FROM MARGINAL TO MAINSTREAM
Challenges of Citizen-Led Renewable Energy Initiatives in Finland

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Anu Aukeala
Corporate Environmental Management
Tiina Onkila, Ph.D.

JYVÄSKYLÄN YLIOPISTO

ABSTRACT

Author
Anu Johanna Aukeala

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Abstract

In Finland, the role of citizen-led renewables has been largely neglected in academic research and as a result, the phenomenon has not been well studied. The lack of academic studies and the low interest towards citizen-led renewables in Finland show that there is a clear research gap and demand for further research. In this study, the identified research gaps were addressed. The focus was to identify what the current barriers hindering citizen-led renewable energy initiatives to scale up in Finland as well as what the enabling factors that can trigger the growth of these projects were. This study was conducted as part of a research project conducted in collaboration with the non-governmental organization Friends of the Earth Finland and Jyväskylä University School of Business and Economics.

Citizen-led renewable energy initiatives were studied using a theoretical framework on Strategic Niche Management (SNM), which focuses to solve how sustainable environmental niche innovations can grow into viable market niches. The data was collected through ten semi-structured interviews. All interviewees were Finnish renewable energy experts. This study used SNM and the abductive thematic analysis method to analyze the collected data and to give a better overview to the phenomenon under study so that pointers how to promote citizen-led renewables could be given.

The findings of this master's thesis highlighted that there are several obstacles hindering the deployment of citizen-led renewable energy initiatives in Finland. The main obstacles were the current electricity transfer fee and difficult permit procedures. Particularly, it seemed that small-scale energy production has not been recognized as a viable alternative in energy production. This results in the fragmentation of citizen-led projects because of the lack of supporting policy measures. Additionally, the results revealed that citizen-led renewable energy initiatives would benefit from clear objectives and targets set up by the Finnish government, legislative support and simple permit procedures. To further accelerate the deployment of citizen-projects additional funding and pilot projects would also be useful. Furthermore, individual actors and projects need practical information, peer support and help from experts to be able to carry out projects.

Keywords
Renewable energy, citizen-led energy, strategic niche management, energy policy

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CONTENTS

1 INTRODUCTION

In Finland and globally, energy sector is the biggest emitter of anthropogenic greenhouse gas emissions (Intergovernmental Panel for Climate Change (IPCC), 2014; Official Statistic of Finland, 2017). The changes in atmospheric greenhouse gas concentrations are causing the global average temperatures to rise, which is considered to cause for example rising of the sea level and extreme weather phenomena (IPCC, 2014). In order to prevent or mitigate climate change greenhouse gas emissions ought to be cut down. Currently, the European Union has agreed to reduce greenhouse gas emissions to 40 per cent below the level of 1990 by the year 2030 and 80 per cent by the year 2050 (European Commission, 2017). Thus, reforming the energy sector is essential if the global warming is to be limited to well below 2 degrees Celsius above pre-industrials levels, a target set up in the Paris Agreement in December 2015 (Paris Agreement, 2015, art. 2).

Improving energy efficiency and increasing the amount of renewables in the global energy mix are essential to reach the objectives of the Paris Agreement. Currently, most of the world's primary energy and electricity come from fossil fuels (IEA, 2016a). However, fossil fuels should be phased out entirely by 2100 or otherwise in a business-as-usual scenario, temperatures might increase almost 5 degrees Celsius above pre-industrial levels, according to the IPCC (2014) report. Therefore, both IPCC (2014) and International Energy Agency (IEA) (2016a) urge governments to make structural changes and give direct support to renewable energy (RE) technologies to promote the policy shift to renewables because decarbonising our energy generation will represent a critical component of mitigating the worst effects of climate change.

In Finland, Government report on the National Energy and Climate Strategy for 2030 published by the Ministry of Economic Affairs and Employment has stated that the objective is to increase the share of renewables in the end consumption to around 50 per cent and similarly, increase self-sufficiency in energy (Huttunen, 2017). However, a report published by Sitra argues that current measures taken by the Finnish government are inadequate for meeting the Paris climate pledge and more actions to support the use of renewables and additional investments in energy efficiency are required (Rocha, Sferra, Schaeffer, Roming, Ancygier, Parra, Cantzler, Coimbra & Hare, 2016).

With concern over climate change and sustainable development, one solution to increase the share of renewable energy in electricity and heat sector could be the promotion of citizen-led renewables that encourage citizens and communities to set up new sustainable and renewable energy sources. In fact, local small-scale energy production can also help to achieve the target of greater energy self-sufficiency (Alanne & Saari, 2006). Whereas in centralized energy production often has a high import need for raw materials such as uranium and fossil fuels, can decentralized energy generation reduce the dependence on import because small-scale energy production utilizes local energy sources such as wind and solar power.

In recent years, citizen-led renewables have started to gain more attention in scientific literature because of prominent results have been achieved par-

ticularly in Germany (Anaya & Pollitt, 2015; Hoppe et al. 2015) and in the UK (Allen, Sheate & Diaz-Chavez, 2012; Martiskainen, 2013; 2014). In Finland, the interest towards citizen-led renewables has been lower. Prior research has focused mainly on small-scale distributed energy generation in general (Lund, 2007; Peura & Hyttinen, 2011; Ruggiero, Varho & Rikkonen, 2015) and merely a few comparative case studies on the required preconditions for citizen-led renewables have been made (Martiskainen, 2013; 2014; Ratinen & Lund, 2014). Because of the limited research, it remains unclear why the overall Finnish capacity of citizen-led renewables remains low and which policy measures promote the diffusion of citizen-led renewable energy initiatives. In this study, these identified research gaps are addressed.

In this thesis, renewable energy projects that are carried out by individual citizens and communities are approached through the concept of 'citizen-led renewable energy initiatives'. The concept refers to locally-based non-commercial renewable energy projects led by one or more citizens. Citizen-led renewable energy initiatives are studied using a theoretical framework on Strategic Niche Management (SNM). In this thesis, the focus is not on a certain renewable technology because the aim is to explore the phenomenon from a broader perspective. The data is collected through semi-structured interviews. From the collected data, the most important barriers and drivers are identified using abductive thematic analysis to give a better overview of the phenomenon. The results will provide an insight into the nature of the current obstacles and drivers so that pointers how to promote citizen-led renewables can be given.

1.1 Rationale for Studying the Topic

In the light of climate change and the current transition to sustainable energy systems, distributed renewables are believed to hold many advantages. Firstly, an increase in sustainable[1] renewable energy sources reduce concerns about climate change because they reduce the dependence on fossil fuels. The transition from fossil fuel based energy to low carbon energy solutions can help to achieve However, in addition to the ecological benefits there are also several other advantages when recognizing the importance of placing local communities and citizens at the centre of sustainable energy generation. Academic studies have demonstrated that many benefits are associated with locality. Thus, in this study, the concept of citizen-led renewable energy initiatives includes the idea of locality. According to Li, Birmele, Schaich and Konold (2013) and Phimister and Roberts (2012), promoting the use of local renewable energy sources can offer new business opportunities for local businesses and hence, help to improve the socio-economic situation of local communities. Local distributed re-

[1] In this study, the term 'sustainability' is defined as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 41).

newables can also strengthen grassroots democracy through more inclusive decision-making processes (Walker, Hunter, Devine-Wright, Evans & Fay, 2007). the targets set up in the Paris Agreement.

This paper also highlights the importance of involving citizens and communities at grassroots level in energy production since individuals who actively engage with energy issues are likely to make more sustainable choices (Goulden, Bedwell, Rennick-Egglestone, Rodden, & Spence, 2014). Hence, the mobilization of citizens is crucial in order to increase energy efficiency. Additionally, it increases the readiness of citizens and communities to participate in demand side management. In Finland, the role of citizen-led renewables is largely neglected in academic research and as a result, the phenomenon has not been well studied. Overall in Finland, citizen-led renewable energy production is in its infancy, which might explain the lack of research concerning the phenomenon. The lack of academic studies and the low interest towards citizen-led renewables in Finland show that there is a clear research gap and demand for further research. There is a clear need for a study to analyse why the overall Finnish capacity of citizen-led renewables remains low and to promote the diffusion of citizen-led renewable energy initiatives. Hopefully, this paper will give a better understanding what would be the optimal energy political framework to promote citizen-led renewables in Finland.

1.2 Research Problem

This master's thesis is a part of a research project conducted in collaboration with the non-governmental organization Friends of the Earth Finland and Jyväskylä University School of Business and Economics. The aim of the research project is to identify barriers that prevent the diffusion of community renewables in Finland and possible ways to overcome them. Although the research project focuses solely to identify drivers and barriers related to community-led renewable energy production in Finland, this master's thesis studies the phenomenon from a broader perspective because of the lack of data on community renewables. In fact, this will ensure a better understanding of community renewables because this study is able to obtain more precise information on the differences between citizen-led and community-led renewables.

The main aim of this master's thesis is to gain understanding how citizen-led renewables can become part of mainstream energy policy in Finland because lack of prior studies on the topic. By becoming a part of mainstream energy policy, citizen-led and community-led renewables can help to meet the climate commitments set up at the UN Paris Climate Conference and ease the energy transition towards renewables, which is needed to stop global warming. Therefore, this master thesis serves a bigger social purpose and attempts to fill an existing gap in the Finnish energy research field alike.

The focus of this master's thesis is to identify what are the current barriers hindering citizen-led renewable energy initiatives to scale up in Finland as well as what are the enabling factors that can trigger the growth of these pro-

jects. Finding an answer to these questions will help to find a way to build a productive and safe environment for citizen-led renewables to achieve their full potential. Barriers and enabling factors are identified by conducting interviews on ten Finnish renewable energy experts in different institutions.

1.3 Research Task

The main research problem in this master's thesis is to study how the state by means of policy intervention can trigger the growth of technological niches; hence the emphasis is on regulatory structures. Therefore, the biggest obstacles and enabling factors to promote citizen-led renewable energy projects are identified. The research problem that this master's thesis tries to resolve can be formulated with the following question and sub questions:

I. What kind of policy framework would enable citizen led renewable energy projects to scale up in the Finnish context?

    a. What factors hinder these projects to scale up?
    b. Which factors enable these kinds of projects?

1.4 Thesis Outline

This master's thesis consists of six chapters and the paper is organized as follows. First, the chosen topic of this study is introduced in Chapter 1 and some background information about climate change, energy and distributed energy production is given. In Chapter 2, the theoretical framework chosen for this study is introduced focusing on Strategic Niche Management, the role of protected niches and multilevel perspective. In the same chapter, an overview of previous academic literature on citizen-led renewable energy initiatives is also provided. Chapter 3 describes the methodological choices and discusses the method, data collection and analysis used in this thesis. The results are presented in Chapter 4. After that, in Chapter 5, the key findings of this study are discussed in light of the chosen theoretical framework and previous academic literature. Chapter 5 also presents the research limitations and contributions as well as suggestions for future research. Finally, this paper is concluded in Chapter 6.

2 STRATEGIC NICHE MANAGEMENT

Due to the worsening state of the environment it is important to analyse why renewable energy production technology remains such a niche market in Finland in spite of its promising environmental and social potential to offer a sustainable solution for energy production. Theoretically, this thesis departs from strategic niche management (SNM), which offers a particularly suitable theoretical framework for such analysis since it aims to solve how sustainable environmental innovations can grow into viable market niches so that they are able to manage on their own without a constant need for regulatory support and compete on the markets against established technologies (Caniëls & Romijn, 2008; Kemp, Schot & Hoogma, 1998; Schot & Geels, 2008). It is, for that reason, the most appropriate in theories on socio-technical transitions.

2.1 Transition to Citizen-Led Renewable Energy

2.1.1 Defining Citizen-Led Renewable Energy Initiatives

Development of renewable energy is becoming ever more important, as countries around the world want to become independent of fossil fuels and to switch to cleaner energy sources. Small-scale distributed energy generation is a considerable option in this transition, as has been stated in several publications (e.g. Heiskanen, Johnson, Robinson, Vadovics & Saastamoinen, 2010; Hoppe, Graf, Warbroek, Lammers & Lepping, 2015; Ratinen & Lund, 2015; Smith, 2012; Walker & Devine-Wright, 2008; Walker, 2008). For that reason, it is important to study citizen-led renewable energy initiatives and how they can help in the transition towards more sustainable energy production. This thesis adheres to the definition of grassroots initiatives by Middlemiss and Parrish (2010), accompanied with the definition of community renewables by Walker and Devine-Wright (2008) and defines *citizen-led renewable energy initiatives* as locally-based non-commercial projects led by one or more people usually with limited resources. They are bottom-up initiatives that operate on civil society arenas and rely on individuals or communities who are willing to give their time and efforts to carry out these projects. Renewable energy, in turn, is defined as "any form of energy from solar, geophysical or biological sources that is replenished by natural processes at a rate that equals or exceeds its rate of use" (IPCC, 2012, p. 178).

The definition of individual is rather simple in comparison with the concept of community-led renewables, which in this study, is included under the term citizen-led renewable energy initiatives. In this thesis, a rather broad interpretation of community renewables is adapted because in Finland the number of community renewable initiatives is rather small and therefore, too nar-

row of a definition might be too limiting and not give a thorough understanding of community renewables in the Finnish context.

According to Walker and Devine-Wright (2008), community renewables differ from other renewable energy initiatives through their processes and outcomes. The *process* dimension illustrates who is an active member involved in the project, and the *outcome* dimension considers the passive members who benefit the social and financial results of the project. An ideal community renewable project is both open and participatory and local and collective; It is run by local people and it benefits them in social or financial terms. However, as Walker and Devine-Wright (2008) state, combining these two dimension different combinations of community renewables emerge and they are all acceptable; they include a large variety of different renewable energy initiatives with the different means of ownership, participation, commitment and leadership. As an example of various types of projects are charitable organizations, cooperatives and owning shares in a local renewable energy project (Walker & Devine-Wright, 2008; Walker, 2008). At the other end of the spectrum there is, for instance, a conventional utility wind farm which is distant, private, closed and institutional and does not constitute a community renewable project (Walker & Devine-Wright, 2008).

Citizen-led renewable energy initiatives, as understood within the remits of this thesis, are thus usually developed and managed by communities and individual citizens at grassroots level instead of commercial utilities. As the community renewables phenomenon in Finland is in its infancy and there are merely few case examples, studying strictly community renewables would be somewhat impossible although originally, that was the plan. For that reason, the scope of this thesis is broader since it focuses on individuals and communities alike.

2.1.2 Resent Research on Small-Scale Energy Production

On a global scale, citizen-led renewable energy initiatives and community renewables have been the subject of intense research in recent years. Academic literature on small-scale energy initiatives mainly emerges from two themes: external and internal factors affecting the outcome. Studies focusing on external factors try to determine how to promote the growth of bottom-up energy initiatives by studying stakeholder influence (Ruggiero, Onkila & Kuittinen, 2014), intermediary organizations (Hargreaves, Hielscher, Seyfang & Smith, 2013), institutional preconditions (Ratinen & Lund, 2015; Wirth, 2014), barriers (Ruggiero et al., 2015; Walker, 2008) and support mechanisms (Anaya & Pollitt, 2015; Cherrington, Goodship, Longfield & Kirwan, 2013). Another stem of academic literature focuses on internal processes in small-scale distributed energy development. Studies have tried to understand the motives and driving factors behind small-scale energy initiatives (Izutsu, Takano, Furuya & Iida, 2012; Walker et al., 2007), the role of early-adopters (Nygren, Kontio, Lyytimäki, Varho & Tapio, 2015) and communities as a context for individual behavioural change (Heiskanen et al., 2010). Mainly the studies have stemmed from sustainability transition literature, such as SNM, and tried to understand the role of individu-

als in transition to low-carbon energy production as well as the institutional and social settings in which consumption practices are formed (e.g. Kellett, 2007; Martiskainen, 2014; Moloney, Horne & Fien, 2010; Verhees, Raven, Veraart, Smith & Kern, 2013).

In Finland, research on citizen-led renewable energy initiatives has not received much attention, but few studies have been made in recent years. Prior academic literature has focused on the challenges faced by small-scale distributes energy production (Ruggiero et al., 2015) and the overall role of renewable energy and energy efficiency in Finland (Lund, 2007; Peura & Hyttinen, 2011). Additionally, a few comparative case studies have been made between Finland and some of the leading countries in distributed energy production such as Germany (Ratinen & Lund, 2014) and the UK (Martiskainen, 2013; 2014). A rather recent study by Ruggiero et al. (2015) also analysed small-scale distributed energy production in Finland and according to the study institutional change, removal of barriers and introduction of incentives are needed to ease the transition to small-scale energy production. Particularly, they highlight the need for simple permit procedures, flexible grid connections, subsidies, and taxation combined with institutional change and the active involvement of key actors.

These findings are supported by Martiskainen (2013; 2014) who compared the development of community renewables in Finland and in the UK, and found that small-scale energy production is more widely distributed in the UK because the political system is more supportive towards citizen-led initiatives in the UK than in Finland. According to her study, one reason for this is the lack of support provided by intermediary organizations in Finland. In the development phase, intermediary organizations can promote the diffusion of energy initiatives by providing technical advice and guidance on funding as well as best practices and for that reason, they have an important role in terms of knowledge transfer (Ruggiero et al., 2014). As for knowledge transfer, it is identified as one of the key processes in SNM (Kemp et al. 1998). The findings by Martiskainen (2013; 2014) and Ruggiero et al. (2015) suggest that there are institutional barriers that need to be removed in order to facilitate the growth of citizen-led renewable energy initiatives in Finland.

These results are in agreement with findings by Ratinen and Lund (2014) which showed that individuals are not included in the energy policy processes in Finland. According to the study, this results in limited niche development and small number of small-scale energy initiatives. Results are not surprising because many recent studies have argued that governmental policies can either hinder or further the growth of citizen-led energy production (Kivimaa & Mickwitz, 2011; Martiskainen, 2013; 2014; Mickwitz, Hyvättinen & Kivimaa, 2008; Ratinen & Lund, 2014; Ruggiero et al., 2015). Hence, the research task presented in this master's thesis is particularly relevant as it addresses the current institutional hindrances and barriers in Finnish small-scale energy deployment to facilitate the growth of citizen-led distributed energy production in Finland.

2.1.3 Distributed Energy Is Gaining Popularity

Although in Finland the deployment of citizen-led renewable energy initiatives has been slow and the phenomenon is only starting to take root in the Finnish society, in many countries in Europe and elsewhere the phase has been significantly faster. The most prominent results have been achieved in Denmark (Anaya & Pollitt, 2015; Ratinen & Lund, 2014), Germany (Anaya & Pollitt, 2015; Hoppe et al. 2015), Scotland (Bomberg & McEwen 2012) and in the UK (Allen et al., 2012; Martiskainen, 2013; 2014), where small-scale renewable energy production has gained popularity. Particularly in Germany and in the UK citizen-led energy initiatives are emerging fast. Although every country has chosen different paths, studies reveal that similarities exist.

In an empirical case study by Ratinen and Lund (2015), policy inclusiveness has been found to enhance a successful diffusion of citizen-led renewable energy initiatives. If citizens have the possibility to take part in the democratic process and their voices are heard, transparency and democracy increases. In contrast, the more closed the democratic process, the fewer actors are involved in the process and less different alternatives are considered. Although inclusion in the processes does not automatically mean inclusion in the outcomes, Ratinen and Lund (2015) found that inclusiveness is likely have a positive influence in the niche development at grassroots level. They used Denmark and Germany as illustrative examples and concluded that both countries have relatively inclusive policy processes and energy policy alternatives are contested publicly. This has resulted in the deployment of distributed energy both in Denmark and in Germany.

In addition, data from several studies suggest that government support given to the expansion of renewable energy generation at early stage results in a higher rate of distributed energy (Anaya & Pollitt, 2015; Bomberg & McEwen, 2012; Li et al., 2013; Martiskainen, 2013; Ratinen & Lund, 2015). Citizen-led renewable energy initiatives seem to benefit from help from intermediary organizations (Martiskainen, 2013; Ruggiero et al., 2014), different subsidies such as feed-in tariffs (Cherrington et al., 2013; Hoppe et al., 2015), regulation that is in favour of consumer-owned distributed generation (Carley, 2009) and the development of smart grids (Anaya et al., 2015).

It is important to study and understand the role of citizens in energy production because Goulden et al. (2014) argue that citizens who actively engage with energy are likely to make more sustainable choices and it increases their readiness to participate in demand side management. In the future, to better align energy generation and demand is one of the most essential issues in climate change mitigation and shift toward renewables. The findings by Goulden et al. (2014) indicate that citizen-led energy production is one way to achieve sustainable energy production since active involvement in energy issues can bring about behavioural changes in individuals as they become active "managers" (p. 28) of energy instead being merely "managed" (p. 28). The lower the level of engagement, the less thought is given to energy. For smart grids to reach their full potential, active and educated citizens are needed, state Goulden et al. (2014).

Citizen-led renewable energy initiatives are believed to hold other advantages as well, both locally and globally. Data from several studies suggest that bottom up energy initiatives can increase social acceptance of local renewable energy projects (Hoppe et al., 2015; Walker, 2008), reduce CO_2 emissions (Li et al., 2013), increase energy self-sufficiency particularly in rural areas (Peura & Hyttinen, 2011), offer new business opportunities for communities (Li et al., 2013) as well as provide monetary savings (Walker, 2008). It is rather surprising that although various positive effects of citizen-led renewable energy initiatives are presented in several publications distributed energy is still in its infancy in Finland; despite Peura and Hyttinen (2011) argue that particularly in bioenergy, the economics of small-scale distributed energy are already feasible in Finland.

2.2 Role of Socio-Technical Regimes and Landscape

In strategic niche management, the focus is on niches and how they can be supported. Since innovations are assumed to emerge from niches it is important to understand the internal and external factors impacting the development of niches and how they can be protected. One of the core assumptions in SNM is that there is a versatile range of obstacles that work against the diffusion of more sustainable technologies, since new innovations always have to compete against established regimes (Hoogma et al., 2002; Kemp et al., 1998; Schot & Geels, 2008). The more radical the innovation is, the more resistance it confronts from the outside world (Ratinen & Lund, 2015). Kemp et al. (1998) define how typically the most important barriers for the diffusion of innovations are technological and economic factors, existing regulatory framework and infrastructure, production factors as well as existing social habits that pose both cultural and psychological barriers. These barriers are always interrelated and therefore, tackling one barrier alone might not be enough to advance the innovation process. Innovations are not able to get a clean start because of established socio-technical regimes.

Socio-technical regimes play a pivotal role when studying the diffusion of innovations since they act as gatekeepers that eventually determine which innovations succeed (Kemp et al., 1998). In SNM theory, the term *socio-technical regime* (meso level) refers to a dynamic system with networks of actors that interact and are dependent on one another and act within a framework that consists of social and technical norms and regulations (Geels, 2005; Hoogma et al., 2002; Kemp et al., 1998; Markard, Raven & Truffer, 2012). The socio-technical regime is a combination of existing consumption patterns, cultural values, beliefs and social rules embedded in technical practices. In other words, the socio-technical regime can be seen to consist of the cognitive routines and processes of different actors in the regime. The society consists of several socio-technical regimes, which are interrelated and manifest in different ways (Geels 2005; Markard et al., 2012). Therefore, citizen-led renewable energy initiatives are affected by different socio-technical regimes such as electricity and heat regimes. In a way, socio-technical regimes are like the 'deep structure' of a sentence,

which is the abstract form that determines the meaning of a sentence, states Geels (2004). Similarly, socio-technical regimes construct the society.

Geels (2002; 2005) broadens the concept of socio-technical regimes in his study and writes that socio-technical regimes are always linked to a bigger global framework as well, because regimes are affected by global trends such as oil prices or environmental disasters like the Fukushima nuclear accident. Changes at macro level take time and are slow, but they can put pressure on regimes. One example of this is the ratification of the Paris Agreement, which forces nations to reconsider their entire energy policy in order to be able to meet the COP21 targets. Geels (2002) calls this global dimension as socio-technical landscape (macro level) and explains how:

> *"[…] regimes are embedded within landscapes and niches within regimes. Novelties emerge in niches in the context of existing regimes and landscapes with its specific problems, rules and capabilities." (p. 1261)*

The interaction between different actors and layers as well as society's social and technical infrastructure creates society as we know it. Niches are developed within this framework as shown in Figure 1. For that reason, the success of a new technology is not only dependent on the activities within the niches but usually needs changes in the existing socio-technical regimes and landscape too (Geels, 2002). Geels et al. (2013) explain how bigger, macro level changes can force regimes to change their practices which can build opportunities for niches to scale up. Additionally, niches can create pressure towards regimes and disrupt their stability. However, Geels (2002) points out that the landscape level is often beyond the direct influence of niche actors and to some extent, regime actors too. Still, there is always at least an indirect influence that goes from niches to the landscape level because established niche policies may transform the landscapes level through regime changes. In Figure 1, this is represented with dotted arrows. The multilevel perspective shows that the interaction goes both ways and to break the status quo and to introduce socio-technical change towards sustainability, which is the main objectives of SNM theory, changes at all three level is preferable.

Against this background, SNM suggests that to overcome the existing barriers and govern a transition towards sustainability a safe haven where innovations can grow gradually by learning without being subject to the pressure of the prevailing regime is needed (Kemp et al., 1998). These safe havens are called protected niches and they are one of the key concepts of SNM (Schot & Geels, 2008; Markard et al., 2012). The lower the level, the unstable it is and for that reason, niches provide seeds for change. Niches act almost as an isolated proto market for innovations that collide with the existing regime (Schot & Geels, 2008). Particularly sustainable innovations that challenge the established socio-technical regime are often radical innovations that differ substantially from existing technology. For that reason, SNM emphasizes the need for protected spaces where these novelties can be tried out through trial and error (Smith, Kern, Raven & Verhees, 2014). In SNM, niches serve as a starting point for socio-technical change (Ratinen & Lund, 2015).

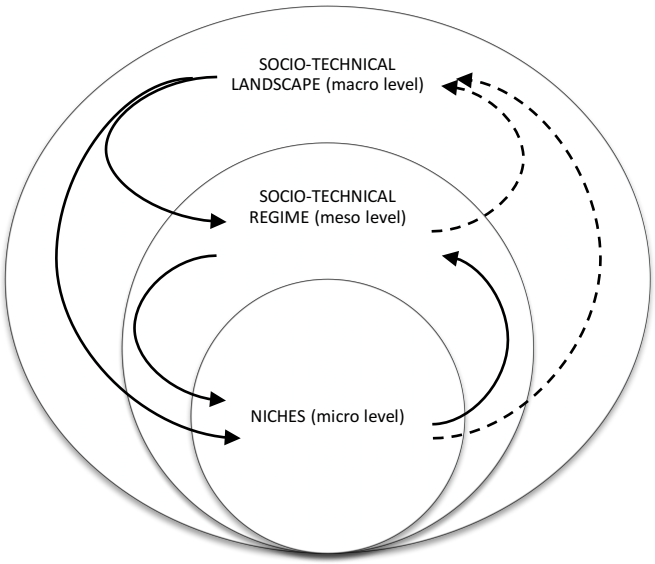


FIGURE 1. Multiple dimensions as a nested hierarchy and the relation between all three levels (based on Geels, 2002, p. 1261).

However, a successful niche formation does not necessarily result in regime transformation. One of the most difficult phases in the transition process is to build bridges between the existing regime and niches because the niches are relatively isolated (Schot & Geels, 2008). Although SNM does not guarantee the niches to scale up, it tries to find ways to ease this diffusion by analysing the interactions between niches and the existing socio-technical regime. One of the strengths of SNM approach is the fact that it highlights both the social and the technical perspective of the upscaling of innovations. SNM underlines that social structures affect the design of different technologies as well as how they are received in society because consumers are used to certain social patterns that guide their everyday life (Hoogma et al., 2002).

For that reason, SNM theory emphasizes the fact that it is important to realize that environmental innovations with proper technological know-how per se do not guarantee them to scale up because it often requires changes in the outside world as well (Kemp et al., 1998; Markard et al., 2012; Romijn, Raven R. & de Visser, 2010; Schot & Geels, 2008). Therefore, new technologies have to be presented in a socially embedded way (Hoogma et al., 2002). According to SNM, technological and social change are always interrelated (Schot & Geels, 2008). It is argued in SNM that the social aspect that constructs reality is often neglected; in reality, it is as vital as the technological aspect because it is one of the steering forces in our society (Hoogma et al., 2002; Scot & Geels, 2008). Furthermore, Ratinen and Lund (2015) continue, regimes are often reluctant towards change. Hence the change process is always slow and complex that involves multiple actors.

In historical perspective, the development of incumbent technologies has taken place over the years when sustainability was not such an important criterion as it is today (Smith et al., 2014). In Finland, this has resulted in a centralized energy production system that depends on fossil fuel (Ruostetsaari, 2010).

According to Romijn et al. (2010) the supremacy of the dominant regime is often somewhat difficult to break without a disruption that shakes the status quo. In the same way, Ruostetsaari (2010) remarks how regimes are often reluctant to change as the status quo serves the interest of the elite in power. Current climate crisis can be seen as such disruption since the mitigation process requires new technologies and forces to rethink the way businesses and societies operate. For that reason, the increasing instability caused by climate change can provide an opportunity for emerging technology to disrupt the status quo. According to Caniëls and Romijn (2008) regime instability caused by severe environmental degradation, such as climate change, can actually work in favour of niche formation and help them to succeed as they introduce new promising sustainable technologies. Study by Raven (2005) supports the hypothesis that instability at the regime level can help the diffusion process since it creates local opportunities for niches, increases interest towards niches and helps regimes to see niches as part of a solution to an existing problem.

2.3 Key Processes for Successful Niche Formation

In early SNM work the main research question has been what is needed for successful niche formation so that it can accelerate a change in the socio-technical regime (Kemp et al., 1998; Schot & Geels, 2008). Later, the importance of changes in the macro and meso level has been acknowledged and currently there seems to be a consensus among researches how the diffusion of a new technology happens as a result of interaction between niches, socio-technical regimes and the socio-technical landscape as discussed earlier (see Chapter 2.2). However, researchers have managed to distinguish certain internal processes that benefit a successful niche formation. According to Kemp et al. (1998) three key processes in niche formation are a clear articulation of vision and expectations, broad actor networks that consists of various different stakeholders as well as second-order learning that challenges existing norms. In line with Kemp et al. (1998), Schot and Geels (2008) continue how these processes are interconnected; underlying vision and expectations of an on-going project shape and guide the learning process and legitimize the experiment. Further, based on the articulated vision, actors decide whether or not to participate in the experiment. Broad networks, on the other hand, provoke second-order learning and for that reason, it would be important to attract multiple kinds of stakeholders. The linkage between key processes and a technological niche is shown in Figure 2.

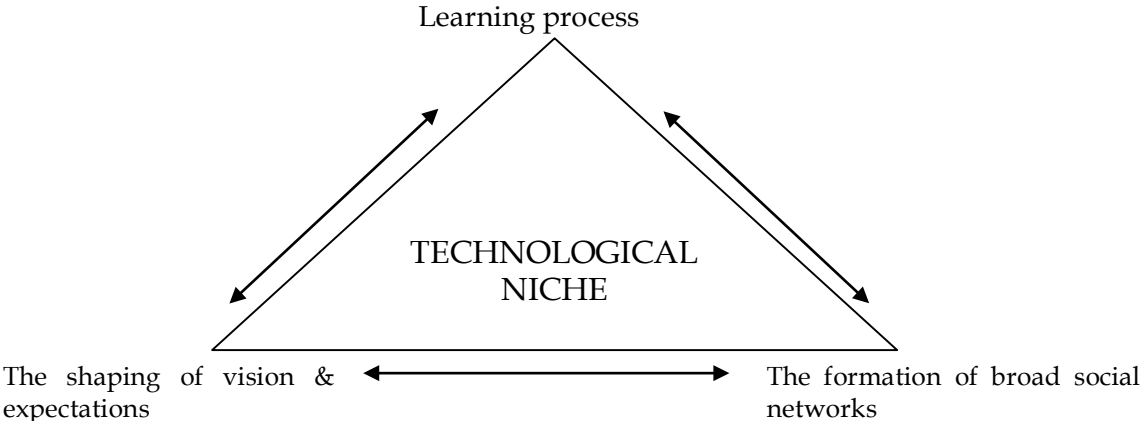


FIGURE 2. Dynamic interaction between key niche formation processes.

Vision is a key element in niche formation as it guides and lays ground on expectations (Kemp et al., 1998). Expectations are also seen to play an equally important role on successful niche formation since they steer learning processes and affect actions taken during the process (Schot & Geels, 2008). At first, expectations might be fragmented as different actors can have divergent motivations, expectations and vision (Raven, 2005). In the course of time, results shape actors' expectations and vision and should result in a much clearer vision of the potential of the new technology if expectations are substantiated (Kemp et al. 1998; Raven, 2005). In line with Kemp et al. (1998), Hoogma et al. (2002) specify if expectations become more robust, specific and are substantiated they usually result in successful niche development. With *robust*, they mean that variety number of actors share the same vision. This phase is crucial for the diffusion process because shared expectations gradually start forming a new homogenous design and standards, which will eventually replace the existing ones.

By contrast, Schot and Geels (2008) downplay the role of vision in their study and argue that visioning beforehand might not be as productive as far as successful niche development is concerned since there are numerous "fruitless scenario and visioning exercises" (p. 542). Still, their study makes no attempt to address this critic further on how to resolve the problem. Since SNM is very much based on creating new stabilized standards and rules that emerge from niches it could be argued that shared vision and expectations might in fact engage actors in cooperation and is therefore important. Dynamic interaction will result in a shared vision, which becomes more specific when experiments progress. This will ease the diffusion process.

So, the main argument in SNM is that niches provide a platform for different actors to interact and learn from one another as well, which has proven to increase the rate of upscaling of innovations (Romijn et al., 2010). A successful learning process that at the same time changes people's social habits, such as values and attitudes, and not merely focuses on improving the performance of a

certain technology, is key to the diffusion process (Caniëls & Romijn, 2008; Hoogma et al., 2002). Hoogma et al. (2002) distinguish a difference between first-order and second-order learning; the latter one results in a learning process that improves the social acceptance of the introduced technology. In the case of introducing new sustainable energy solutions, first-order learning would primarily be about enhancing the effectiveness of the new technology, not about how to achieve a more sustainable energy system and, for instance, how to get citizens actively to participate in energy demand management that requires behavioural changes through education. To achieve second-order learning an active involvement of various actors in the dynamic innovation process and interaction between users is required since it does not occur automatically (Raven 2005).

Ideally, niche networks should include various actors as broad networks facilitate second-order learning (Schot & Geels, 2008). Especially involving outsiders provoke second-order learning since their activities are not tied by the dominant regime, as Raven (2005) notes. The broader the network, the more radical innovations occur. Although involving outsiders is encouraged, SNM studies have shown how minimal involvement of actors representing the dominant regime seem to end in failed niche formation too (Schot & Geels, 2008). An explanation for this is that this will weaken the social acceptance of new technologies and result in lack of resources. As a conclusion from SNM literature could be drawn that it is important to include actors from the dominant regime but their role is mainly to provide resources. They should not try to guide the innovation process as it leads to incremental changes and hinder the innovation process.

In addition, Caniëls and Romijn (2008) and Kemp et al. (1998) discuss how the chosen technologies should provide an answer to an existing social problem like climate change at a reasonable cost and be open to development. Within a reasonable timeframe, the virtues of the new technology should greatly outweigh its faults. Introduced technologies cannot be too radical, and hence there must be a balance between characteristics that are familiar to the dominant regime and still serve a promise of socio-technical changes (Caniël & Romijn, 2008). In addition, users should be curious and willing to explore and build the potential of new technologies without having a too strict mindset (Caniëls & Romijn, 2008; Kemp et al., 1998). Without these elements trial and error -learning process aiming for social change, which is key to SNM, is not possible.

After choosing a technology eligible enough for support comes one of the most difficult phases in the innovation process which is finding a balance between protection and selection pressure (Kemp et al., 1998). The main goal is that innovations grow into viable market niches and are capable of holding on their own without a need for protection. Protection can be either public or private support like subsidies, tax support or other measures such as regulatory exemptions that aim at shielding niches from existing social and institutional barriers (Kemp et al., 1998; Raven 2005). This is crucial step in maturing innovations as technologies are not able to achieve their full potential without protection since they are rejected by the dominant regime (Coenen, Raven & Verbong,

2010). Overall, shielding policies which aim at creating a linkage between existing markets and innovations seem to be the most appropriate at the early stage of development. In practice, what the most suitable measures are should, however, be decided separately for each experiment (Caniëls & Romijn, 2008).

Although protection is seen as one of the most important phases in the diffusion process, not much guidance is given in SNM how much protection is needed and how to breakdown the protection. Too much protection generates, so to say, ´momma's boys´ that are dependent on constant protection, but at the same time too little protection hinders the growth of niches. Although study by Sushandoyo and Magnusson (2014) reminds that exposing technologies to markets and competition is as important as protection because it gives an opportunity to test innovations in practice. Unfortunately, not much study has been made in SNM on the ideal balance between protection and market exposure.

2.4 Citizen-Led Renewable Energy Initiatives as Niches

Central to SNM is the concept that promising technologies are introduced through local experimentation. Niches act as a playground for experimentation where "actors are prepared to work with specific functionalities, accept such teething problems as higher costs, and are willing to invest in improvements of new technology and the development of new markets" (Hoogma et al., 2002, p. 4) and in return, they gain benefits that the existing regime cannot provide. Definition of a niche fits well with the citizen-led decentralized renewable energy production in Finland as it is still in its infancy; there are several barriers that need to be overcome for the sustainable transition to take place (Nygren et al., 2015; Ruggiero et al., 2015). Still, small-scale energy producers in Finland are willing to overcome these barriers to achieve benefits such as sustainable energy production, self-sufficiency or economic gain (Nygren et al., 2015). Furthermore, distributed small-scale energy production does not fit well with the existing regime in Finland that is dominated by big market players and nuclear power (Ratinen & Lund, 2015). For that reason, currently in Finland, small-scale distributed energy projects are mostly undertaken by civil society actors such as communities and individual citizens rather than actors, who dominate current energy markets. In SNM, it is typical that niches often start to develop at the grassroots level, where they have the potential to challenge the existing regime (Raven, 2005). Although in SNM, the focus is usually only on one technological innovation at a time, like solar photovoltaic systems for example, Hoppe et al. (2015) argue that since in citizen-led renewable energy initiatives the goal is on sustainable development regardless of the chosen technology, it fits with the definition of a niche in SNM although the technological choices might vary. This thesis departs from that conclusion and does not focus on a specific renewable energy technology alone.

For the above-mentioned reasons, SNM is particularly relevant when studying the hindering factors for citizen-led renewable energy initiatives to scale up in the Finnish context because citizen-led projects fit well with the def-

inition of niches in SNM. Therefore, the use of SNM theory as a framework for analysis is reasonable because it can help to provide insight into the nature of these regulatory hindrances and suggestions how to overcome them so that small-scale energy production can become a part of the current existing energy political framework in Finland. Although, it should be noted that in SNM, the actors' own motivation factors and attitudes play a pivotal role in niche formation and learning process too (Caniëls & Romijn, 2008). Nonetheless governmental policies can enhance the niche formation at micro level, such as increase positive attitudes, and hence help the diffusion process (Raven, 2005). A study by Ratinen and Lund (2015) conclude also how policy measures which are inclusive towards niche actors seem to result in a successful niche formation. For that reason, the focus of this thesis is on regulatory policies since they have an obvious effect on micro level niche development processes.

Although SNM puts emphasis both internal and external factors in the diffusion process, more focus has been given to the management of individual niches rather than the following stages on how to enable new technologies to grow from a marginal niche to a viable mainstream option. That is currently one of the main challenges of SNM because it hardly acts as an operational tool although it is meant to assist the diffusion of innovations. SNM does not provide answers how to move forward on successful niche formation. In the SNM approach, perhaps too much emphasis has been put on the idea that local niches can start a diffusion process that transforms the current socio-technical regime if supported sufficiently. Later studies have realized the transition process towards sustainability requires changes in existing regimes as well because change is an outcome of interaction between niches, socio-technical regimes and landscape and does not happen merely on a single level (e.g. Raven, 2005; Schot & Geels, 2008; Smith & Raven, 2012). For that reason, it is important to study prevailing societal structures and practices. What is the role of the current socio-technical regime in sustainability transition processes and what is needed to break existing social structures and practices? Answering these questions can help to move forward in the transition process and to overcome the weaknesses of SNM approach.

In a way, the ongoing discussion regarding the energy transition process towards decentralized energy production in Finland can be reflected upon the introduction of mobile phones, which called for a socio-technical transition that enabled new type of mobile services. Laakso, Rubin and Linturi (2012) argue that regulation was one of the steering forces for the creation of operator business as we know it now. One example mentioned by Laakso et al. (2012) is how operators were prohibited by law to charge customers who wanted to switch operators and keep their old number. This increased competition and had depressive effect on the prices. The example indicates that the role of regulation in the creation of mobile operator business in Finland was not trivial. Somewhat similar indications in general were made by Caniëls and Romijn (2008) when they found similarities between niche protection and government policies for infant industry –protection; large variety of governmental policies is required in both cases for wider structural changes to take place. Therefore, it is important to study the role of regulation in socio-technical transitions, such as the diffu-

sion of decentralized energy production. Regulation can further institutional embedding of new technologies and help the diffusion process, which is the main goal of SNM.

2.5 Framework for Multilevel Analysis

Academic literature on SNM can be divided into early research which focuses mostly on internal niche formation and its role in the diffusion process and more recent literature which provides a broader multilevel analysis on niches and the interaction between micro, meso and macro levels (Schot & Geels, 2008). Without changes at all three levels, niche innovations cannot diffuse more widely. For that reason, in this master's thesis, the interest is more in the recent SNM literature and especially in how shifts in socio-technical regimes can further the niche diffusion process. This master's thesis analyses barriers and enabling factors at all three levels and draws on the work by Geels (2005) and Kemp et al. (1998) on multilevel analysis. The focus has been chosen because the novelties emerging in niches are strongly influenced by existing socio-technical regimes and landscape since there is a dynamic interaction between micro, meso and macro levels (Geels, 2005). For that reason, it is important to analyse each level separately instead of focusing merely on niche level analysis, which is often the case in SNM studies.

The current dominance of incumbent technologies has deep historical roots and over the years existing technologies have become institutionally embedded. Incumbent technologies are supported by cognitive routines, regulative rules as well as infrastructure, which all have an important role in maintaining system stability (Geels, 2005). It is the stability of regimes that creates social, technological and economic barriers for the diffusion of new technologies (Kemp et al., 1998). Niches serve as a starting point to disrupt the status quo although deep structural trends particularly at the sociotechnical landscape level (e.g. the dependence on fossil fuels) are somewhat impossible for local niche actors to change, notes Geels (2005). However, niches are highly influenced by actions at meso and macro levels and for instance, the establishment of new policies might create new opportunities for niche initiatives to invade mainstream markets. Kemp et al. (1998) state that governments have an important role in facilitating this change as they can set up policies which advance the upscaling of successful experiments in niches. External factors affecting niches should work in favour of internal niche formation processes, such as learning and networking, so that niches can bring about regime transformation and contribute to changes in the existing routines (Schot & Geels, 2008). Overall, it is the dynamic interaction between micro, meso and macro dimensions that eventually result in technological transition as regimes may rarely be transformed by local niche actors alone (Geels 2002; 2005; Kemp et al., 1998).

This master's thesis tries to create a framework to enhance local distributed energy and uses SNM to conduct a multilevel analysis to study factors affecting citizen-led renewable energy initiatives in the Finnish context. The multi-

level analysis is crucial for enhancing the diffusion of small-scale energy initiatives as their goal is to be embedded in the current socio-technical regime but currently face resistance because of their mismatch with incumbent technologies, which hinders their diffusion. Understanding the obstacles as well as enabling factors at each level hopefully helps citizen-led renewable energy initiatives to break out from niches, which is the main goal of SNM.

3 DATA AND RESEARCH METHOD

3.1 Qualitative Study

In this master's thesis, qualitative research is applied to study what are the biggest obstacles and enabling factors to promote citizen-led renewable energy projects in Finland. A qualitative research method was chosen because the aim of this thesis is to find out detailed information about the phenomenon investigated. According to Eskola and Suoranta (1998) and Silverman (2006; 2005) qualitative research can be used to study a certain phenomenon in detail. Whereas quantitative research seeks to confirm preselected hypotheses, qualitative research seeks to explore phenomena (Silverman, 2005). Thus, a qualitative approach represents the most suitable choice for this master's thesis.

However, as Eskola and Suoranta (1998) point out, qualitative study is a much more theoretically driven method compared with quantitative study; there are infinite possibilities to interpret the data which emphasizes the need for a solid theoretical framework. In fact, one of the limitations of qualitative study is that they are somewhat difficult to replicate due to the subjective nature of qualitative research compared with a quantitative one (Eskola & Suoranta, 1998).

3.2 The Collection of Primary Data

3.2.1 Semi-Structured Interviews

According to Hirsjärvi and Hurme (2015) and Silverman (2006), interviewing is a frequently employed method in qualitative studies as it is a versatile approach and gives emphasis on the interviewees' own voice and experiences. Therefore, it is particularly suitable for this master's thesis as the main objective is to study and explore what is the interviewees' view of the phenomenon under study.

For this study, primary data was collected through semi-structured interviews, which are informal conversations that take place within predefined boundaries (Bernard, 2011). This method was chosen because it allows flexibility in the collection of data but within the boundaries of the theoretical framing of the research. The use of semi-structured interviews allows key themes to be covered during interviews as the approach provides enough structure to ensure relevance to the topic while allowing new ideas to be taken into consideration due to the flexible nature of this approach (Galletta, 2012; Hirsjärvi & Hurme, 2015).

In fact, one of the advantages of this approach is that it creates enough space to clarify and specify the research topic during the interview because they are conducted with a somewhat open framework (Galletta, 2012). In this re-

search, this was particularly important aspect to take into account when considering the unexplored nature of the phenomenon examined; citizen-led renewable energy initiatives have not been studied much in Finland and main objective is to enhance understanding of the phenomenon under study. Semi-structured interviews are also recommended if the interview is to be carried out in one sitting (Bernad, 2015; Galletta, 2012), which was the case in this study.

3.2.2 Selection of Interviewees

A total of ten semi-structured interviews were conducted during this study. All institutions and people involved in the study were anonymized for the final report so that interviewees could express themselves more freely. All interviewees were selected on the basis of their experience of the small-scale energy sector and knowledge of citizen-led renewable energy production in Finland. Their professional profiles include senior managers, advisors, project leaders and researchers.

Snowball sampling was utilized to reach the most suitable interviewees for this study. Snowball sampling is a sampling technique where interviewees are asked to identify potential informants for the study (Hirsjärvi & Hurme, 2015) Although time consuming, this technique is particularly relevant when it is difficult to find informants who meet the criteria used in the study (Metsämuuronen, 2011). Because citizen-led renewable energy production is in its infancy in Finland, finding potential candidates was somewhat difficult. Together with the research group, we identified a few potential interviewees who have knowledge of renewable energy and citizen-led distributed energy production, and after first two interviews, snowball sampling was used. The final interviewees from the recommended candidates were chosen so that they have the knowledge to identify key challenges related to citizen-led renewable energy project development in Finland.

The initial purpose was to conduct 7-8 interviews. However, it became clear during the data collection that sufficient data particularly related to community energy projects was hard to gather. Therefore, ten interviews were conducted to ensure a comprehensive data. Most of the interviews were individual interviews, but in one interview there were two people participating in case additional information about certain research projects were needed. However, that person is not included as one of the interviewees and none of the direct citations are from this person because the purpose was merely to provide additional information if needed. In this master's thesis, the names of the interviewees are replaced with numbers from 1-10 in random order.

Potential interviewees were contacted by e-mail. In the e-mail, the objectives and aim of the study were described. In some of the cases, the potential interviewees were also asked about their possible knowledge of citizen-led renewable energy projects. The majority of people agreed to be interviewed, with a few declining due to lack of knowledge on the topic. However, they always recommended someone who might be a better candidate for this study.

3.2.3 Conducting Interviews

All interviews were conducted in person between February and June 2016 and were recorded and subsequently transcribed. Before the interviews, the interviewees were e-mailed with the interview questions so they could familiarize themselves with the questions beforehand. The questions were based on the literature review about small scale energy production and the strategic niche management theory. In addition, the research problem was used as a compass to formulate the interview questions to ensure they were relevant to the purpose and objectives of the study, as recommended by Galletta (2012). The interview guide contained five themes, which were the current state of citizen-led renewable energy initiatives in Finland, existing obstacles, drivers, the role of intermediary organizations as well as expectations and motivational factors. Under each theme, there were 2-6 preliminary questions. Finally, the interviewees were also asked to summarize the main factors promoting the diffusion of citizen-led renewable energy initiatives in Finland and to name potential candidates suitable for an interview.

The interviews were generally opened with a short informal discussion, and an introduction about the author and the research project. This is important for the development of mutual trust between interviewer and interviewee as it becomes (Hirsjärvi & Hurme, 2015). The term 'citizen-led renewable energy initiatives' was also explained because it is a term that might be hard to define unanimously. During the interviews, there was no strict sequence in the order the questions or themes were phrased. The role of the interviewer was to facilitate the discussion objectively so that certain themes were covered during the conversation (Galletta, 2012). Depending on the course of the conversation, some of the questions were slightly adapted to keep the interview flowing and follow-up questions added to clarify specific aspects that arose.

All interviews were recorded using a digital recorder. Interviews lasted an average of 55 minutes, with the shortest interview being 46 minutes and the longest 1 hour and 9 minutes. The total recorded interview time for ten interviews was 9 hours and 18 minutes. All interviews were conducted in Finnish and afterwards, each interview was transcribed in Finnish by the researcher, which resulted in 10-15 pages per interview. Before transcribing the interviews, the audio files were listened to at least once. This was done to increase the reliability of the transcripts, as is suggested by Silverman (2005). Only the quotes used in Chapter 4 were translated into English.

The interviews were conducted in the Capital region. Most of the interviews were conducted either in the interviewee's work office or in a meeting room. However, one interview was conducted in the interviewee's home and one in a cafeteria. As was recommended by Hirsjärvi & Hurme (2015), the interviews were conducted sitting at a table which gave the interviewee and interviewer the opportunity to make eye contact and to read each other's facial expressions.

3.3 Abductive Thematic Analysis

To analyze the interview transcripts, both abductive thematic analysis and SNM theory was utilized. Thematic analysis is a form of content analysis used in qualitative research (Smith, 1992). Thematic analysis and content analysis share many of the same principles as both aim to identify emerging patterns and meanings within data. According to Guest, McQueen and Namey (2012, p. 10), "Thematic analyses move beyond counting explicit words or phrases and focus on identifying and describing both implicit and explicit ideas within the data, that is, themes." In contrast to content analysis which aims in a more systematic way to classify and quantify data, the purpose of thematic analysis is to develop themes and provide a more descriptive understanding of data (Silverman, 2006; Smith, 1992). Abductive thematic analysis focuses on finding broader patterns that derive from data to explore the phenomenon under study and reduce it to key ideas (Eskola & Suoranta, 1998; Tuomi & Sarajärvi, 2002). Because abductive thematic analysis is a flexible approach it can be used with many kinds of qualitative data such as interview transcripts, and it is a particularly suitable method when little is known about the phenomenon under study.

Abductive analysis was chosen to utilize in this study because the phenomenon under study is somewhat unknown and new and for that reason, the purpose is not to test an existing hypothesis. Abductive analysis is similar to both deductive coding, which is a hypothesis-driven approach and inductive coding, which is more explorative by nature since themes derive from the data (Bernard, 2011). In abductive analysis, results emerge from the collected data. However, the theoretical framework is used to limit an infinite number of possible explanations for a phenomenon under study (Tuomi & Sarajärvi, 2002). In this study, the results were divided into three main categories derived from SNM: the landscape, socio-technical regimes and niches. Abductive approach requires a sound knowledge of the data since Guest et al. (2012) emphasize that whenever themes are strongly linked to the data, it is extremely important to carefully read through the data several times before analysis takes place.

First, each interview was transcribed into a written format. Interviews were transcribed close to verbatim, because the purpose was to directly quote the interviewees. Filler words such as "like" or "uhm" and pauses were excluded because their role was insignificant in the study. The next step was to read the transcripts through several times in order to become familiar with the data and to find hidden themes and structures within data. Before starting the actual analysis, preliminary obstacles and enabling factors were identified based on detailed notes to get a better understanding of the data before the unit of analysis was established. In this study, any a word or sentence to describe the phenomenon under study was used as a unit of analysis as the objective of analysis was to look for expressions of an idea.

In the next phase, transcripts were coded, categorized and organized. According to Guest et al. (2012) a code means "A textual description of the semantic boundaries of a theme or a component of a theme" (p. 50) and coding in turn refers to "The process by which a qualitative analyst links specific codes to

specific data segments" (p. 50). Each transcript was coded manually by highlighting key words and sentences from the text using different colors for obstacles and enabling factors. Key words and sentences referring to the same obstacles or enabling factors were classified into separate categories. For each category, an initial descriptive theme that accurately depicts the data was developed based on the words and sentences for further analysis. In this study, a theme refers to "A unit of meaning that is observed (noticed) in the data by a reader of the text" (Guest et al., 2012, p. 50). After that, all themes were reviewed and the data was carefully re-read. Lastly, final theme categories were generated. Categorization scheme was constructed so that it fits the objectives of the research and therefore in the final phase, themes were further categorized using SNM; obstacles and drivers were situated either at the landscape, regime or niche level.

To increase the reliability of study and the validity of findings, a precise count of themes and verbatim citations were used to connect the author's interpretation with what interviewees actually said. According to Guest et al. (2012) the transparency of data analysis is particularly important in qualitative study because it is based on the researcher's own interpretations of data. The results are reported in Chapter 4.

4 RESEARCH FINDINGS

This part will present the findings made throughout the gathering and analysis of the primary data, as described in previous part. Hindering and enabling factors are tracked separately at all three levels: landscape, regimes and niches. The results are presented using tables and illustrative citations from the interviews.

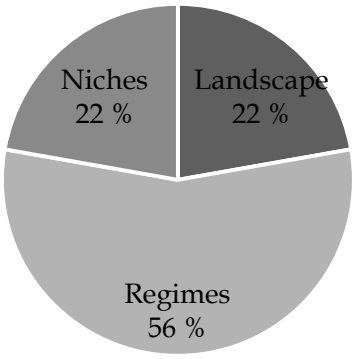
Although the focus of this study was on small-scale energy production in general and not on the diffusion of specific renewable energy technology, solar photovoltaic dominated the discussion in every interview as it was seen having the most potential. This is worth noting when reading the results because different laws apply to different technologies.

4.1 Hindering Factors

This subchapter describes the hindering factors for citizen-led renewable energy initiatives to scale up derived from strategic niche management theory and its multilevel analysis. It provides answers to the first research sub-question and summarizes experts' view on the factors hampering the diffusion of citizen-led renewable energy initiatives in Finland.

As Table 1 below demonstrates, the main hindering factors for the deployment of citizen-led RE initiatives are situated at the socio-technical regime level, and somewhat few obstacles at the landscape and niche levels could be drawn from the data. This indicates that national policies play a considerable role in the diffusion of these projects. The results are in line with SNM theory, which states that regimes have an important role in facilitating the transition process as they can set up policies which either advance or hinder the upscaling of successful experiments in niches (Kemp et al., 1998).

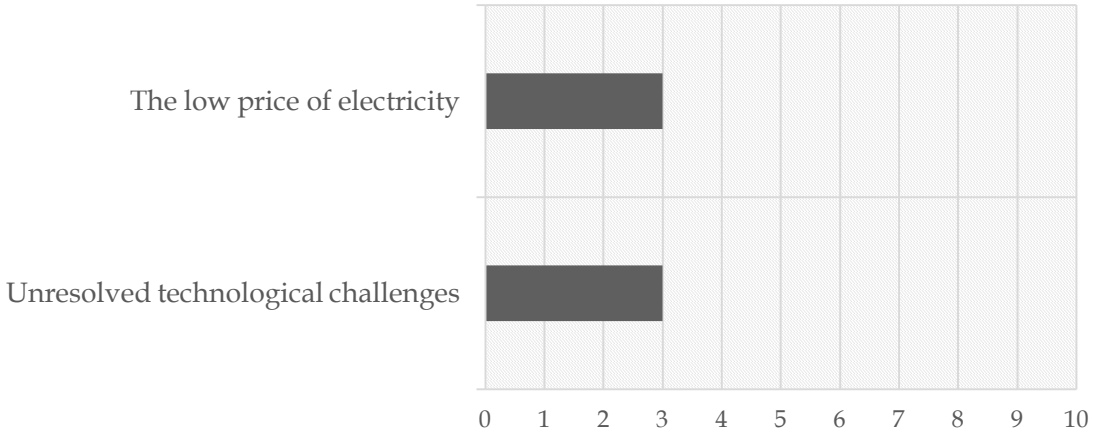
TABLE 1. Distribution of hindrances between landscape level, socio-technical regimes and niches



4.1.1 The Landscape Level

In Finland, the main obstacles at the landscape level seem to be unresolved technological challenges related to renewable energy such as energy storage, and the current low price of electricity. Both obstacles were raised up by three interviewees. The results are presented in Table 2 below. In Finland, the price of electricity generally reflects the price of oil and coal, weather conditions, operation costs, regulation and taxation as well as the price of electricity in the Nordic electricity exchange. Merely national level policies are not affective to govern electricity prices and for that reason, the low price of electricity is placed at the landscape level. Both obstacles are presented in more detail in Chapters 4.1.1.1 and 4.1.1.2.

TABLE 2. Obstacles at the landscape level



4.1.1.1 Unresolved technological challenges

Three out of ten of the interviewees estimated that unresolved technological challenges, such as renewable energy storage, hinder the transition to distributed energy production. They were concerned how Finland can solve the problem of integrating high shares of renewable energy sources into the existing energy system. Unlike conventional power from nuclear power plant or fossil fuels which can be generated according to demand with total predictability generation from solar or wind energy depends on the weather and for that reason, affects grid stability.

> *"The fluctuating supply of electricity [based on wind and solar power] poses a dilemma. Electricity is produced when it is not needed or it is not produced when needed."*
> *(2)*

The Finnish winter season poses an additional challenge, two of the interviewees stated. According to them, that is why Finland can never be completely dependent on distributed energy.

"Long winters are our problem because the largest consumption peak occurs during one week in the wintertime. For that reason, we need to be prepared and keep this heavy machinery going" (2)

"A cold country like Finland, a lot of energy is consumed during winters and I'm not sure whether distributed energy systems are able to meet the demand during the coldest periods." (8)

Thus, phasing out fossil fuels for renewables requires a solution how to transfer energy surplus from periods of excess to the period when there is a lack, according to the interviewees. However, the comment below demonstrates that technical issues related to storing renewable energy are a global problem, not merely a national concern.

"Of course, overall, one of the big questions is how does the future energy system function. Production from distributed energy sources… we have to solve the predictability issues related to distributed energy and in managing power demand and supply." (4)

4.1.1.2 The low price of electricity

Three of the interviewees mentioned that the current low price of electricity hinders citizens and communities to invest in distributed energy solutions. They all thought that distributed energy has gained momentum but higher electricity prices would accelerate the transition.

"Currently the price for electricity is low. Electricity is cheap. Some might think that they'll invest when prices go up." (8)

"When the price of renewable energy technologies lowers just a bit more and electricity prices go up, I believe it would take off, the same way as the heat pumps did. It's on everybody's lips." (3)

The main concern for the interviewees was that low prices do not motivate citizens to invest in new technologies because it takes longer until renewable energy investments break-even.

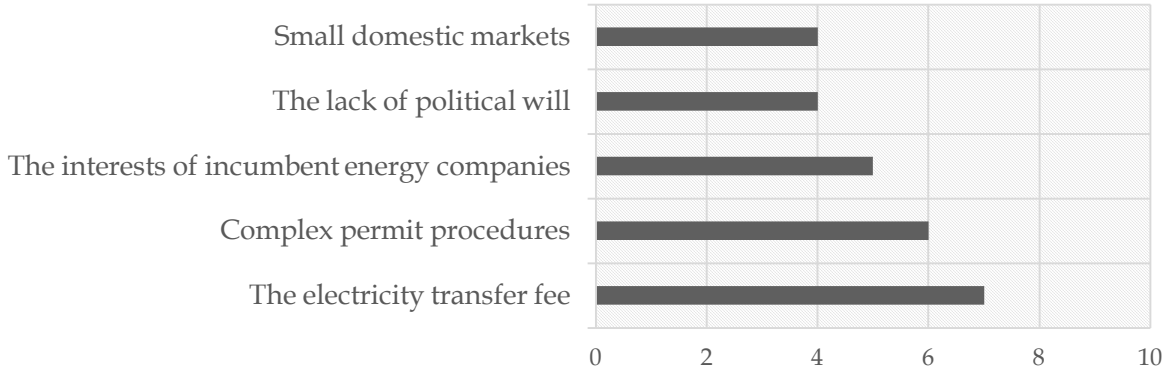
"It's perfectly normal that consumers are interested in electricity prices and at the same time, follow and compare what is the average payback period of installing their own system." (4)

4.1.2 The Socio-Technical Regime Level

According to the data, it seems that most of the obstacles are situated at the socio-technical regime level. The main two obstacles at this level were expensive electricity transfer fees and difficult permit procedures. Results are presented in Table 3 below. Both obstacles were mentioned multiple times during many of the interviews. There seemed to be a mutual understanding that to promote citizen-led renewable energy initiatives the process needs to be as simple as plugging in a socket; citizens look for easy solutions.

Nearly half of the respondent also stated that currently, the interests of big energy companies weight more in the debate than the will of individual consumers. There is not enough political will to shift towards distributed renewable energy. Because the environment is not favourable towards small-scale energy production it has led to small domestic markets which poses an additional challenge in the transition process, stated four of the interviewees.

TABLE 3. Obstacles at the socio-technical regime level



4.1.2.1 The electricity transfer fee

Seven out of ten of the interviewees recognized the possible hindering effect of the current Electricity Market Act, which states that if communities sell electricity outside the physical border of their own property the power plant must be connected to the national grid and a transfer fee must be paid. The main criticism of the current legislation was that because the transfer fee equals half of the price of electricity, it makes the energy production unprofitable. This applies particularly to cooperatives.

> *"If the electricity must be connected to the national grid and a transfer fee must be paid, it is unprofitable." (3)*

> *"In the economic equation, the transfer fee plays such a pivotal role that there is no point for a community to install panels or wind mills somewhere in the nearby field and use the national grid to transmit electricity. It's not profitable." (5)*

> *"We aren't able to distribute electricity together if we have five detached houses for example. No, we can't do that. I have to sell it to the national grid and pay terrible fees." (10)*

However, there were contradictory views among the interviewees whether this is an obstacle or not. Three out of seven of the interviewees stated that in their view it is not a problem. Although they do recognize the negative financial impact the transfer fee has on communities producing their own energy.

> *"I hear a lot of talk about how it's a problem that you can't transmit electricity between neighbours. I personally don't think so." (1)*

"Well of course for those who want to invest in bigger facilities and transmit it to other users, it's a problem. […] Personally, I don't see it such a big problem." (9)

One suggestion that arose during the interviews was a so called Mankala – principle, which is a unique ownership model for Finnish energy producers. Nuclear financing models for example are based on the Mankala ownership model. Shareholders are responsible for the operating costs of the company producing energy and reciprocally have the right to purchase energy on a cost price bases in accordance with their respective share in the so called Mankala -company. The idea behind the suggestion was that individual citizens would be able to jointly own a power plant and exploit Mankala -principle. However, the two interviewees who raised up this issue had contradictory views about the principle; one interviewee was in favour and another one was against it because in his opinion it would be against the Energy Tax Directive.

"It is against the principle of equity that someone else pays for your transfer fee. It wouldn't be fair. The distribution system operator must treat everyone with neutral manner. […] The fact that you don't have to pay for your transfer fee although you're connected to the national grid is against the Energy Tax Directive." (3)

The transfer fee is an obstacle that clearly separates communities and individual citizens as energy producers. According to studies (Rogers, Simmons, Convery & Weatherall, 2008; Izutsu et al., 2012) and seven of the interviewees, economic factors are one of the main driving factors behind small-scale energy investments and for that reason, the fee might significantly hinder the diffusion of community energy projects. It could even explain to some extent why community projects are so rare in Finland.

4.1.2.2 Complex and variable permit procedures

Six out of ten of the interviewees saw that current permission procedure is too complicated, and thus hinders the diffusion of citizen-led RE initiatives. One of the problems is that the permit procedures can vary widely between communities.

"Each community has different procedures and they require permits of a different kind; whether to apply for planning permissions or planning permission for minor construction. That slows down the process unnecessarily and can be considered a problem" (1)

"Depending on the community, getting the permits can be either really difficult or really easy." (8)

"It is a truly terrible forest of different procedures one has to go through from regional planning to environmental impact assessment. […] leasing of land, the EIA, planning and permitting process, noise, owls and everything… " (2)

The current permission procedure is too burdensome for small-scale energy producers, according to six of the interviewees. The bigger the power plant and

the project, the more complex the process gets. This indicates that permission procedure strains more community energy projects compared with individual producers as five of the interviewees pointed out. One concern was whether communities have the necessary know-how and time to take care of all the necessary permission.

> *"As soon as we're talking about a bigger production facility than merely installing solar panels to your own rooftop […] it requires a lot of preparation and planning until you're allowed to build a wind mill or a concentrated solar power system. If it got anything to do with a transmission network or grid, it involves a lot of planning and licensing. You don't just end up there from thin air." (6)*

The same interviewee was concerned about how the complexity of permit procedures might become an obstacle to community energy projects.

> *"Bigger facilities are made subject to an environmental impact assessment of their effects and all these other permit procedures. Who takes care of all that? Is it a member of the cooperative? Does he get paid? The assumption cannot be that one person takes care of everything for free." (6)*

All six interviewees were willing to simplify the process, and one of the interviewees was willing even to remove all unnecessary permits if individual citizens want to install solar panels, for instance, inside their own plot borders. This would simplify the permit procedure, according to the interviewee.

> *"I'm not really convinced that there is any need to apply for approval if you want to build some kind of energy production system on your own plot." (2)*

4.1.2.3 The interests of incumbent energy companies

Five interviewees saw that the interests of incumbent energy companies might hinder the diffusion citizen-led RE initiatives. According to the interviewees, the reason for this is that small-scale energy production threatens their business model. The conflict between centralized and decentralized energy production might hinder the development of new legislation that would be in favor of small-scale energy production because the interests of energy companies weight more in the debate than interests of individual citizens.

> *"Energy is multi-billion industry and energy companies will fight tooth and nail to save their business." (10)*

> *"It's obvious that interest and objectives are somewhat different when we are comparing energy industry and citizen-led energy initiatives." (8)*

> *"Energy companies want to keep the market to themselves and for that reason, are not too keen on any reform that might threaten their business. They are powerful lobbyists." (7)*

One of the interviewees suggested that working together with energy companies might contribute to the diffusion of citizen-led RE initiatives. According to

the interviewee, by co-operating and helping energy companies to realize the potential behind small-scale energy production is the only way to truly promote the growth of citizen-led RE initiatives. The polarization between centralized and decentralized energy production will eventually lead nowhere.

> *"We need energy companies to promote distributed energy for these initiatives to diffuse more widely. Big companies should see this as a viable business option and not the other way around." (6)*

4.1.2.4 The lack of political will

Four out of ten of the interviewees suggested that the one of the biggest obstacles to the diffusion of citizen-led renewable energy initiatives is the lack of interest to promote small-scale energy production.

> *"I just feel that this isn't at the top of the hierarchy." (10)*

> *"This doesn't seem to interest no one. Well, maybe researchers." (5)*

> *"Unfortunately, the Finnish energy policy isn't executed in a way that motivates citizens to invest in distributed energy." (6)*

This has led to a business-as-usual situation that supports the use of fossil fuels and centralized energy production and is not favorable towards citizen-led energy production.

> *"Nowadays, the most polluting options are also, in many cases, the cheapest and easiest options." (6)*

According to the interviewees, this is mostly because energy intensive industry plays a significant role in the Finnish energy policy and for that reason, the voice of individual citizens and communities does not have an impact on the decision making. The interviewees argued that the Ministry of Economic Affairs and Employment is intended to promote mainly industrial policy and for that reason, the role of energy intensive industry is emphasized in the Finnish energy discussion.

> *"Our energy intensive industry determines the content of our energy policy." (10)*

The status quo dates back to the forming of the current Ministry of Economic Affairs and Employment by emerging the former Ministry of Trade and Industry as part of the ministry, explained one of the interviewees:

> *"The current attitudes and culture are a leftover from times when the Finnish energy policy and the Ministry of Economic Affairs and Employment were still a part of the Ministry of Trade and Industry. The Finnish energy policy has always been tied to our industrial policy. They have the same officials who are used to serving the interests and needs of our high-energy intensive industry. This is the starting point." (5)*

Because of our historical past, one of the interviewees stated that the change does not happen overnight because we must change the existing power structures:

> *"The slate isn't clean. We have a regime that is very much in favor of centralized energy production. The trend is towards distributed energy but we must bring about change." (7)*

Two of the interviewees suggested that the status quo explains why there are merely few citizen-led energy projects here and there.

> *"We have a couple of projects here and there. It's hard to scale up these kinds of projects when our energy policy doesn't serve the interests of individual citizens." (10)*

> *"In Finland, we don't have an objective to improve the social acceptance of renewable energy or mobilize citizens to investments in renewables. Nothing like this. This results in a patchwork of policies and to a few isolated projects here and there" (5)*

One suggestion was to recognize small-scale energy production in the Government Programme, which might promote its diffusion.

> *"Even a small print that we need to include citizens in the energy transition in our energy strategy would make a big difference. Then the officials at the Ministry of the Environment and the Ministry of Economic Affairs and Employment would have to take that into account and start thinking how to proceed." (5)*

4.1.2.5 Small domestic markets

It was suggested by four of the interviewees that small domestic markets limit the deployment of citizen-led RE initiatives as there are not enough professional actors in the markets.

> *"The interest toward renewables is growing and housing cooperatives are interested in exploring this option. So, I think the overall interest is strong. However, community energy projects, for instance, usually need someone to implement and solve all the technical issues. Sure, there are always people who are willing to do it themselves, but they are a marginal group. It requires a professional third party to do that. Now when the domestic market is so small, there aren't any." (10)*

The same interviewee continued by elaborating why the lack of competition poses an obstacle to the diffusion process:

> *"If we had more competition, usually the equipment supplier would handle the permits and all the other stuff: "We take care of the permits." It is much easier for the consumers. Now that the domestic market is so small, consumers pay the price and they must take care of everything themselves; it becomes an obstacle." (10)*

Additionally, small domestic markets limit the number of business innovations as companies do not have enough resources to invest and develop new business ideas. This in turn limits the competition and the number of new solutions in the market, which would be favorable to consumers.

"In Finland, we have great potential for solar thermal systems, but the domestic markets are just too small." (9)

"It requires capital and resources to invest in new business ideas. It's hard to run a business when the net worth of solar panels connected to the national grid in Finland is maybe 10 million euro." (1)

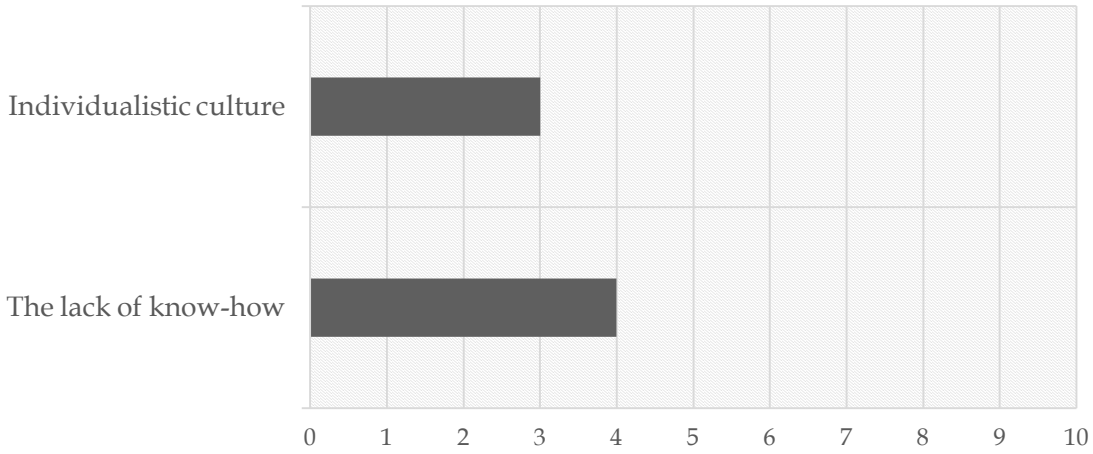
In addition, a well-functioning home market was seen as a vital stepping stone for Finnish companies to internationalize their operations. Four of the interviewees emphasized the importance of a well-functioning domestic market as it would help in particular those SMEs with the potential to grow and internationalize across the single market and beyond. Without functioning domestic markets, companies are unable to obtain practical experience that serves as a reference and stimulates internationalization.

"We have a lot of innovations that we could export abroad but Finnish companies need references. So, in a way, it would be economically reasonable for us to grant support for these companies. They need references that prove that these technological innovations actually work: "We have one project in Tampere, come and see." References are extremely important. They are among the key issues, I believe" (8)

4.1.3 The Niche Level

At the niche level, the main hindrances derived from the data were individualistic culture and lack of expertise and know-how of individuals and communities. All the themes identified from the interviews are presented in Table 4. Particularly, the lack of know-how of individuals and communities can become a major obstacle if they are not offered assistance. It became evident during the interviews that the existing support system for small-scale energy production is currently somewhat scattered and weak. Both obstacles are presented in more detail in Chapters 4.1.3.1 and 4.1.3.2.

TABLE 4. Obstacles at the niche level



4.1.3.1 The lack of know-how and expertise

At the niche level, four interviewees were concern about how the lack of know-how and expertise of individuals and communities might hinder the development of citizen-led RE initiatives.

> *"No one wants to be the first one who has to tackle all the challenges and problems alone. People rather go with something that has been tried and tested."(6)*

> *"This might be the first time cooperatives are doing these kinds of investments. […] All this administrative work; how to organize everything in case they want to invest." (4)*

The latter interviewee also suggested how citizens who are not clever with their hands or experts on the matter, usually want everything to be as easy as possible. The main concern was that the investment threshold might be too high for these people.

> *"There are always those people who are so interested in renewables and producing their own energy that they are able to obtain all the information from the equipment supplier, figure out funding and all the required permits. How about those who don't have the time or expertise or need support? Are they left by the sideways?" (4)*

In addition to the lack of financial and technical know-how, one interviewee thought that citizens do not fully understand the impacts of climate change and how it affects energy prices in the long term. This prevents them from making wise energy decisions.

> *"People should be able to calculate the long-term energy costs; I mean 30 years from now. They are focusing on short-term energy prices." (9)*

It became clear during the data gathering that small-scale energy production is still in its infancy in Finland. When asked from the interviewees which authority provides assistance and support for individuals and communities, many different authorities were suggested: Motiva, Lähienergialiitto, Ilmastoinfo, Centre for Economic Development, Transport and the Environment, and other local actors such as Valonia, which is a service centre for sustainable development and energy of Southwest Finland. However, it was evident that the field is still somewhat scattered and some of the interviewees were not even sure whether these authorities they suggested could provide the necessary assistance.

> *"Sure, pretty soon there is a need for more accurate calculations, detailed planning and discussing what is the best option in that particular case […] they might provide more general guidance." (4)*

> *"Well Motiva might be the one to provide assistance, and then we have these local energy advice organizations, but I'm not sure how useful they are." (5)*

The comment below demonstrates what the general climate for citizen-led energy production still seems to be in Finland:

"Producing your own energy is still a bit of an oddity. It's far from a standard." (9)

One interviewee even reported how a few years ago it was difficult to find a professional electrician to connect a solar PV system to the national grid.

"A couple of years ago, the electrician didn't even know it was possible to connect a solar PV system to the national grid." (1)

The data suggests that an adequate support system has not yet been established for individuals or communities who require extra assistance. For that reason, it might be hard for individuals and communities find assistance if needed. This in turn, increases the investment threshold. When asked should a new authority be established to assist citizens on this matter, one of the interviewees stated that it would not solve the problem:

"We need more effort from the existing ones." (2)

4.1.3.2 Individualistic culture

Three interviewees argued that individualistic culture hinders the diffusion of community energy projects. According to them, this partly explains why in Denmark or Germany, for instance, community energy is gaining popularity compared with Finland.

"Finnish culture is different from the Dutch or Danish one. […] Yeah, I think that this is a cultural question above all." (2)

"Sense of community isn't as strong here in Finland compared with other countries. People might not see it as a viable option for their investment. For instance, a combine harvester sharing isn't that common here. Everyone has their own and the same applies also to many other things. Why that is, is something we should discuss more." (6)

"We Finns do what we want in our backyard and the same rules apply to our neighbors. We don't have any interest in doing something jointly with our neighbors." (1)

One of the interviewees had also heard this argument to explain the lack of community energy projects in Finland, but stated that it is not that black and white as there are many cooperatives in other sectors. The question should rather be how could these be turned into energy cooperatives:

"We have a lot of housing cooperatives and other cooperatives. There are 2 million housing cooperatives in Finland. There is huge potential there. In a way, we have the organizational structure in place." (5)

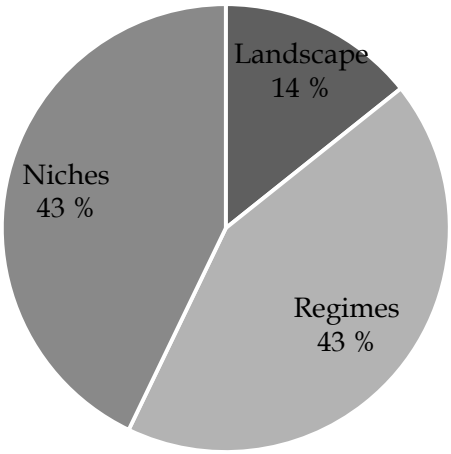
4.2 Enabling Factors

This subchapter describes the enabling factors for citizen-led renewable energy initiatives to scale up derived from the data. It provides answers to the second

research sub-question and summarizes interviewees' views on the factors promoting the diffusion of citizen-led renewable energy initiatives in Finland.

As Table 5 below demonstrates, the enabling factors for the deployment of citizen-led RE initiatives are evenly distributed at the socio-technical regime and niche levels, whereas the landscape level plays only a minor role in promoting the diffusion. This indicates that national policies as well as actions taken within niches play a considerable role in the diffusion of citizen-led RE initiatives. The findings are in line with the theoretical framework that highlights the importance of creating protected spaces for niches (Kemp et al., 1998) and the role of governmental policies in enhancing the diffusion process (Raven, 2005).

TABLE 5. Distribution of the enabling factors between landscape level, socio-technical regimes and niches



4.2.1 The Landscape Level

At the landscape level, the development of renewable energy technologies was the only enabling factor that could be derived from the data. It was supported by most of the interviewees. Since the socio-technical landscape is beyond the direct influence of niches and regimes, it is not surprising that the role of the landscape was seen somewhat insignificant in facilitating changes towards citizen-led RE initiatives. The results are presented in more detail in Chapter 4.2.1.1.

4.2.1.1 The development of renewable energy technologies

Seven interviewees stated that citizen-led RE initiatives are becoming more attractive to consumers because of the rapid development of technology. Lower fares and increased competition contribute to more consumer choice. There is a natural development from centralized to decentralized energy production that is happening globally and Finland is part of that development, as the comment below demonstrates.

"The price of technology will become lower and competition of market shares will increase. Finland is affected by global trends even though we'd just sit and do nothing. That's how it goes. […] We are part of a bigger socio-economic transition when it comes to energy, climate and environmental questions. […] I see it as a natural development path." (10)

This will naturally increase interest towards renewables generated by lower prices and better performance of renewable technologies.

"Distributed energy will expand. Solar panels, for instance, are becoming affordable. Soon maybe the battery technology will follow." (1)

"As soon as the solar panel prices come down more and all these technical solutions […] it will spread rapidly. It is a natural evolution." (8)

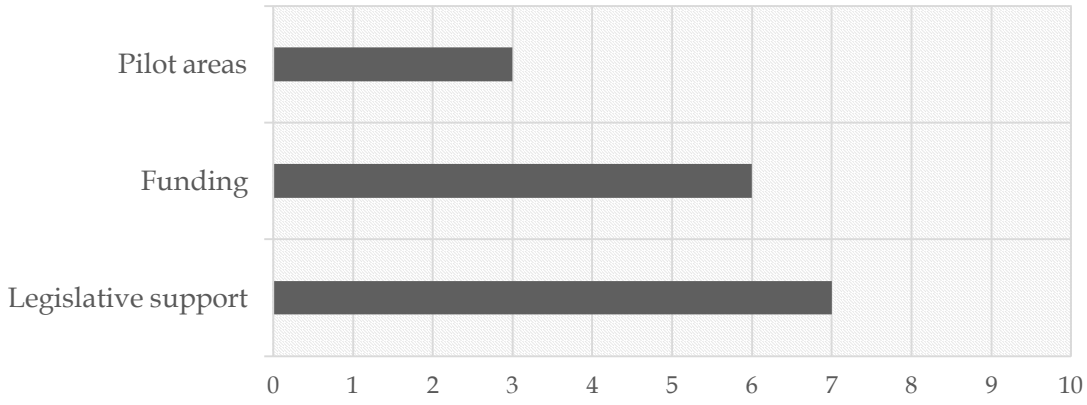
"Renewable technologies have to be cheap and affordable for people to buy them. That is the magic word." (2)

As the comments demonstrate, the interviewees thought that in Finland, markets will take care of the diffusion of citizen-led RE initiatives.

4.2.2 The Socio-Technical Regime Level

According to the data, the most important factor supporting the transition to distributed energy was legislative support for citizen-led renewable energy initiatives, which was mentioned nearly all the interviewees. It was seen vital to reduce the administrative burden of small-scale energy producers whereas funding and launching pilot projects were seen more as a way to accelerate the transition towards small-scale energy production, not as a necessity. The results obtained from the analysis of data are summarised in Table 6.

TABLE 6. Enabling factors at the socio-technical regimes



4.2.2.1 Legislative support

Most of the interviewees thought the current Electricity Market Act serves the interest of large producers, and changes to encourage small-scale distributed energy production is needed. Seven out of ten of the interviewees were willing to cut unnecessary red-tape and over-regulation to reduce the administrative burden for small-scale energy production. However, opinions were divided when specific means to achieve this were asked. Specific suggestions mentioned by the interviewees were virtual net metering[2], hourly net metering[3], a harmonisation of rules and practices, and cutting unnecessary technical standards.

> *"I'm not sure that these projects even need any public funding. However, the current Electricity Market Act is way too complicated and that's what we need to address. There are plenty of technical standards and other stuff…We need to simplify laws and procedures." (10)*

> *"Well, in my view, net measuring per hour would be a practical solution." (1)*

> *"Do you really need to apply for a permit when installing solar panels to your own rooftop and that sort of stuff to smoother and simplify the process." (2)*

However, the main goal behind all the suggestions was the same; to simplify the process and to encourage citizens to invest in small-scale energy production by legislative means. To reduce the administrative burden that bears upon individuals and communities was seen as crucial in order to promote the growth of citizen-led RE initiatives.

> *"It should be as simple as plugging in a socket" (2)*

> *"For an individual citizen, easiness is the key word here. Of course, there are always those people who are so excited about something that they don't mind how hard the project is: To reach the critical mass, the process needs to be as easy as possible" (6)*

> *"Funding, taxation and legislation should favour small-scale distributed renewable energy production so that it clearly becomes a cheaper alternative in comparison to traditional, fossil fuel based energy production." (5)*

This was seen clearly as one of the most important factors in facilitating the growth of distributed energy. The majority of the interviewees commented that cutting down red-tape would encourage citizens to invest in citizen-led energy production.

> *"If we sorted out all the political obstacles, it would have an effect similar to popping the cork of a champagne bottle." (10)*

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[2] Virtual net metering allows communities (housing cooperative etc.) to offset part or all of their electricity bills with the electricity produced by their collectively owned power plant situated at another location (e.g. on the rooftop of an apartment building).

[3] Under hourly net metering, the electricity production is netted off your electricity consumption on an hourly basis and you pay your utility for the balance.

4.2.2.2 Government funding

Funding aroused diverging views within the interviewees. Three interviewees were happy with the current government funding as six out of ten wanted extra funding for citizen-led RE initiatives. One interviewee criticized the current system but did not support extra funding for citizen-led RE initiatives. Six interviewees who supported extra funding believed that even a relatively small amount of aid would make a big difference; it would send a message that citizen-led RE initiatives are seen important and worth supporting.

> *"We should grant public funding for these projects, at least something small. It has a big psychological impact. Like a tax incentive or some other subsidy. After that, it would really take off." (5)*

> *"Obviously, public aid always acts as a catalyst." (6)*

> *"I believe that some sort of investment aid would definitely increase the willingness to invest." (1)*

> *"Of course, if we want these projects to scale up, public funding is the key. However, funding can't be the final solutions." (6)*

The main critic towards the current aid scheme was that it is directed to businesses, not to consumer-led energy and thus, does not promote the growth of distributed energy.

> *"Consumer-led energy is something that has never been supported in anyway." (10)*

> *"Investment subsidies for renewable energy granted by the Ministry of Economic Affairs and Employment are granted only to companies and municipalities. Not to private citizens who produce their own electricity." (5)*

However, even those interviewees who supported extra funding were hesitant about what would be the optimal financing framework. One of the interviewees emphasized how short-sighted aid schemes can be confusing and usually cause only a short-term peak in investments and create a stop and go –effect. This puts pressure on equipment sellers who must meet the growth in demand from consumers within a short period of time. Once the periods of subsidy have come to an end, customers disappear immediately. For that reason, continuity and long-term predictability are important when it comes to subsidies.

> *"It should be clear from the beginning that, for instance, this year they grant 20%, then the next year followed by a reduction of 5% and the year after that 10% until fully paid after three years. Or something like that. But it should be announced right from the beginning." (1)*

In addition, subsidies should support new business ventures involving smart technology such as storage or inverters, emphasized four of the interviewees.

"If the purpose of the aid scheme is to provide an incentive for further develop smart technology such as smart inverters, then it would be a smart move. I believe that Helen is engaged in a pilot project that studies the usability of electrical storages and solar panels. To promote and support that sort of stuff is smart because it has export opportunities." (3)

Overall, it was somewhat clear that subsidies were recognized mainly as a mean to accelerate the rate of growth of investments, not as necessity.

"I believe that many households start to invest in renewable energy systems, with or without investment subsidies because the payback period for their investment is relatively reasonable." (4)

"I don't see it [the lack of subsidies] as an obstacle. The technology is already affordable." (9)

The interviewees who were pleased with the current government funding thought that recent changes in taxation to favor small-scale energy production were enough to encourage citizens to invest in distributed energy. In 2015, taxation was improved by exempting electricity self-consumers from grid fees and electricity taxes up to 100 kVA system size or 800 MWh yearly production (Customs, 2015).

"The current incentives are enough. I don't think there is need for more public funding." (2)

"The tax incentive is substantial and now it is attractive even to bigger systems." (3)

In addition, currently single houses can get household tax deduction from installation work. However, one interviewee criticized the current system because this does not apply to housing cooperatives and recommended extending the scope of household tax deduction.

"I would actually recommend that housing cooperatives should be able to get tax credit for domestic help because after all, it is the individual consumers who pays the investment in the form of maintenance charge." (9)

Surprisingly, compared with Germany and the UK where feed-in tariffs have been introduced to support small-scale energy production, most of the interviewees seemed to oppose introducing feed-in tariffs in Finland. Although they had contradictory views on the issue. The ones who were in favor of feed-in tariffs seemed to think the climate was not in favor of introducing feed-in tariffs and for that reason, there was no point trying to impose the idea any further even though it would promote the growth of citizen-led RE initiatives.

"We want to create markets for Finnish companies to get export. If this is the case, it is absurd that we don't have feed-in tariffs for photovoltaic." (9)

"I just wonder why it [Germany] is considered such a great example; tenants living in apartment buildings are paying the subsidies to farmers and other rich people living in single houses." (3)

4.2.2.3 Pilot areas

Three out of ten of the interviewees were in favour of launching new pilot projects to advance the diffusion of citizen-led energy initiatives. The main idea would be to temporarily authorize on limited areas pilot projects incorporating new technologies or new concepts which might not comply with the current Electricity Market Act. These areas could be HINKU-municipalities or housing fairs for instance.

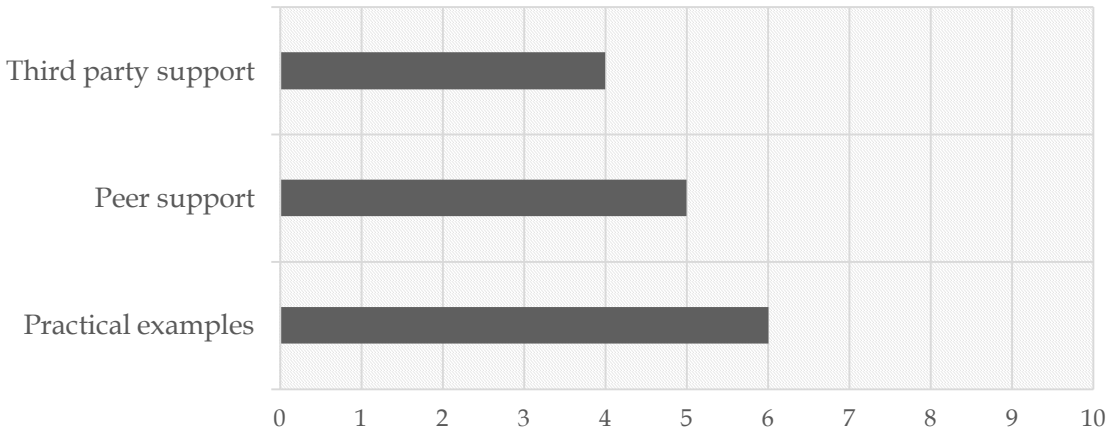
> *"We have HINKU –municipalities. They could constitute as pilot areas and field test new innovations and ideas. If the ideas work, they could be introduced in other municipalities too." (10)*

> *"We need to launch pilot projects and areas to develop new technologies. They could benefit from public funding." (9)*

4.2.3 Niche Level

According to the data, the most important means to support citizen-led renewable energy initiatives were practical examples and peer and third-party support. All the themes identified from the interviews are presented in Table 7. It became evident during the data gathering that individuals and communities seem to need very practical help in a hands-on way, according to the interviewees.

TABLE 7. Enabling factors at the niche level



4.2.3.1 Practical and concrete examples

There was a broad consensus among the interviewees that disseminating practical examples, ready-made models, and best practices, is the best way to promote the diffusion of citizen-led RE initiatives. Six out of ten of the interviewees stated that more concrete examples and practical information are needed.

"Citizens are already familiar with all this general stuff about renewables and solar panels and so on. They need something more concrete; practical examples about costs and possible difficulties that they might face when installing solar panels." (6)

"I believe that disseminating practical examples is important. General information is not enough because people face these practical questions right from the start" (8)

"The fact that you see that your neighbour has solar panels on the roof encourages you to make the investment." (4)

"Best practices, success stories, hands-on experiences… That kind of information we need to disseminate." (10)

The majority of the interviewees emphasized that consumers look for information on very practical problems such as landscaping, permit procedures, and calculating the overall costs.

"How's the landscaping? Is it possible to sell excess electricity into the national grid? How about cleaning? People seek answers to very practical questions." (2)

"People want to see them [solar panels] with their own eyes and hear from the neighbour how much money they spent and whether they faced any problems." (1)

When asked who is responsible for disseminating information and best practises, the interviewees could not give a clear answer to this question. However, the majority of interviewees emphasized the role of the state because distributed energy is in its infancy in Finland.

"Because this isn't a viable business yet, it [information dissemination] is dependent on public funding." (5)

Currently, the main problem with citizen-led RE initiatives is that although it generates interests among citizens, the interest does not result in investments as the citation below demonstrates.

"I believe that there is high-level of interest towards renewables, particularly when the prices come down just a bit. When it comes to taking a concrete step to invest.. well, there is a big gap between interest and investment decisions." (10)

Raising awareness through practical examples plays a key role in generating investments and lowering the investment threshold, according to the interviewees. One of the interviewees mentioned a concept called Vihreät Ovet as a concrete way to communicate best practices for citizens. Vihreät Ovet is a guided energy walking tour, which has been organized in different municipalities. During the tours, citizens who have made energy efficiency improvements open up their homes to share their experiences and people attending to walking tours learn about local energy solutions.

4.2.3.2 Peer support

The importance of peer support was underlined by five interviewees. People get courage from other people's actions, as one interviewee commented:

> *"People tend to get more courage to do things when they see that others are doing it as well. That's why peer support is so important; it has a boosting effect." (9)*

Existing communities could be used to ensure a stronger peer support as was suggested by one interviewee.

> *"I would start contacting resident's associations for example to organize an energy event. It would be great if one of the residents had already installed panels and could guide others along the way." (9)*

One great example of successful peer support is a collective purchase -concept, which was discussed during three interviews. A collective purchase is when interested citizens form a group and use their collective buying power to negotiate a volume discount, and together make an informed purchase.

> *"A collective purchase gives peer support and reduces the threshold to make an investment." (7)*

> *"With a collective purchase, the prices are lower because of bigger volumes. At the same time, people get that extra courage to invest when they know that their neighbour is investing as well." (1)*

Data verifies that collective purchases lower the investment threshold and increases total photovoltaic installations significantly; communities that took part in the joint procurement of solar power plants organized by the HINKU project had the highest number of solar photovoltaic systems per 10 000 inhabitants in HINKU municipalities (Finnish Environment Institute, 2016). Three interviewees emphasized how collective purchases can help in tackling barriers related to the diffusion of citizen-led RE initiatives, which are high upfront costs and complex decisions involving choices about technical issues and choosing between contractors. The main advantage of a collective purchase –model is that participants do not feel like they are making the decision on their own because they have the support of the community throughout the process.

4.2.3.3 Third party support

Four interviewees thought that individuals and communities would benefit from third party support.

> *"Energy is a very complex issue for an average Joe, it requires a certain amount of expertise. Investments are expensive so you don't want to fail, otherwise it gets cold. Are there any risks? Does this really work? People wonder. And these are long-term investments. The payback period is 10-20 years. All these reasons make the investment threshold somewhat high. For that reason, people need outside assistance to guide them through. Someone who has time and expertise." (7)*

"It is easier to invest when an independent third party member says that 'Hey, this is actually a really good thing and you should invest.' Little extra encouragement." (9)

This kind of assistance could be provided by either a public authority or private consultant, or both. None of the interviewees had a clear vision what would be the best way to organize assistance for individuals and communities.

4.3 Summary of results

This study aimed at understanding the factors that hindered or favoured the diffusion of citizen-led renewable energy initiatives in Finland. For this purpose, ten interviews with Finnish renewable energy experts representing different institutions were conducted. The primary data was collected through semi-structured interviews. The interview transcripts were analysed with a qualitative thematic analysis based on an abductive approach.

The results from the interviews show that several factors hinder the deployment of citizen-led renewable energy initiatives in Finland. The results derived from the data seem to be in line with SNM because the majority of the obstacles are situated at the socio-technical regime level. According to the theory, national policies at the regime level have an important role in facilitating the transition process (Kemp et al., 1998). The main obstacles at this level mentioned by at least half of the interviewees or more were the electricity transfer fee, difficult permit procedures and the interests of incumbent energy companies. The transfer fee is an obstacle that particularly affects communities and makes community renewable projects unprofitable. Therefore, it could explain to some extent why community projects are so rare in Finland.

The enabling factors mentioned most frequently by the interviewees were situated at the socio-technical regimes and niches. The results are not surprising because SNM highlights the role of protected niches (Kemp et al., 1998) and the role of governmental policies in enhancing the diffusion (Raven, 2005). At the regime level, legislative support and providing funding were the most significant factors promoting the deployment of citizen-led renewable energy projects. At the niche level, a need for concrete and practical examples was emphasized as well as the role of peer support.

The findings gathered during this study are summarized in Table 8. The table gives a comprehensive picture of the biggest obstacles and enabling factors for the deployment of citizen-led renewable energy initiatives in Finland. The figures on the right indicate how many of the obstacles or drivers are situated at the landscape, socio-technical regime or niche level whilst the figures on the left indicate the percentage of interviewees who mentioned that specific obstacle or driver.

TABLE 8. The table summarizes the factors that hinder or favour the diffusion of citizen-led renewable energy initiatives in Finland at the landscape, socio-technical regime and niche level.

	HINDERING FACTORS	Percentage of inter-viewees
22 %	**Landscape level**	
	Unresolved technological challenges (e.g. energy storage)	30 %
	The low price of electricity	30 %
56 %	**Socio-technical regimes**	
	The electricity transfer fee	70 %
	Complex & variable permit procedures	60 %
	The interests of incumbent energy companies	50 %
	The lack of political will	40 %
	Small domestic markets	40 %
22 %	**Niches**	
	The lack of know-how and expertise	40 %
	Individualistic culture	30 %
	ENABLING FACTORS	
14 %	**Landscape level**	
	The development of renewable energy technologies	70 %
43 %	**Socio-technical regimes**	
	Legislative support	70 %
	Government funding	60 %
	Launching of pilot areas	30 %
43 %	**Niches**	
	Dissemination of practical and concrete examples	60 %
	Peer support	50 %
	Third party support	40 %

5 DISCUSSION

This study set out to identify the biggest obstacles and enabling factors to promote citizen-led renewable energy projects. It was undertaken by interviewing ten Finnish renewable energy experts in different institutions. This part brings together the obstacles and enabling factors of citizen-led RE initiatives discussed in Chapter 4, keeping in mind the key research question: *What kind of policy framework would enable citizen-led renewable energy projects to scale up in the Finnish context?* Discussion outlines what policy support may be in place for such projects using the theoretical framework formulated in Chapter 2.

5.1 Policy Framework for Citizen-Led Renewable Energy Initiatives

The results of this study indicate that currently, there are several obstacles hindering the deployment of citizen-led renewable energy initiatives in Finland. Particularly, it seems that small-scale energy production has not yet been recognized as a viable alternative to complement or to replace centralized energy production, which results in the fragmentation of citizen-led projects because of the lack of supporting policy measures. On the basis of the findings of this study, a policy framework was created to explain in a clear manner which policy measures could promote citizen-led renewable energy projects to scale up in Finland. In Figure 3, a house is used as an allegory to illustrate the policy framework and the key findings of this study.

Laying the foundation is one of the most important parts when building a house; the design of the foundation depends upon the desired house and the ground in which it is laid. Similarly, objectives set up in the Finnish energy and climate strategy steer the decisions made by the government and thus, they can either weaken or improve the position of new technologies by creating either a hostile or a favorable environment for their deployment. Furthermore, setting clear and long-term objectives provides more security for end-users, suppliers and other actors by improving transparency and increasing predictability, which plays a crucial role in the upscaling of niche innovations (Verbong, Christiaens, Raven & Balkema, 2010). Therefore, clearly stated objectives and targets can be seen as the foundation of which the policy framework to support citizen-led energy production is built on, as is presented in Figure 3.

According to the results, the starting position is not favorable towards distributed energy because the Finnish energy policy is designed to serve the interest of energy intensive industry. This has resulted in forgetting the voice of individuals and communities in the energy debate. As a comparison, the situation in Finland differs significantly from the one in Scotland where the Scottish government set a target of developing 500 MW of citizen-led renewable energy projects by 2020, which has already been met five years early (Nabney, 2015).

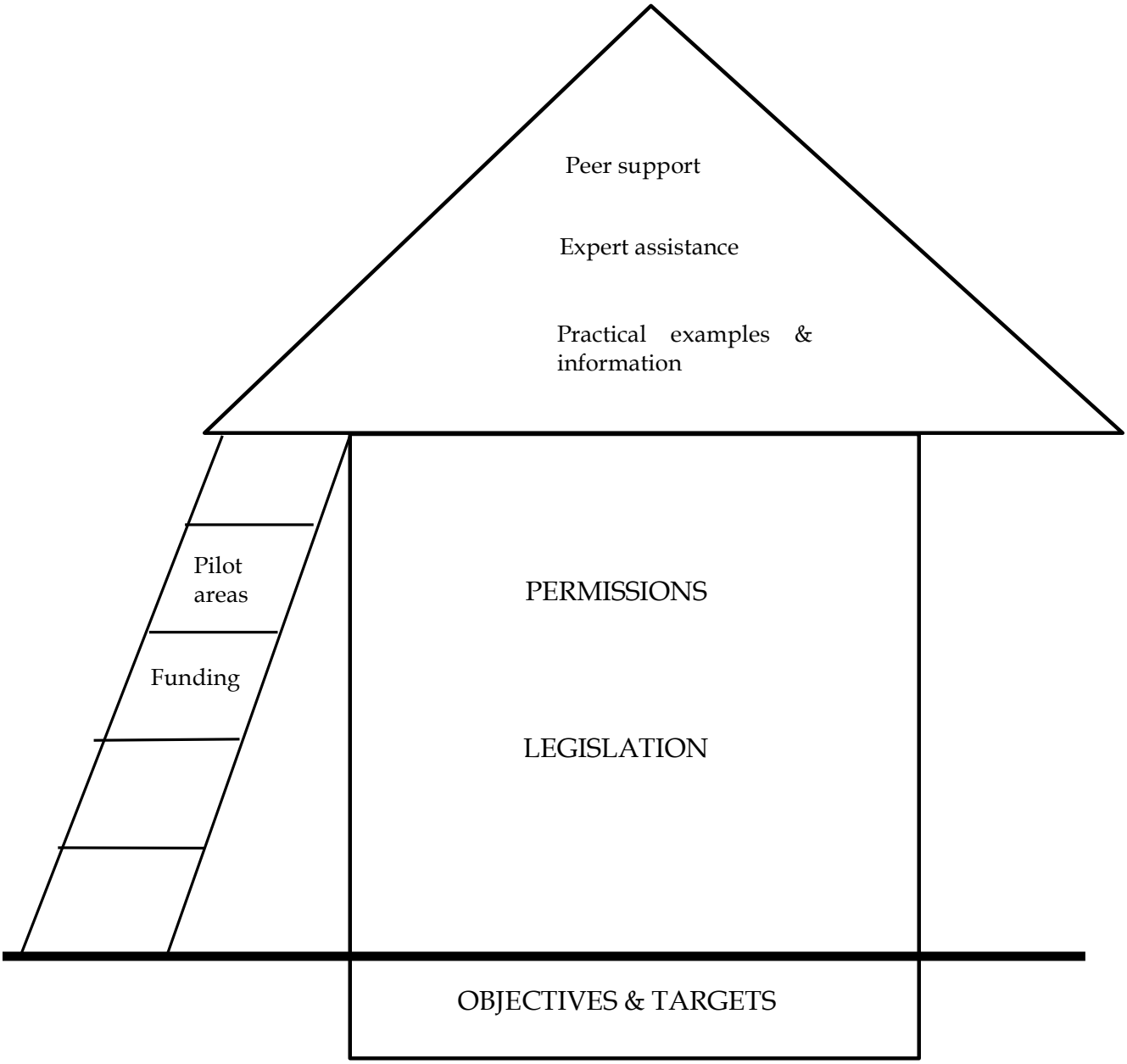


FIGURE 3. Illustration of the key factors promoting the diffusion of citizen-led renewable energy projects in Finland

To meet the target, a state support scheme was created in order to promote citizen-led renewable energy initiatives, which created a political environment that effectively mobilized citizens to engage in citizen-led or community-led projects (Bomberg & McEwen, 2012). Particularly, an environment that actively engages citizens in decision-making processes which directly affect them, seem to be crucial in citizen mobilization (Bomberg & McEwen, 2012; Lund, 2007). The Scotland example clearly illustrates the importance of objectives and targets; binding targets force to think what is required so that the objectives are attained. Hence, setting binding targets could also contribute to the deployment of citizen-led energy in Finland.

The second prerequisites are legislative support and seamless permission procedures, which are illustrated as the walls of the house in Figure 3. The walls of a house are its most important structural elements because they form the support system of the house. Similarly, permissions and legislation are the backbone of the society and they guide people's behavior since individuals and communities are always affected by the political environment they operate in. Previous studies in the Netherlands (Negro, Hekkert & Smits, 2007; Raven, 2004) provide evidence on how supportive regulation is among the most effective measures in aiding technological niche innovations to diffuse more widely. This has been recognized also in the recent SNM literature; Geels (2002) emphasizes how the success of a new technology is not merely dependent on the activities within the niches, but also requires changes in the existing socio-technical regimes.

The results of this study are in line with SNM and confirm that one of the most effective means to encourage citizens to invest in small-scale energy production is by legislative means. At the moment, difficult permit processes and the current Electricity Act were seen as one of the biggest bottlenecks constraining the diffusion of citizen-led energy production. There is a distinct mismatch between citizen-led renewable energy initiatives and the formal and informal rules embedded in legislation and regimes. Thus, the key is to reduce the administrative burden that bears upon individuals and communities by making the legislative process as simple as possible for citizen-led renewable energy initiatives to fit better with the existing regime. This can be achieved by adopting legislation that is supportive towards citizen-led renewable energy initiatives and by harmonizing and simplifying permit procedures.

Launching of pilot areas and granting public funds were recognized in this study mainly as means to accelerate the rate of growth of citizen-led renewable energy investments, not as a necessity. Hence, they are illustrated in Figure 3 as the ladder because both can accelerate the deployment of innovations but are not perceived as a core element of the house. The results are supported by Verhees et al. (2013) who claim that governmental support such as funding and national research programs can promote the diffusion of technological niches. In Finland, possible pilot areas could be HINKU-municipalities or house fair areas. Furthermore, ensured funding would create an incentive for citizens to invest in renewable energy, acting as a stimulus for growth and investment. Particularly, protected spaces for experimentations could be created by combining pilot projects and public funding. However, according to the re-

sults, citizens will invest in small-scale renewable energy even without these policy measures mainly because of the reasonable payback periods.

Even though creating safe havens for niches is at the core of SNM, the interaction between niches and regimes is largely neglected in the scientific literature. To overcome this limitation, it is suggested in this study that a monitoring and feedback system should be created so that niche actors are able to engage in socio-technical system building, which is part of the process of institutionalizing niche innovations by linking protective niches to wider discussion in society. In order to do this, citizens should be able to clearly articulate how the dominant selection environment should be altered to favor citizen-led renewable energy initiatives. For this purpose, particularly pilot projects are important because they can generate know-how and contribute to the learning process and shaping of vision and expectations. In pilot projects, the aim should be to collect user feedback from citizens and communities and to encourage citizens to actively take part in the energy debate. This would have a positive influence in the niche development at grassroots level (Ratinen & Lund, 2015). However, the mechanisms of the monitoring and feedback system require further research.

Finally, there is the house roof illustrated in Figure 3, representing niches and the support needed by individuals and communities at grassroots level. According to the results, the dissemination of practical and concrete examples, peer support and expert assistance are among the main drivers at the niche level. This is in accordance with Michelsen and Madlener (2016), who highlight that well-informed citizens are more likely to invest in renewables. Therefore, disseminating information has a crucial role to play in the deployment of citizen-led renewables. The results also further support the findings of Ruggiero et al. (2014) who state that forerunners often lack technical skills and adequate experience to execute these projects. Unfortunately, the current study found that in Finland, an adequate support system has not yet been established for individuals and communities who require assistance. In addition, it seems that there is lack of clarity of which institute is responsible for providing relevant information. Since the role of niches and forerunners is vital in the diffusion of technological innovations (Nygren et al., 2015; Ruggiero et al., 2014), these finding may help to understand why citizen-led energy is in its infancy in Finland. Now, it seems that niche actors have to help themselves. It is therefore important to clarify and strengthen the role of existing intermediary organizations for them to have a larger role in knowledge transfer.

In addition, it is important to encourage individuals and communities to cooperate with a diverse group of different actors. This could be done by expanding collective purchases –model or organizing study groups on citizen-led renewables. By doing so, individuals and communities would have the ability to gain required knowledge and technical skills by participating and cooperating with a broad range of different actors such as other projects, local community members, suppliers and experts. This kind of cooperation accelerates second-order learning. In addition, dynamic interaction between various actors will result in a shared vision, which becomes more specific when experiments progress (Seyfang & Smith, 2007). This in turn will ease the diffusion process.

Although the role of forerunners and local actors is significant in the diffusion of technological innovations the main aim of this study is to understand how to create a larger demand for citizen-led renewables. According to the results, for citizen-led renewable energy initiatives to reach sufficient critical mass so that they can overcome the technological problems, projects need to be easy to carry out. This requires changes in the current legislation. Similar observations can be found in Nygren et al. (2015), who emphasize the need for institutional changes so that the use of renewables becomes easy, economic and realistic alternative. Otherwise, the transition towards citizen-led renewable energy rests solely on the shoulders of forerunners and will never be able to reach the masses. Therefore, the policy framework suggested in this study is particularly important because it tries to ensure that citizen-led renewable energy initiatives become attractive for the public. Thus, the emphasis is on legislation and how the state by means of policy intervention can trigger the growth of technological niche.

The policy framework presented in this chapter aims to support both internal niche processes and to promote the technological change at the socio-technical regime level because only together they can bring about change and result in the upscaling of technological innovations. Changes in the legislation and permission procedures help niche actors by creating windows of opportunities for niches to scale up. At the same time, institutional changes forces regimes to change their practices, which is required for niches to bring about regime transformation. Moreover, niches are supported by funding, creating pilot projects, disseminating practical information and providing assistance from various actors. Together, all these supporting measures enable second-order learning, the shaping of vision and broad actor networks which have an essential role in the deployment of innovations, according to SNM.

Overall, the results seem to be in line with previous literature on the topic as well as other countries' experiences; creating policy instruments to promote citizen-led renewable energy initiatives is important. Although the promoting policies slightly differ between countries the most common ones are regulation and funding. Therefore, it was somewhat surprising that the stimulating role of funding in supporting citizen-led renewable energy initiatives was not considered significant in Finland, according to the results. Furthermore, the results of this study suggest that the majority of obstacles are located at regimes and in order to facilitate structural change towards citizen-led energy production, changes at the socio-technical regimes are needed. In addition, assistance measures should be directed towards niche actors. The findings of the current study support the recent research on SNM which emphasizes the need for changes at multiple levels in facilitating structural changes. For that reason, changes at both national and international level would be desirable. However, this study suggests that changes at the socio-technical regime and niche level are enough to promote the deployment of citizen-led initiatives in Finland.

The contribution of this study has been to show what kind of policy instruments promote citizen-led renewable energy initiatives. The findings of this study also complement those of earlier studies since there has not been many studies on this specific issue to date in Finland. In addition, this is a first study

to create a concrete policy framework which would enable citizen-led renewable energy projects to scale up in the Finnish context.

5.2 Evaluation of the Study

The assessment of reliability and validity of a study is an extremely important part of the research process since they determine the soundness of the chosen research measures. According to Silverman (2005), validity "is another word for truth" (p.175). In other words, it means the degree to which the study measures and represents the phenomenon that it was meant to assess. Reliability, in turn, refers to the repeatability of a study; how similar the results are when repeating the study (Silverman, 2006). Particularly in qualitative research, one way to make the research more reliable is by making the whole research process as transparent as possible by describing it in detail (Eskola & Suoranta, 1998; Silverman, 2005). In Chapter 3 and throughout this study, the aim has been to give a detailed description of the process. In addition, the audio files were carefully listened to at least once before transcribing them. This reduces the risk to failures and therefore, increases the reliability in a study (Silverman, 2005). Furthermore, all interviews were transcribed close to verbatim. In this study, the results have been presented by combining citations and the number of answers to improve the accuracy of the analysis and reduce the risk of misinterpretation. However, in qualitative research the results are always a reflection on the researcher's own interpretation based on the data (Eskola & Suoranta, 1998).

All in all, this study has reached its goal of providing more understanding on the key factors that favoured or hindered the diffusion of citizen-led renewable energy initiatives in Finland. However, this study underlies some limitations that need to be acknowledges. Firstly, the results of this study might have possible differences depending on the technology used since different technologies are subject to a different legislation. These differences were not considered in this study as the aim was to provide more general understanding of the phenomenon under study due to time and resource constraints. However, it should be taken into account that solar photovoltaic dominated the discussion which will inevitably be reflected in the results.

Another limitation of this study is the fact that citizen-led renewable energy initiatives and particular community renewables are a very marginal phenomenon in Finland and both terms are somewhat ambiguous. For that reason, it is possible that the interviewees might have understood the questions differently. To ensure the reliability of the interviews and that all interviewees understood the questions and the phenomenon in the same manner, the term 'citizen-led renewable energy initiative' was explained at the beginning of each interview. Although the reliability of semi-structured interviews is harder to ensure, in this study it was a fruitful method because it gave emphasis on the interviewees' own opinions. A more structured interview schedule would have limited the discussion more.

Despite the above limitations, this study significantly contributes to the ongoing debate on the role of citizen-led renewable energy projects and provides interesting findings about the exact obstacles and enabling factors for their deployment. In addition, this study provides a useful information about the differences between citizen-led and community-led renewables. Second, this study further contributes to SNM literature by combining SNM and multi-level analysis. The findings of this study confirm the assumption in SNM that socio-technical regimes play a significant role in the diffusion of technical innovations. Therefore, more attention should be given to the interaction between niches and regimes as well as how to promote dialogue between niche actors and policy makers. Finally, according to the author's knowledge, there is no study to date which has created a concrete policy framework to support the diffusion of citizen-led renewable energy initiatives in Finland. Hence, this study makes an important contribution by providing suggestions of how citizen-led renewables can become part of mainstream energy policy. In addition, the results of this study give valuable information to Friends of the Earth in Finland in developing community renewables in Finland since it reveals the most significant policy measures needed to support citizen-led initiatives.

5.3 Further Research

The enabling factors for citizen-led renewables have not been studied much in Finland, and for that reason, there is a need for future research. Particularly, Finnish community-led renewable energy projects have not been subject to much analysis and a new study focusing only on community renewables could try to shed light on the legislative elements that can favour the diffusion on community-led renewable projects in Finland. Whilst this study shows a clear difference between the obstacles between citizen-led and community renewables, further research is necessary to close the gap in knowledge about community renewables, and hence strengthen the foundation for promoting policies.

In addition, some research could be carried out to determine the role of intermediary organizations and how to establish an effective way of disseminating best practices as well as supporting niche actors. It is also important to understand how to promote the dialogue between niches and regimes by creating inclusive policies so that niche actors can engage in socio-technical system building. Since this aspect is largely neglected in the SNM literature, there is a need for more research on the issue. To overcome this limitation, it was suggested in this study that a monitoring and feedback system should be created. In this regard, how to create a such system could be an interesting field to explore. Future research answering these questions would possibly help to further improve the diffusion of citizen-led renewable energy initiatives.

Thirdly, since different technologies are subject to a different legislation, it would be beneficial to carry out a study focusing on the deployment of one specific technology to obtain more precise information on each technology. Lastly, it would also be interesting to further study the attitudes of actors in the

energy industry since their resistance towards small-scale energy production were mentioned as a significant obstacle. Examining new business opportunities and new prospects opened up by the transition to distributed energy might also provide useful information to energy companies.

6 CONCLUSIONS

The present study was designed to identify the biggest obstacles and enabling factors to promote citizen-led renewable energy initiatives in Finland. Based on the results of this study, a policy framework was created to bring citizen-led renewables into the mainstream. One of the main findings of this study was that citizen-led renewable energy initiatives are clearly not compatible with the existing energy policy regime. Legal barriers, the complexity of permit procedures and electricity transfer fees, which make community renewables unprofitable, indicate a mismatch between citizen-led projects and the existing socio-technical regime. The results of this study are hardly surprising given the global situation on energy; much of the world's primary energy and electricity come from fossil fuels and the vast majority of world's electricity is from centralized generation (IEA, 2016b). Under the current centralized generation paradigm, it is an expected finding that the diffusion of new technical innovations that radically differ from the existing socio-technical regime is difficult.

However, keeping in mind the main research question of this paper, this study has demonstrated that clear objectives and targets, supporting legislation and simple permit procedures support the deployment of citizen-led renewable energy initiatives. In addition, citizen-led renewables would benefit from pilot projects and funding. At the niche level, actors need practical information, peer support and help from experts to be able to carry out projects. This study has also shown that isolated actions within niches are not adequate because of the link between niche internal and external processes. Therefore, providing a nurtured space for innovations is as important as changes in the existing socio-technical regime and landscape.

This study has shown that change will take place gradually as a result of numerous promoting policy measures. Together small streams make great rivers, as the old saying goes. Likewise, citizen-led renewable energy initiatives will become mainstream when an environment where these projects can prosper is created.

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