2012 show that the trend in electricity generation has been for increased coal and renewable use, while electricity generation from gas has been decreasing. Electricity generation from coal increased by 31.9% between 2011 and 2012, while wind, solar, wave and tidal increased by 45.6% and bioenergy by 15.1% (DECC, 2013e). Gas use was down by 31.7%, due to high prices in the international gas markets (DECC, 2013e).

In terms of electricity consumption, the main bulk of this is shared almost equally by the domestic sector (36%), industry (32%) and other users (30%) (DECC, 2013e). Figure A.2 illustrates this.

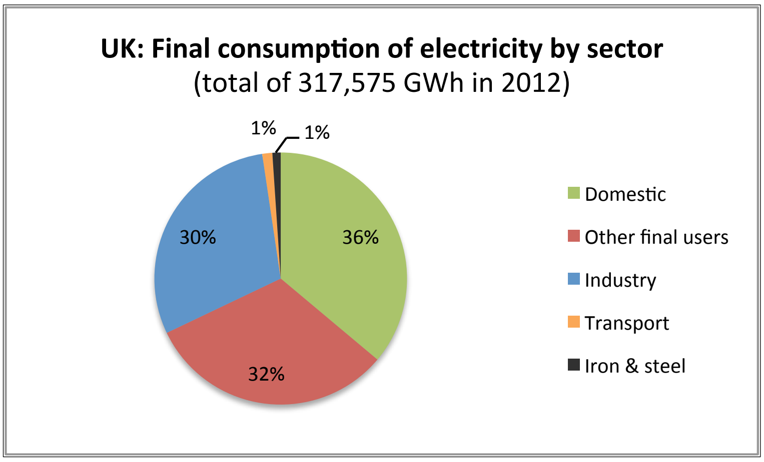

Figure A.2: Electricity consumption in the UK by sector (DECC, 2013e)

Heat produced in the UK mainly comes from fossil fuels and there are limited amounts of heat networks or renewable heating. The main sources of heat production in 2011 were from gas (82%), followed by coal (15%) and oil (3%). The UK government is revising its heat policies and published *The Future of Heating: Meeting the challenge* strategy for decarbonising heat in 2013 (DECC, 2013b).

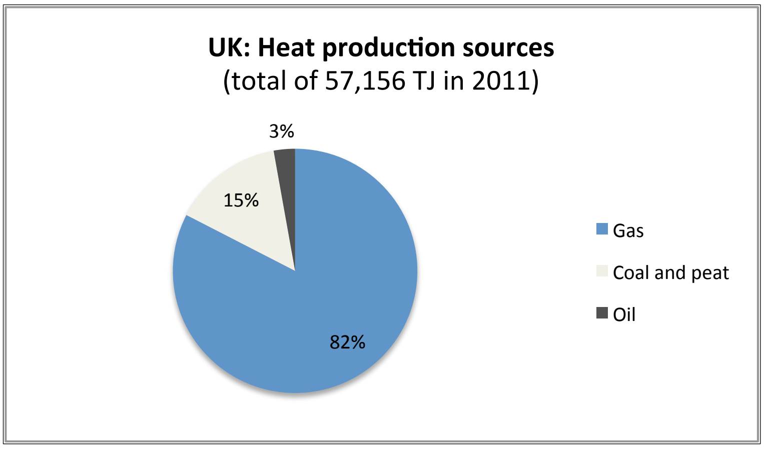

Figure A.3: Heat production in the UK by fuel source (IEA, 2011c)

Heat consumption, in the mean while, is dominated by industry (66%), while commercial and public services (30%) follow suit. The residential sector counts to around 4% of the UK's heat consumption.

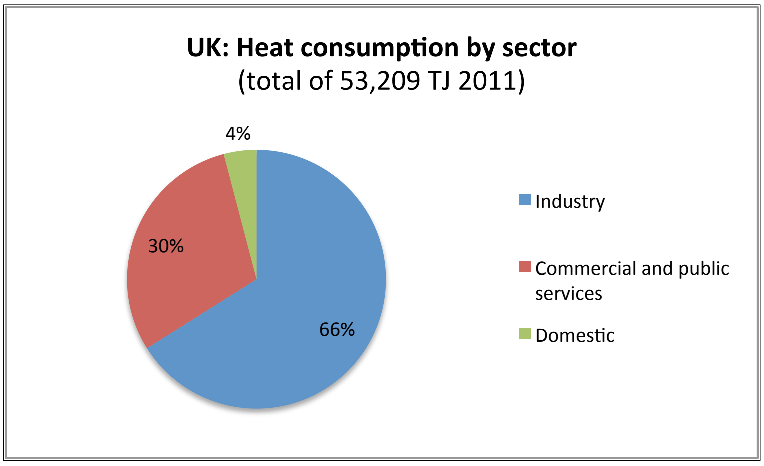

Figure A.4: Heat consumption in the UK by sector (IEA, 2011c)

As can be seen from the UK's energy mix, the energy system is largely based on fossil fuels. This has implications on several grounds, especially in terms of GHG emissions linked to fossil fuel usage.

Appendix B: Overview of Finland's Energy System

The energy context within which community energy projects operate in Finland looks somewhat different to that from the UK. Finland has a much more decentralised energy system compared to the UK and there are more municipal level actors in the energy sector as a whole, as well as a mix of electricity generation sources and a wide use of district heating networks. The Finnish electricity market was opened up for competition in 1995, and by 1998 all electricity consumers were free to choose their electricity supplier (EMV, 2013b). Around the same time, in 1998, Finland became a member of the Northern European power market, which meant that it did not have its own wholesale power market anymore. The Northern European power market includes neighbouring countries Denmark, Norway and Sweden, as well as Baltic countries which have all joined in the last few years, Estonia in 2010, Lithuania in 2011 and Latvia in 2013 (EMV, 2013a). Finland was regularly importing electricity from Russia until 2011, however, these dropped by 60% in 2012 due to changes in the Russian market (EMV, 2013a).

There are approximately 130 electricity generating companies in Finland, with three of the largest companies having an estimated 62% of the market share (EMV, 2013a). In 2012, there were 74 retail electricity suppliers in Finland, of which 44 were supplying electricity across the country (EMV, 2013a). In terms of electricity production, around 40% comes from renewable generation, while the rest is a mix of nuclear and other sources. The full mix of electricity generation sources in 2012 were nuclear (33%), hydro (25%), biofuels (15%), coal (10%), gas (9%), peat (6%), waste (1%), wind (1%) and oil (1%) (Finnish Energy Industries, 2013b). One of the sources, peat is rather controversial as Finland considers it a long-term renewable source while it is usually classed as a non-renewable source, this is due to peat's high emissions content (see for example Worrall et al., 2011). Figure B.1 illustrates the mix of electricity generation.

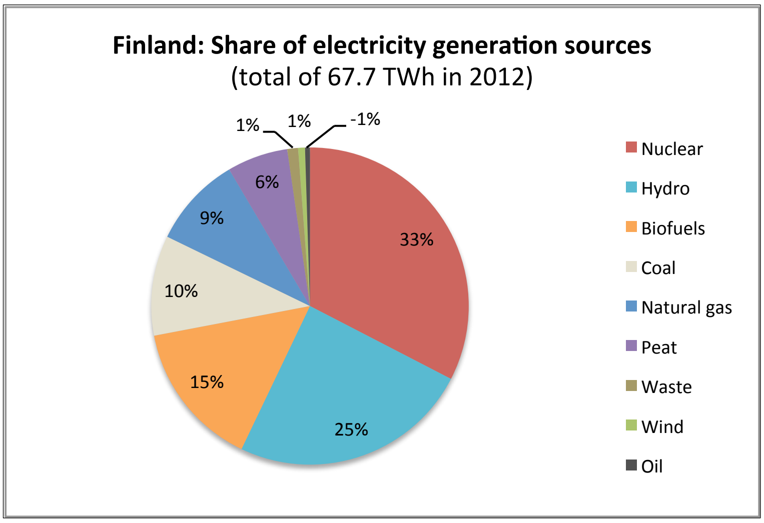

Figure B.1: Electricity generation sources in Finland (Finnish Energy Industries, 2013b)

Finland is a very energy intense country due to heavy industrial use of energy such as forestry and metal industries. In 2011, the IEA estimated that electricity consumption in Finland was 15.74 kWh/capita, compared to 5.52 kWh/capita in the UK (IEA, 2011c, IEA, 2011b). In 2012, total electricity generation was 67.7 TWh, while consumption was 85.2 TWh (EMV, 2013a). Industry is the largest consumer of electricity in Finland. In 2012, forestry, metal, chemical and other industries accounted for 46% of electricity consumption, while housing & agriculture (28%) and services and buildings (23%) were other main users (Finnish Energy Industries, 2013b).

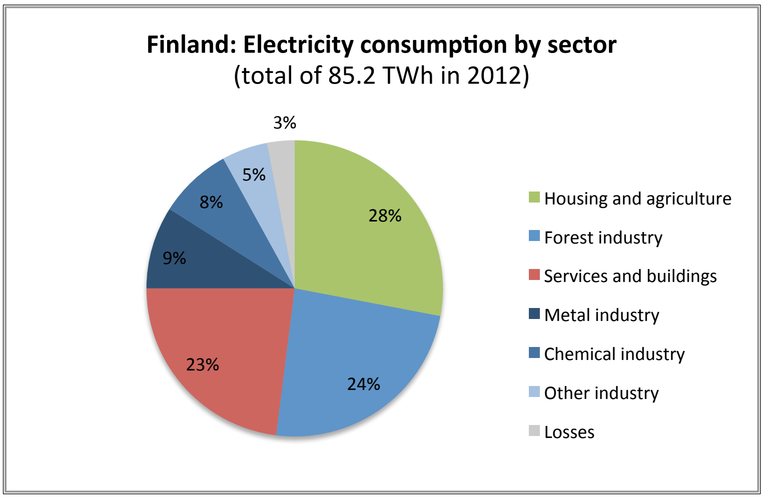

Figure B.2: Electricity consumption in Finland (Finnish Energy Industries, 2013b)

Out of Finland's 5.39 million population, 2.67 million people were living in district-heated dwellings in 2012, equivalent to around 47% of the space heating market share (Finnish Energy Industries, 2013a). In 2012, 70% of district-heating came from co-generation and the rest 30% from separate heat generation. Co-generated heat uses a mix of resources, including both fossil and renewable fuels. In 2012, approximately 27% of co-generated district heating came from natural gas, 24% from coal and 3% from oil (Finnish Energy Industries, 2013a). The share of renewable heat generation has increased considerably in recent years. Wood and other biomass produced around 24% of co-generated heat in 2012, while the controversial peat had a share of around 15% (Finnish Energy Industries, 2013a). Figure B.3 below shows the breakdown of total heat resources in Finland that includes also district heating.

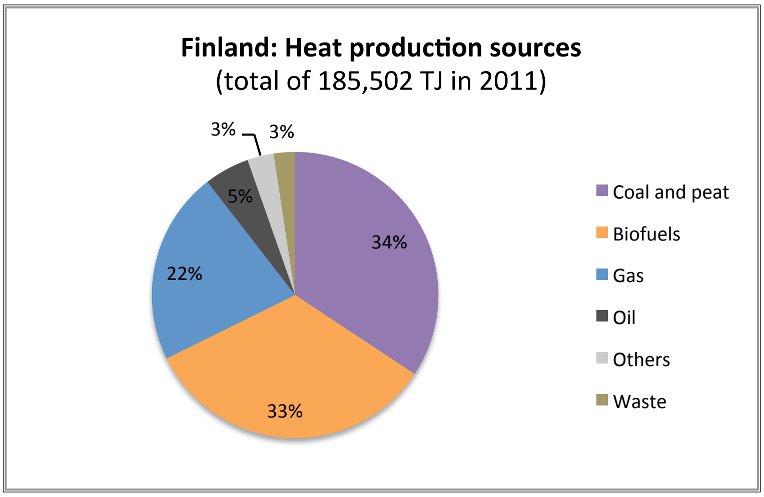

Figure B.3: Heat production sources in Finland (IEA, 2011a)

In terms of heat consumption, the largest consumer of heat in Finland is industry with over 40%, followed by households (36%) and other sectors (24%). Figure B.4 illustrates these.

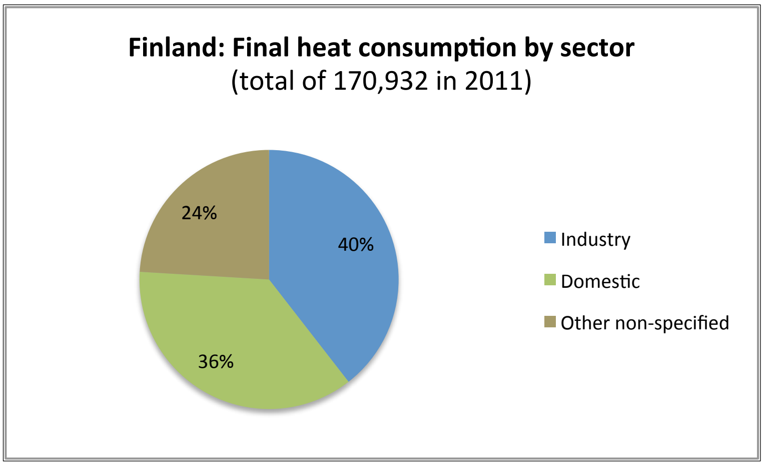

Figure B.4: Heat consumption by sector in Finland (IEA, 2011a)

As can be seen from the Finnish energy system outlined above, it consists form a range of sources, including nuclear, fossil fuels and renewables. Heat production and its use in particular has a difference in Finland and the UK, given that a third of heat production in Finland comes from renewable sources and district heating networks are very common.

Appendix C: List of interviewees

<u>Interviews conducted in Finland</u>

(P) = Personal interview, (T) = Telephone interview

Name	***Organisation***	***Date***
Taru Peltola	Finnish Environment Agency (SYKE)	23.08.2011 (P)
Hanna-Liisa Kangas	WWF Suomi Finland	31.08.2011 (P)
Jussi Nikula	WWF Suomi Finland	31.08.2011 (P)
Janne Käpylehto	Finnish Association for Nature Conservation	02.09.2011 (P)
Pekka Peura	University of Vaasa	05.09.2011 (T)
Researcher	Policy think tank	05.09.2011 (P)
Kaarina Toivonen	Finnish Environment Agency (SYKE)	06.09.2011 (P)
Pasi Tainio	Finnish Environment Agency (SYKE)	06.09.2011 (P)
Lauri Lahtinen	Keuruun OP-Kiinteistokeskus OY LKV	08.09.2011 (T)
Johanna Kirkinen	Finnish Innovation Fund SITRA	09.09.2011 (P)
Eva Heiskanen	National Consumer Research Council	12.09.2011 (P)
Consultant	Energy consultancy	12.09.2011 (P)
Mirja Aho	Asunto Oy Keuruun Ylä-Kivelä	14.09.2011 (P)
Ylä-Kivelä resident 2	Asunto Oy Keuruun Ylä-Kivelä	14.09.2011 (P)
Ylä-Kivelä resident 1	Asunto Oy Keuruun Ylä-Kivelä	15.09.2011 (P)
Ylä-Kivelä resident 3	Asunto Oy Keuruun Ylä-Kivelä	15.09.2011 (P)
Jussi Jantola	Valkeakoski Vocational College	19.09.2011 (P)
Hannu Mäkelä	Kaakonoja Area Residents' Association	19.09.2011 (P)
Tuomo Knuuttila	Kaakonoja Area Residents' Association	20.09.2011 (P)
Johanna Veijonen	Valkeakoski Vocational College	21.09.2011 (P)
Olli Laitinen	Finnish Energy Efficiency Agency MOTIVA	23.09.2011 (P)
Eliisa Vesisenaho	Pirkan Helmi	12.06.2012 (P)
Hannu Mäkelä	Kaakonoja Area Residents' Association	13.06.2012 (P)
Kirsti Mäkinen	Kaakonoja Area Residents' Association	13.06.2012 (P)
Seppo Sairanen	Kaakonoja Area Residents' Association	13.06.2012 (P)
Lauri Lahtinen	Keuruun OP-Kiinteistokeskus OY LKV	14.06.2012 (P)
Eero Katainen	VAPO	14.06.2012 (P)

<u>Interviews conducted in the UK</u>

(P) = Personal interview, (T) = Telephone interview, (CISE) = Interview by the CISE team

Name	***Organisation***	***Date***
Intermediary	Anonymous	10.02.2011 (CISE)
Intermediary	Community Renewable Energy	17.02.2011 (CISE)
Intermediary	Marches Energy Agency	04.03.2011 (CISE)
Intermediary	South East England Development Agency	10.03.2011 (CISE)
Intermediary	Energy Saving Trust	30.03.2011 (CISE)
Intermediary	Global Action Plan	31.03.2011 (CISE)
Intermediary	Low Carbon Communities Network	19.04.2011 (CISE)
Intermediary	Centre for Sustainable Energy	27.04.2011 (CISE)
Intermediary	Sustrans	02.05.2011 (CISE)
Utility	Good Energy	07.06.2011 (CISE)
Rob Dewing	Lyndhurst Community Centre	27.04.2012 (P)
Claire Gingell	New Forest National Park Authority	30.04.2012 (P)
John Charlesworth	Lyndhurst Community Centre	30.04.2012 (P)
Hugo Schonbeck	Hyde Farm Climate Action Network	28.10.2012 (T)
Susan Sheehan	Hyde Farm Climate Action Network	05.10.2012 (T)
Resident	Hyde Farm Climate Action Network	08.10.2012 (T)

Appendix D: Participant Information Sheet

University of Sussex

November 2012

PARTICIPANT INFORMATION SHEET
Community Energy Innovation in Finland and the UK

Invitation to take part in a research project

You are being invited to take part in the "*Innovation of Community Energy in Finland and the UK"* study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

Purpose of research

This PhD research is undertaken by Mari Martiskainen at SPRU, University of Sussex, Brighton, UK between October 2010 and September 2013. The research is funded by the UK's Engineering and Physical Sciences Research Council (EPSRC) and is part of a SPRU/University of East Anglia project "*Community Innovation for Sustainable Energy"* (CISE) (funded by EdF Energy and EPSRC). This PhD research identifies key support mechanisms or barriers for community energy development in Finland and the UK. Furthermore, the research aims to discover possible similarities or differences between the two countries. The research also analyses how community energy projects fit the countries' national energy policy. The research discusses the following key topic areas:

- How is 'community' energy defined in Finland and the UK and by whom?
- How and why are community energy projects developed in Finland and the UK; what makes them successful/unsuccessful (e.g. role of finance, legal issues, planning, and technical skills)?
- How do community energy projects replicate and link to national energy policy?

Why have I been asked to participate?

This study uses qualitative research methods and one of the data collection methods is the use of semi-structured interviews. These interviews will be conducted with community energy practitioners, civil society organisations, energy/environmental agencies and government officials. Approximately a total of 40 interviews are anticipated during the research. The interviews data will be used to help form an analysis of community energy development in Finland and the UK.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason.

What will happen if I do take part?

The interview will be semi-structured whereby the researcher will be asking you questions around certain topics, rather than using a pre-defined questionnaire. The interview will last approximately 1-1.5 hours and will be recorded on your consent. There will be no costs associated with the interview other than time.

What are possible benefits of taking part?

Taking part in this interview will give you an opportunity to provide your views on community energy development and what are the key issues relating to this field. Your participation provides a valuable source of information and evidence about how community energy projects are developed in Finland/UK. The interview data will be used to analyse community energy development and further understand this topic.

Will the interview be confidential?

Yes. All information collected during the interview will be kept strictly confidential. Interviewees are given the option to stay anonymous if they so wish. Interviewees will only be identified using unique codes and all transcribed interview materials will be stored in a password protected computer. Interview data will not be used for any other purpose than this PhD research and related academic publications. The interview will not collect sensitive personal information (e.g. income, ethnicity, political views, sexual orientation or religious beliefs).

What should I do if I want to take part?

By signing the Consent Form you agree to take part in the interview.

What will happen to the results of the research study?

The interview data will be used to analyse and compare community energy development in Finland and the UK. The data will be used in the final thesis of the PhD in aiding the analysis and comparison of the two countries, especially relating to: community energy development, key stages, key funding sources, barriers and support for development. It is expected that some of the PhD results will also be published in academic journals such as Energy Policy and Environment & Planning. A copy of published results will be available to interviewees.

Funding for the research

This PhD research is funded by the UK's Engineering and Physical Sciences Research Council (EPSRC) and is part of a SPRU/University of East Anglia project "*Community Innovation for Sustainable Energy"* (CISE) (funded by EdF Energy and EPSRC).

Who has reviewed the study?

The research has been approved by Dr Elaine Sharland, Cluster-based Research Ethics Committee (C-REC) ethical review process (28 July 2011).

Contact and further information

If you have any questions relating to this PhD research, or the way it has been conducted, please contact:

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Telephone: UK +44 7734 703459/Finland +358 46 8482630
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Professor Gordon MacKerron (Supervisor)
SPRU (Science and Technology Policy Research)
Freeman Centre, University of Sussex
Falmer, Brighton, BN1 9QE, UK
Telephone: +44 1273 876584 or +44 1273 678166
Email: G.S.Mackerron@sussex.ac.uk

Further information

"Community Innovation for Sustainable Energy" project

http://www.grassrootsinnovations.org/Grassroots_Innovations/CISE/CISE_home.html

SPRU based at University of Sussex

http://www.sussex.ac.uk/spru/

Engineering and Physical Sciences Research Council

http://www.epsrc.ac.uk/

Thank you for taking the time to read this Information Sheet.

Appendix E: Interview Topic Guide – Community energy practitioner (UK)

Interview Topic Guide – Community energy practitioner (UK)

The Innovation of Community Energy in Finland and the UK

Introduction
Hello and thank you for agreeing to participate in this research project. I will be using a semi-structured interview format, which means that I have prepared some general questions around certain themes.

- **Ask to read information sheet and sign consent form**
- **Explain confidentiality and how results are used**
- **Does the interviewee want to stay anonymous**

Explain some background to the project:
This doctoral research focuses on the innovation of community energy projects in Finland and the United Kingdom. It uses a comparative case study analysis and answers the question *how do community energy innovations develop in Finland and the UK*? Research findings are expected to highlight possible similarities or differences between the two countries, how community energy projects are developed and how they link to national energy systems. This DPhil research is funded by the Engineering and Physical Sciences Research Council (EPSRC) and is part of a SPRU/UEA *Community Innovation for Sustainable Energy* (CISE) project (funded by EdF Energy and EPSRC).

Who I am interviewing
Community energy practitioners are people who have been involved in a community energy project development. They are the people who are actually doing community energy projects either by installing them by themselves or with other people, or owning shares in such schemes.

Interview:
I would like to find out more about your experience about community energy development in the UK and what it has been like. Could you tell me more about:

1) **Personal background**
    a. Your role in the community energy project?
    b. How did you get involved?
    c. How actively have you been involved in the project?

2) **Definition of community energy**
    a. How would you define community energy?

3) **Your community energy project**
    a. When did your project start?

b. How was the project started?
c. What motivated the project?
d. How long did it take to get the project started?
e. Was there a key person/group starting it?

f. Did you have previous expertise about developing a community energy project?
g. Where did you find information about community energy/renewables/energy saving?
h. Who have been your main contacts during your community energy project development?
i. Have you learnt from others? Vice versa?
j. How was the project funded?
k. Was funding crucial? Was it easy/difficult to obtain?

l. Where there specific key stages in the project?
m. Was there anything difficult about developing the project?
n. Was there something easy?
o. Did you have any issues with technology for instance?
p. What about planning, did you need a planning permission?

q. Has your community developed other projects together before?
r. Do you know if your project has influenced other projects?
s. What are their main objectives and activities?

4) Other community energy projects

a. Are you aware of other community energy projects in the UK?
b. Are you aware of community energy projects talking to each other?
c. Have they for instance shared information and experience, i.e. learned from each other?

5) Networking with others

a. Are you aware of community energy networks in the UK?
b. Are you part of such networks?
c. If not, are you aware of any networks or projects?
d. Would you know what their main activities and motives are?

6) Views on innovation and community energy

a. Would you see community energy as innovative?
b. If so, what in particular is innovative about it?
c. Can you think of something that has been particularly innovative about your community energy project?

7) The role of community energy in UK energy policy

a. Do you follow UK's energy policy?
b. Could you tell me about energy policy developments that have been particularly relevant to your project?
c. Are there for instance any particular support mechanisms?
d. What about barriers?

e. What in your opinion is the potential of community energy in the UK?
f. Can you think of some good models for community energy?
g. Some others that perhaps do not work so well?
h. Any barriers/problems?
i. How could community energy be better supported? Does it need support?

8) Any other questions

a. Other community energy projects or contacts I should be aware of?
b. Anything else to add?

9) Thank you!

Appendix F: Images of community energy projects

Picture 1: Draught proofing at Hyde Farm (*picture by Susan Sheehan*)

Picture 2: Lyndhurst Community Centre (*picture by Mari Martiskainen*)

Picture 3: Tuomo Knuuttila (left) and Hannu Mäkelä (right) outside Mäkelä's house in Kaakonoja (*picure by Mari Martiskainen*)

Picture 4: Ylä-Kivelä block of flats with pellet storage on the left and solar thermal collectors on the top of the building (*picture by Lauri Lahtinen*)