Local Renewable Energy Initiatives:

The development of Lochem Energie (Netherlands) and Klimakommune Saerbeck (Germany) from a Strategic Niche Management standpoint

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ABSTRACT

The road towards sustainable development calls for system-wide transformations in sociotechnical systems of energy provision. There are a number of local renewable energy initiatives that emerged from all over Europe to take on this challenge. However, comparatively limited research has been done about the processes and conditions required for these initiatives to further develop and increase their influence on wider energy systems. For this reason, a comparative case-study analysis was conducted between to two local renewable energy initiatives: Lochem Energie in the Netherlands and Klimakommune Saerbeck in Germany, guided by the following research question: "How did change in the local energy systems of Lochem and Saerbeck come about, and what were the key drivers for change when comparing these cases?"

Both case studies were framed as "grassroots innovations," or as "abstract" niches that provide space for new social arrangements, habits and practices that differ from those in the regime to be put into practice. After which, both case studies were mapped onto the Strategic Niche Management framework to elucidate factors that brought about changes in their system of energy. This study illustrated that the three factors Kemp et al (1998) claim to be vital for technology-centered niches (building networks, managing expectations and learning processes) appear to be suitable for 'social' niche innovations. Lochem Energie and Klimakommune Saerbeck have addressed each of these factors, although with differentiating means, priorities and intensities. In addition, it appears that this has allowed these initiatives to overcome some of the common obstacles that grassroots innovations typically face.

Keywords: sustainability transitions, strategic niche management, local renewable energy initiatives, and grassroots innovations

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1. INTRODUCTION

In Europe, temperatures are increasing faster than in the rest of the world. Climate change, air pollution, peak oil, and threats to energy security have driven the policy agenda towards more sustainable energy systems. To reduce greenhouse gas emissions and the dependency on imported energy, the European Union (EU) set a target of receiving 20% of its energy from renewable sources by 2020 (European Commission, 2014). This objective brought along with it further potential benefits that include stimulating innovation for local communities through decentralized energy.

Steps towards sustainability generated a variety of social innovations alongside innovative technologies in different arenas and at different scales (Seyfang and Smith, 2007). However, our 'normal' habit of energy consumption has been deeply ingrained in our everyday lives. Sustainable development is henceforth challenged to tackle the demand for system-wide transformations within sociotechnical systems of supply. The shift to local, renewable or low-carbon energy systems confronts the mainstream growth-based conceptions of a highly globalized and industrialized world, where high consumptions of oil and gas have been associated with wealth and progress (Seyfang and Haxeltine, 2012).

Mounting evidence claims that in order to address climate change and achieve a low-carbon economy, system-wide transformations are key (Foxon et al., 2009; Jackson, 2009; Kallis and Norgaard, 2010). Indeed, 'environmental transitions' (Kemp and Pearson, 2007: 7), as they are called, lead to *"…a product, production process, service or management, or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resource use (including energy) compared to relevant alternatives."*

The challenge, however, is that innovation tends to be incremental and path dependent on (Seyfang and Smith, 2007: 587-8):

- The cognitive frameworks, routines, resources, capabilities, and knowledge of technology producers and users;
- The way social and technical practices are embedded within wider infrastructures, which consequently hinders the opportunities for alternatives;
- Incumbent practices that prefer economies of scale and positive network externalities since there is less risk involved in following established practices than to invest in new practices;
- The coevolution of institutions and technological practices, like government policies, market rules, and professional associations that reinforce existing trajectories;
- The prevailing market and social norms that provide results seen as satisfactory, which influenced certain lifestyle routines, embedding these practices further.

Cognitive, social, economic, institutional and technological processes lock us into trajectories while at the same time lock out sustainable alternatives. Imposing a goal like sustainable development on existing sociotechnical regimes implies connecting and synchronizing changes in actors, institutions and artifacts at different

points within and beyond the regime. Starting within a network of pioneering organizations, technologies and users that form a niche practice, it is possible for a dominant regime to undergo radical changes despite lock-ins and path dependencies and it is the goal of this research to find out how this is made possible.

1.1. Emergence of Local Energy Initiatives

Society seems to have developed a 'doing things ourselves' approach in dealing with sustainable development (Arentsen and Bellekom, 2014). The trust that has once been given to organizations (government, multinationals) seems to have diminished, as communities prefer to take tasks that were placed in the hands of these organizations into their own. To grow and prepare your own vegetables, to clean after the sidewalk in front of your home, to install PV panels on your roof, to sustainably consume energy – these are examples of efforts that can be done by any individual. Nevertheless, there seems to be a growing interest in doing these things collectively.

Previous research has discovered existing motives, drives and barriers to the emergence of local energy initiatives. These motives can be generally categorized into four types: social, environmental, economic and the dissatisfaction with the government (Arentsen and Bellekom, 2014). Bomberg and McEwen (2012) studied what drives communities to participate in local energy initiatives. They distinguish 'structural' and 'symbolic' resources. 'Structural' resources are influenced by wider political structures, such as the government, that shape opportunities for local energy initiatives to be realized. 'Symbolic' resources come in the form of non-material incentives. The increasing desire to strengthen community identity is evidently observed in society as local groups emerge in several different fields.

The environment has been pointed out by participants in a sustainable energy community in the UK, as revealed by a research conducted by Rogers et al. (2008). Chin-a-fo (2012) points out that, in addition to the concern for the environment, the need to be independent from large energy companies ass two of the main drivers of participation in local energy initiatives. Economic aspects such as adding local value, creating jobs and profit in the region, as well as profit for individual households, are reasons to set-up or participate in local energy initiatives. A general dissatisfaction of society with government effectiveness in implementing solutions aimed at reducing the environmental impact of society is also a motivator for individuals as well as communities to take part in these initiatives. Most local energy initiatives are based on a combination of these types of motives (Arentsen and Bellekom, 2014).

1.2. Conceptualizing Local Energy Initiatives

The decentralization of energy provision through local renewable energy initiatives appears on multiple levels, ranging from individual households to regional cooperative arranged organizations, and can involve a diverse composition of actors with different motives, responsibilities and forms of ownership. Scientific literature attempts to conceptualize the concept of energy decentralization however a coherent definition still remains absent. This is due to various interpretations on the degree of

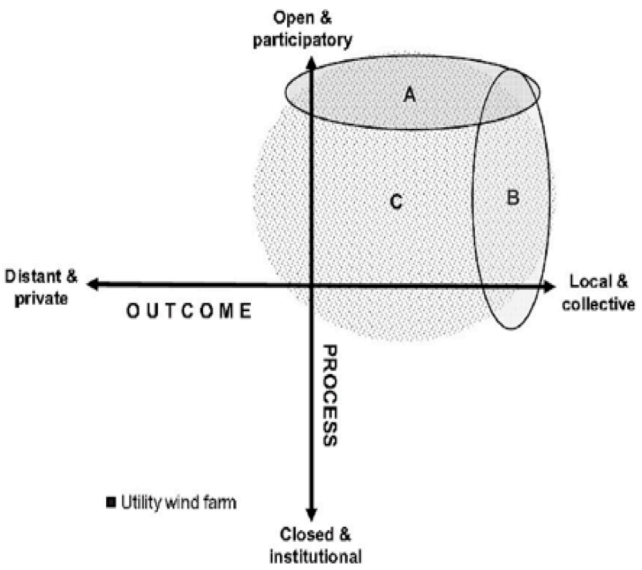
consumer participation, the geographical boundaries and the patterns of benefit for the community.

In terms of consumer participation, the literature distinguishes three models (Sauter and Watson, 2007; and van Vliet et al., 2005): Co-construction, co-production and co-provision. Among the three, co-provision is the most comprehensive since it implies an active consumer role, encompassing both co-construction - the development of energy systems, and co-production - the ownership and operation of these systems. Van Vliet et al., (2005) define it as *"the provision (including the generation, treatment, distribution and consumption) of utility services by a range of new intermediaries (e.g. consumers themselves, other organizations or sub-networks), alongside or intermingled with centrally provided services (e.g. public network or grid-provision)."* This definition allows for the inclusion of a broad range of activities and initiatives that function under different organizational characteristics in the field of energy supply and demand.

Also, the words 'local' or 'community' have been attached to projects and initiatives as part of the discourse for mainstream energy policy. However, to use these terms in policy discourse gives rise to the key question as to what 'community' should actually mean and include. Walker and Devine-Wright (2008) address this question by asking those involved in community renewable energy projects. There are three interpretations of the term 'community renewables' derived from the interviews with different actors. The first definition focuses on the *process* dimension and sees the necessity of the involvement of local people in the planning, setting up and, potentially, the running of the community project. The second definition focuses on the *outcome* dimension concerning the distribution of benefits among the participants. The third definition understands 'community renewables' as an expansive space, open to many different forms of project being given a community label. People here were less concerned about whether the project fulfilled the requirements to be labeled under 'community,' but were rather made sure that the project was actually moving forward and would lead to something productive and useful.

Based on these interpretations, they discover two key dimensions that underlie the views of policy makers, administrators, activists, project participants and local residents: 'process' and 'outcome'. The 'process' dimension is concerned with whom a project is developed and run by, who is involved and who has influence. The 'outcome' dimension is concerned with how the outcomes of a project are spatially and socially distributed (who the project is

Fig 1. Community Renewable Energy in Relation to 'process' and 'outcome' dimensions (Walker and Devine-Wright, 2008: 498)



for, who are the beneficiaries in economic and social terms). These are dimensions that are not of the technology itself, but are of particular social arrangements through which a given technology is being implemented and made useful (Walker and Devine-Wright, 2008). These two dimensions are put together in fig. 1 to form a space where different combinations of 'process' and 'outcome' can be positioned.

Walker and Devine-Wright (2008) used a conventional utility-developed wind farm as an example. It is placed at the bottom left of the diagram- a project that has minimal direct involvement of local people and is developed by a distant and closed institution that generates energy for the grid rather than for use in the locality. With this example, neither process nor outcome is locally focused. The 'ideal' community project would be found at the very top right of the diagram as one which is entirely driven and carried through by a group of local people and which brings collective benefits to the local community – a project that is both by and for local people.

All of these aspects must be taken into account in defining local energy initiatives. The following definition provided by Boon (2012: 10) considers the process and level of consumer participation, the outcome for the community, as well as the geographical boundaries:

> Local energy initiatives are projects *"initiated and managed by actors from civil society, that aim to educate or facilitate people on energy use and efficiency, to enable the collective procurement of renewable energy or technologies, to provide, generate, treat or distribute renewable energy derived from various renewable resources for consumption by inhabitants, participants or members who live in the vicinity of the renewable resource or where the renewable energy is generated."*

1.3. Research Question and Objectives

What were the key drivers for change in the local energy systems of Lochem and Saerbeck and how do these compare from an SNM standpoint?

Comparatively limited research has been done about the processes and conditions required for successful community energy projects, and on how to increase their influence on wider energy systems (Hielscher et al., 2011). However, transition theory literature has revealed how historic regime transformations developed from the build-up of projects in 'niches', or protected spaces where practices are different from the mainstream, that paved the way for radical alternatives. One particular branch of this literature (that will be applied in this study) developed around the concept of strategic niche management (SNM) as a framework for governing sociotechnical niches to promote desired systemic outcomes (Kemp et al., 1998). But this literature has until recently centralized on the *technological* aspects of sociotechnical transitions, forcing *social* innovation, movements, and actors out of the picture.

The concept of community-led 'grassroots innovations' as conceptualized by Seyfang and Smith (2007), places emphasis on *social* innovations developed at the community level. They characterize these innovations as *"networks of activists and*

organizations generating novel bottom-up solutions for sustainable development." Their model of 'green' sociotechnical niche innovations exhibits how the SNM theory can be applied in shifting the focus from technological to social, making it a suitable conceptual framework in understanding the role of civil society in the emergence and governance of sustainability transitions. As an analytical framework, this niche-based approach studies niche emergence and development (Smith, 2007) by focusing the analysis on social networks, learning process, expectations and participation of actors and resources in emerging niche practices.

The research question above seeks to understand and compare the ways in which 'grassroots innovations,' specifically the local projects in Lochem and Saerbeck as case examples, contribute to building energy niches against the background of mainstream energy regimes to bring about systemic change. In applying the SNM framework to these empirical phenomena, the findings may offer a new insight on how civil society initiatives might enrich sustainability transitions. In answering the main research question, the following sub-questions have been formulated:

1) What factors stimulated the emergence of these local energy initiatives? Who started them and what were the prerequisites necessary to develop these initiatives?
2) What were the challenges present in the socio-technical regime that the initiatives had to overcome?
3) Who are the key actor-networks in these initiatives (niche) and the key actor-networks in the regime?
4) Who were the 'pioneers', 'enablers', 'facilitators' and so-called 'niche managers' that set the local transition in motion?
5) How did civil society reinterpret, reinvent and reinforce the practices and norms? And what work is needed, and by whom, for social learning to take place?
6) What were the breakthroughs that lead to change?

1.4. Outline

Alongside the introduction of the problem and the main research question, this chapter attempted to conceptualize local energy initiatives as the main concept to be analyzed throughout this research. The second chapter will cover the theoretical context, where the literature on sustainability transitions will be briefly reviewed followed by an elaboration on the SNM framework as applied by Seyfang and Smith (2007) in connection to their concept of 'grassroots innovations'. The methodology will be presented in the succeeding chapter. The empirical background is presented in chapter four. The Multi-level Perspective will be applied in comparing the institutional and social context behind renewable energy in the Netherlands and Germany. After which, the origin, development and current state of the local energy initiatives in both countries are reviewed and compared. In chapter five, the Strategic Niche Management approach will be applied in analyzing and comparing the key drivers for change in the developments of Lochem and Saerbeck as grassroots innovations aiming to bring about system transformations. Chapter six serves as a

conclusion by pointing out the key drivers for change manifested in both cases and the implications of these findings to the initiatives themselves and to the development of the theory regarding the role of civil society in governing sustainability transitions.

2. THEORETICAL FRAMEWORK

2.1. Sustainability Transitions

Climate change is a complex problem, and although it is environmental in nature, it disperses into other spheres of existence, including global issues such as poverty, energy security, economic development and population growth. The reduction of emissions lies at the very core of resolving this worldwide dilemma with the transition from non-renewable energy towards renewable energy as one way of approaching this. Renewable energy technology is a concept that must be understood beyond its technical aspect, and must therefore be examined in a broader context as a sociotechnical regime involving social practices alongside technological advancements (Rohrache and Ornetzeder, 2006).

The energy supply sector, just like the water supply sector and transportation sector, is an example of a *sociotechnical system* consisting of actors (individuals, firms, collective actors) and institutions (societal and technical norms, regulations, standards of good practice), as well as material knowledge and artifacts (Geels, 2004; Markard, 2011; Weber, 2003). These elements are deeply intertwined and interdependent with one another, providing specific services for society and playing a crucial role for system transformation (Markard et al., 2012). The complex structure of these elements that reproduce technological practices is captured in what is called a *sociotechnical regime* (Seyfang and Smith, 2007).

In order for radical improvements in production and consumption systems to develop, innovation must take place at the scale of sociotechnical regimes. This innovation comes in the form of a *sociotechnical transition*, which is a set of processes that leads to a shift in sociotechnical systems (Kemp, 1994; Geels and Schot, 2010). This transition involves changes that take place along different dimensions (technological, material, organizational, institutional, political, economic, socio-cultural) including a broad range of actors over the course of a considerable time-span of around 50 years. New products, services, business models, and organizations emerge out of these transitions, complementing or eventually substituting the existing one.

Sociotechnical transitions differ from technological transitions in the sense that the former includes changes in user practices and institutional structures, in addition to the technological dimension (Markard et al., 2012). The emergence of a transportation system, with automobiles at its core, required the development of road infrastructure, fuel supply systems, traffic rules, user practices and the like to complement the transition. In addition, Geels provides historical examples of socio-technical transitions including the shift from sailing ships to steam ships (2002), the introduction of pipe-based water supply (2005a), and the shift from carriages to automobiles (2005b).

Sustainability transitions take place when established sociotechnical systems shift towards more sustainable modes of production and consumption through long-term, multi-dimensional, and fundamental transformation processes. Academic literature around these innovations for sustainability, under the heading ‘sustainability transitions,’ has recently emerged as an attempt to comprehend the dynamics, governance and directions of such sociotechnical transformations and social change

(Grin et al., 2010). Gaining attention over the recent years, it has become the central theme in the work of many organizations, including NGOS, government bodies, and researchers from the academe (Elzen and Wieczorek, 2005).

2.1.1. Strategic Niche Management

One branch of the sustainability transitions literature is Strategic Niche Management (SNM) (Kemp et al, 1998; Weber, 1999), a novel concept that was presented as a research model and policy tool to manage technological innovation within so-called niches. Although niches have been defined by the sustainability transitions literature in various ways, the SNM framework provides the following definition, characterizing niches as:

> *"A protected space where sub-optimally performing experiments can develop away from regime selection pressures. Niches comprise intermediary organizations and actors, which serve as 'global carriers' of best practice, standards, institutionalized learning, and other intermediating resources such as networking and lobbying, which are informed by, and in turn inform, concrete local projects (experiments)"* (Geels and Raven, 2006; Kemp et al., 1998; Schot & Geels, 2008).

In their paper, Kemp, Schot and Hoogma (1998) focused on how governments can manage the transition process to a different regime. Naturally, SNM is not limited to political actors but also to actors who want to incorporate new sustainable technologies into the market. The authors define what they mean by strategic niche management with the following definition (1998: 186):

> *"Strategic niche management is the creation, development and controlled phase-out of protected spaces for the development and use of promising technologies be means of experimentation, with the aim of (1) learning about the desirability of the new technology and (2) enhancing the further development and the rate of application of the new technology."*

This definition reveals the overarching objective of SNM to develop protected spaces for certain applications of a new technology (1998: 186). The aims are:

- To articulate the changes in technology and in the institutional framework that are necessary for the economic success of the new technology;
- To learn more about the technical and economical feasibility and environmental gains of different technology options, i.e. to learn more about the social desirability of the options;
- To stimulate further development of these technologies, to achieve cost efficiencies in mass production, to promote the development of complementary technologies and skills and to stimulate changes in social

organization that are important to the wider diffusion of the new technology; and

- To build a constituency behind a product (firms, researchers, and public authorities) whose semi-coordinated actions are necessary to bring about a substantial shift in interconnected technologies and practices.

The SNM framework studies niches in interaction with sociotechnical regimes, asking which trajectories a technological system could follow in order to most effectively change the existing regime. This sociotechnical transition involves changes that take place along different dimensions (technological, material, organizational, institutional, political, economic, sociocultural). Just like the metaphor of the 'seamless web' coined by Hughes (1987), physical artifacts, organizations, natural resources, legislative artifacts must be combined for a certain technology will achieve its functionalities. An academic literature regarding sustainability transitions, the Multi-level perspective (MLP) has emerged to capture the relationships in the 'seamless web' (Geels, 2005; Loorgbach, 2007; Rip and Kemp, 1998).

SNM is built on the Multi-level Perspective (MLP) of sociotechnical change. It comprises of a set of conceptual tools for understanding and governing transitions towards sustainable development. Based on the notion that *sociotechnical niches* are protected spaces where new practices can develop, it places the niche against a dominant sociotechnical regime in attempts to understand how niches might develop beyond the regime. In relation to the SNM approach, the MLP approach has emerged to capture the relationship between micro-level actors and macro-level structures (Geels, 2005; Loorbach, 2007; Rip and Kemp, 1998). It comprises of a set of conceptual tools for understanding and governing transitions towards sustainable development. Based on the notion that *sociotechnical niches* are protected spaces where new practices can develop, it places the niche against a dominant sociotechnical regime in attempts to understand how niches might develop beyond the regime.

The MLP organizes an analysis of the sociotechnical system within three levels: the landscape, regime and niche. The *regime* level consists of all the rules and other social constructs concerning the technology in question. Highly institutionalized market rules, government policies, cultural meaning, user practices, consumption habits and scientific knowledge characterize today's fossil fuel-driven regime. Mainstream conceptions of our globalized and industrial world, where high consumptions of oil and gas have been associated with wealth and progress, significantly hamper the development of sustainable energy (Seyfang & Haxeltine, 2012). Our societies deeply ingrained habits of energy consumption, embedded within wider infrastructures and user practices, also add on to this (Seyfang & Smith, 2007).

The *landscape* level makes up the larger context of the socio-technical regime. According to Geels (2002), the metaphor 'landscape' is chosen because of the literal connotation of relative 'hardness' and the material context of society. The socio-technical landscape contains a set of heterogeneous factors such as oil prices, economic growth, cultural and normative values, and public awareness of environmental problems. Dramatic changes that happen at this level may influence and pressure the development of the energy system but is beyond the control of the

regime. The oil crisis of the 1970s, the Kyoto Protocol of the United Nations, the European Climate Change Program – all are examples of world-wide events that have influenced nations' understanding of the environment and the role of renewable energy.

And *niches* are radical innovations that deviate from the regime and thus provide opportunities to develop technologies that go against the dominating regime (Geels, 2002). Niches do not necessarily have to refer to a technology but could also include the social arrangement that supports the development of the technology in question. Lochem Energie and Klimmakomune Saerbeck are niches in the sense that their social arrangement as local energy initiatives fosters the use and development of renewable energy (in the form of PV panels, wind turbines, bioenergy).

The question now is, how do regime shifts occur. Although there is no general set of rules since each transition is unique, case studies suggest that there are a number of elements that are present in technological regime shifts. First of all, there is a deep interrelation between the technological progress and the social and managerial environment in which they are applied. New technologies pave the way for new user-supplier relationships and also specific managerial problems. Second, specialized applications come into play in the early phase of technology development. At this stage, there is usually little to no economic advantage of the technologies. Third, these technologies tend to involve 'systems' of related techniques. The economics of the processes thus depend on the costs of particular inputs and availability of complementary technologies. And lastly, social views on the technology are of considerable importance. This includes the engineering ideas, management beliefs and expectations about the market potential, and perception of the technology on the user-side. These beliefs and views on the new technology are highly subjective and will differ across communities, hence may become either a barrier or a catalyst to the development of a particular technology (Kemp et al., 1998).

As historical evidence suggests, entrepreneurs/system builders and niches play an important role in the transition process. Looking back in history, Edison was the inventor/entrepreneur who built the first electric system; and Insull was the manager/entrepreneur who managed the expansion of the electric system, uniting local systems into larger ones. Complementary to this is the availability of niches or domains for application. To give examples, clocks were first used in monasteries where day-to-day activities were arranged according to strict timetables; and the wheel was first used for ritual and ceremonial purposes (Ibid). These niches set in motion the take off of a new technology. Aside from demonstrating the feasibility of a new technology, niches help in strengthening the foundation of a new technology, and to stimulate learning processes and institutional adaptations.

As earlier mentioned, the primary aims of SNM are stimulating learning about problems, needs and possibilities of a technology, building actor networks, alignment of different interests to a goal, altering the expectations of different actors and fostering institutional adaptation. Successful niches facilitate the diffusion of innovative practices and systems and theory suggests that niches can influence the regime by enabling replication of projects within the niche, bringing about changes through multiple small initiatives; by enabling constituent projects to grow in scale

and attract more participants; and by facilitating the translation of niche ideas into mainstream settings.

Indeed the SNM theory claims that the successful emergence and growth of niches depends on three key processes: 1) the *management of expectations*, 2) the *building of social networks*, and 3) the *learning processes*. *Managing expectations* concerns how niches are presented to the public and whether they live up to the promises they make about performance and effectiveness. In *building social networks*, niches are best supported when they embrace many different stakeholders, who can call on resources from their organizations to support the niche's growth. Finally, *learning processes* do not only contribute to everyday knowledge and expertise but also to 'second order learning,' where people question the assumptions of regime systems, being the most effective way of niche development.

2.2. Local Energy Initiatives as "Radical Innovations"

In practice, different actors (state policy makers, local authorities, NGOs, citizen groups, special interest groups) may take the lead in carrying on strategic niche management depending on who is best qualified to take on the task. Niche management, just like any other form of management, is not the responsibility of a single actor but a collective endeavor. Some actors, either as an individual person or as an organization, are likely to take on larger roles as 'niche managers' (Ibid). Seyfang and Smith (2007) argue that regimes can undergo radical changes initiated by a network of pioneering organizations, technologies and users that form a niche practice.

Seyfang and Smith (2007) use the term 'grassroots innovations' in describing the *"networks of activists and organizations generating novel bottom-up solutions for sustainable development."* These innovations are also solutions designed to *"respond to the local situation and the interests and values of the communities involved."* Community led 'grassroots innovations' place emphasis on social innovations developed at the community level. Their model of 'green' sociotechnical niche innovations will provide the most suitable framework for this study in analyzing the role of civil society in the emergence of sustainability transitions. As an analytical framework, this niche-based approach studies niche emergence and development (Smith, 2007) by focusing the analysis on social networks, learning process, expectations and enrolment of actors and resources in emerging niche practices.

Although, an intriguing question has been raised regarding whether or not local energy initiatives should be considered as 'seedbeds' for innovation (Arentsen & Bellekom, 2014). Arentsen and Bellekom (2014) turned towards Schumpeter's (1934) modern notion of innovation. According to him, innovation implies the introduction of five kinds of new approaches to already existing resources by entrepreneurs: new products, new production processes, new markets, new organizations and new input. Furthermore, Schumpeter (1976) viewed innovation as part of a trilogy of change: invention, or the generation of new ideas and knowledge; innovation, or the transformation of inventions into new products and processes; and diffusion, or the spread of these products and processes into the economic process.

Arentsen and Bellekom (2014) argue that local energy initiatives are indeed 'seedbeds' for innovation when understood from the Schumpeterian understanding of innovation. Local energy initiatives can be considered as Schumpeterian entrepreneurs who came up with new combinations of knowledge and resources related to the electricity supply. Rather than developing new knowledge, they used already existing models and technologies and applied them to their local electricity supply, developing new ways of organizing production and consumption.

Furthermore, Hielscher et al (2011) explain that local energy initiatives are more effective than typical bottom-down solutions because of the following reasons: the multi-faceted approach, the ability to change contexts, and the focus on engagement. Regarding the multi-faceted approach, community energy projects often aim to combine a variety of activities from conducting workshops to setting up voluntary initiatives and working groups. In Saerbeck, for example, they have what is called an "Energiestammtisch Saerbeck" ("Stammtisch is German for "regular's table," which culturally denotes a group of people who gather regularly to discuss important matters over beer) where experts in renewable energy come together once a month to simply talk about energy, exchange ideas, and to assess their progress (Personal communications with Interviewee 6, 2014). Other initiatives sometimes connect religious beliefs with practical actions like demonstrating different ways of living and consumption practices for example (Moloney et al., 2010). As part of their campaign, Klimakommune Saerbeck created a simple home video featuring the minister of the local parish along with other familiar members of society such as the head of the local sports club to advocate the transition towards green energy (Personal communications with Interviewee 6, 2014).

In the past, policy makers who wished to steer energy-related behavior were guided by the assumption that individuals are rational decision-makers capable to take full control of their behavior. But Wilhite et al (2000) proved that this assumption is of limited efficiency. Individuals are not able to take full control of decisions; it is rather the socio-technical infrastructure and conventions that are more influential. This is why, when faced by a problem that sounds impossible as tackling climate change, individuals feel disempowered (Thogersen, 2005). Therefore the context, or the socio-technical systems within which people live, needs to be altered in order to enable more sustainable manners of consumption. Community-led approaches become innovative in the sense that they aid in the process of people changing their everyday practices together. Furthermore, individuals are limited in their capacity of changing societal structures (Hielscher et al, 2011).

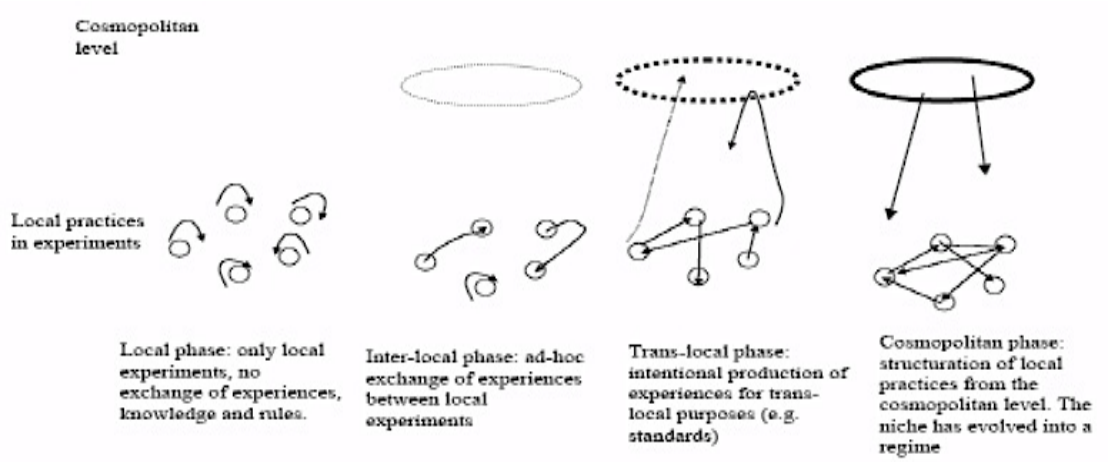
The focus on participation is another key characteristic that differentiates local energy initiatives from other approaches that address energy-related problems since they allow members to submerge themselves as project participants (Walker and Cass, 2007). Lochem Energie, for example, allows their members to volunteer for working groups that deal with specific projects the initiative is working on (Personal communications with Interviewee 2, 2014). This brings together people from different backgrounds who can learn from one another. Members are more likely to participate given different reasons that are not predominantly for self-interest but rather because of the potential benefits to community and the sense of duty and importance (Hielscher et al, 2011). Participation, research shows, is often motivated by the

desire to create a space where alternative values may be practiced and where experimenting with alternative ways of living is enabled (Seyfang, 2009).

2.3. Identifying Niches

The previous section has justified that community energy initiatives are indeed innovative by virtue of their sustainability against the incumbent regime. But in order to appropriately apply the SNM theory to assess the extent of which niche processes occur and to see what they must do to overcome challenges, the question then is: do these local energy initiatives constitute a niche? Raven et al (2010) have illustrated how a collection of local innovative projects that initially share no real connection can gradually develop into a niche. As shown in the figure 2 below, projects begin to network with each other and exchange learning. This then leads to the development of a range of niche activities such as standardization, shared learning conferences and the like, making it easier to set up subsequent projects and thereby developing the niche.

Fig 2. Trajectory of social learning carried by community projects (Raven et al, 2010)



Raven et al (2010) further explain that niche-theory has gradually shifted in its focus from individual projects seen as 'carried by local networks and characterized by local variety' towards the 'global level'. Instead of regarding individual local energy initiatives as numerous niches, it is a number of them that create the 'global level' niche. Specific community energy initiatives such as the installment of PV panels, the use of central heating, renting out of electric cars, giving out seminars and hosting events are therefore 'projects,' serving as smaller units of analysis making up the overall 'abstract' niche.

Determining the overall 'abstract' niche is not apparent, considering the diverse characteristics of community energy, as explained by Walker and Devine-Wright (2008). Local energy initiatives can diverge, for example, in relation to their focus of improving the energy system, energy efficiency, behavior towards change and even their main source of renewable energy, which can further be subdivided into solar, wind and hydro. Raven et al (2010) point out, however, that the distinction

between local experiments, niches and the regime against their boundaries are “analytical, and not ontological” (p. 63). Niches exist to provide a way of thinking through the regime, landscape and niche interaction of niche developments. Hielscher et al (2011) agree that, “it would make most sense to conceive of all the diverse community-led energy initiatives together as one niche, as they share the common focus on ‘sustainable energy’ (p. 13)”. Therefore, the community-led projects of Lochem Energie and Klimakommune Saerbeck could be considered the ‘abstract’ niche.

3. METHODOLOGY

Given that this paper is interested in learning how local groups develop, how participants interact and how social learning takes place in attempts to influence wider society, the 'grassroots innovations' and SNM would serve as a suitable theoretical framework in explaining this empirical phenomenon. The SNM theory claims that successful niche development and growth depends on the following factors: *expectations* contribute to successful niche building when there is a multiplicity of actors participating, if it is specific, and if it is substantiated by ongoing projects; *social networks* contribute when their membership is broad (plural perspective) and deep (commitment by members); and that *learning processes* do not only accumulate facts, data and first-order lessons, but also generate second-order learning about alternative cognitive frames and different ways of valuing and supporting the niche (Hielscher et al, 2011). This research will follow the argument that niches grow through the replication of projects; that social learning across replicated projects facilitates adaptations; and that this ultimately translate into new business models and markets.

The local energy initiatives of Lochem and Saerbeck will be mapped onto the SNM framework to see what this theory can say about the factors that led to change in their local energy systems. This knowledge will be used to identify how these initiatives can further their development and help them overcome current challenges.

3.1. Case Study Selection

The transition towards renewable energy requires a shift in behavior that goes hand in hand with changes in infrastructure, institutions and the mode of governance therefore cannot be understood as isolated from the context where it emerges. It is expected that these cases may vary from one case to the other across Europe. With that said, a comparative case study analysis becomes the appropriate methodology for this research. The case study method, as Yin defines it (2004: 13), is *"an empirical inquiry about a contemporary phenomenon, set within its real-world context – especially when the boundaries between phenomenon and context are not clearly evident."* Compared to other methods, the strength of the case study method lies in its ability to examine a case within its real-life context.

Following Yin's (2004) lead, two case studies were selected and will be compared in this research. Lochem Energie and Klimakommune Saerbeck are considered frontrunners among the local energy initiatives. Being ahead in this respect makes it difficult to compare them with other less developed initiatives in their respective countries. In addition, given the trade-offs in doing a multiple- or single-case study analysis, plus the limited time frame, the case study selection is limited to two in order to gain a closer and deeper understanding of the causal effects for change in local energy initiatives.

The first case study is Lochem, a municipality in the eastern part of the Netherlands, where local actors are currently attempting to incorporate decentralized renewable energy into an existing network. This project, which was initiated by the Lochem Energie citizens, encourages residents *"to consume less energy, to generate their own energy locally using solar panels, and to exchange that energy*

between themselves" (NL Agency, 2012). Over 1,000 households involved in the initiative are actively willing to contribute to a sustainable Lochem.

The second case study is Saerbeck, a municipality located in the western part of central Germany. Based on the initiatives of the local community in 1989 to solve the climate crisis, the municipality of Saerbeck decided to take steps to becoming climate-neutral by 2030, thus giving birth to the Klimakommune (German for climate community). Energy turnaround, climate protection and climate adaption in practice – this is what Saerbeck strives to stand for. The municipality developed an Integrated Climate Protection and Climate Adaptation Concept, where the participation of the local population becomes a central proponent. Abiding by the words "think globally – act locally," the whole village of Saerbeck is heading for a climate-friendly future (EnergieAgentur NRW, 2013).

3.2. Data Collection

It is typical for case study research to collect data from multiple source of evidence. Yin (2009) identifies six primary sources of evidence: documentation, archival records, interviews, direct observation, participant observation, and physical artifacts. This study draws evidence from three out of the six: 1) documents, which include reports, publications, previous studies and newspaper articles referring to the initiatives; 2) interviews, which, in relation to this study, take the form of open-ended interviews with individuals affiliated to the initiatives; and 3) direct observation, which includes a site visit to Saerbeck and the Bioenergy Park. In order to increase the reliability of the data and the process of gathering, the triangulation of sources will be observed during this phase of data collection. This occurs when at least three independent sources all lead towards the same set of events, facts, or interpretations.

As mentioned, in-depth interviews are common sources of evidence for case studies. If done effectively, according to Yin (2009), the flexible open-ended format can reveal *"how case study participants construct reality and think about situations."* By conducting interviews with key individuals connected to these initiatives, data on the origin, development, organizational characteristics and other important insights about these local energy initiatives can be drawn. A questionnaire consisting of 10-12 open-ended questions (varied per interviewee) served as a general outline of issues to be covered, but at the same time gave room for questions generated spontaneously. The following interviewees have been selected:

Table 1. List of interviewees

#	Position	Affiliation	Date
1	*Researcher on Participation*	LE	23-06/17-06-14
2	*Former Alderman of Lochem*	LE	02-09-14
3	*"Active" resident of Lochem*	LE	14-08-14
4	*Former Village Ambassador*	LE	19-09-14
5	*Project Manager*	KS	20-06/23-09-14
6	*Public Relations*	KS	24-05-14

Four individuals were requested for a phone interview regarding Lochem Energie given their different affiliations with the initiative. Interviewee 1 was one of the six founding members and a former member of the board for Lochem Energie. He is currently responsible for research in partnership with the University of Twente on how to stimulate interest among the residents of Lochem in Lochem Energie. Interviewee 2 was also one of the six founding members. For the past eight years, he was serving as a public official (alderman) in the local municipality of Lochem. Interviewee 3 is one of the more "active" residents of Lochem who is currently involved in another local initiatives by the municipality of Lochem, ADEL. And finally, Interviewee 4 volunteered to be a village ambassador[1] for Lochem Energie. However, due to Lochem Energie's lack of communication and clarity as to what the coherent responsibilities of an ambassador were, he ended up starting a similar initiative within Lochem called Laren Energie[2].

As for Klimakommune Saerbeck, two individuals from the steering committee were contacted for interviewing. Interviewee 5 currently serves as the project manager and was interviewed via Skype. Although not a resident of Saerbeck, he was invited by the mayor, Mr. Wilfried Roos, to take part in the development of this initiative given his background as an engineer in regional development. There were multiple attempts to interview Mr. Roos, but his schedule kept him unavailable. Questions meant for him were then readdressed to the project manager. The interview with Interviewee 5 was conducted in combination with an excursion to the municipality of Saerbeck and the Bio Energy Park. Knowledgeable of the fundamentals that make up Klimakommune Saerbeck, he is mainly responsible for public relations, such as managing the webpage, creating posters, handling visitor groups and the like.

In order to effectively and systematically evaluate information gathered from an open-ended and semi-structured interview, full transcripts were made for all the interviews. All interviews were recorded onto a laptop and were then transcribed in Rich Text Format (interview_name.rtf), which were then uploaded to Atlas.ti.

3.3. Data Analysis

To begin, the key development of the two case studies are described in a chronological manner. Next, these key developments were analyzed using the theoretical concepts in SNM framework. There is no single "cookbook" procedure when it comes to analyzing case study results, since case study scholars recommend a variety of procedures – from Levy's (1988) explanatory-exploratory methodology to Yin's (2009) case study protocol. But the development of computer

[1] Lochem is a municipality that is made of smaller villages and hamlets. The idea of having village ambassadors was intended to gather more participants and at the same time tackle the challenge of communication. Village ambassadors are meant to represent Lochem Energie in their respective villages and to advocate the benefits of being a member to the residents of Lochem (Personal Communications with Interviewee 4, 2014).

[2] Laren Energie is one of the working groups overseen by Wakker (Werlen Aan Kansen, Knelpunten en Rechten or Working on Opportunities, Obstacles and Rights) Laorne, an association that aims to represent the interests of Laren from a grassroots level. Laren Energie is the working group headed by Paul de Koning that implements projects linked with renewable energy, including Vedel (elaborated on in chapter 5) (Wakkerlaorne, 2014).

software programs makes this tedious process moderately bearable. ATLAS.ti is a computer program used mostly for qualitative data analysis, allowing researchers to uncover and systematically analyze complex phenomena hidden in unstructured data, such as text and audio data. The program assists the researcher to locate, code, and annotate findings in primary data material, to weigh and evaluate their importance, and to visualize the complex relations between them (Lewins, et al., 2007), making it a suitable aid in analyzing the data gathered from interviews.

There is no automated algorithm when analyzing narrative data. It is the researchers responsibility to define the data in broader themes and create an algorithm or a set of rules, tags or codes befitting the case studies. ATLAS.ti allows the researcher to efficiently organize and process vast amounts of data through coding. Around 30 pages worth of transcribed interviews were fed into ATLAS.ti. Each transcript was carefully worked through where in discrete phrases or paragraphs were tagged with a code. The codes can be categorized into two groups: one category based on the MLP approach and another based on the SNM perspective. These codes along with a brief explanation as to when they apply are summarized in table 2.

Table 2. Codes created for ATLAS.ti in analyzing semi-structured interviews

Theoretical Background	Code	Operationalization
MLP	*Reason behind emergence*	Refers to the motivating factors that led to the decision of forming a local renewable energy initiative (e.g. Dissatisfaction with energy provider; concern for the environment).
	Challenges (Diffusion)	Refers to challenges presented by the regime (e.g. Conservatism of consumers; effective advertising by larger energy companies).
	Challenges (Intrinsic)	Refers to challenges present within the niche beginning from their inception (e.g. The lack of financial resources; decreasing number of volunteers).
SNM	*Networking (Internal)*	Refers to actor-networks internal to the niche that supports its development (e.g. Sports clubs, church, school, or other community initiatives).
	Networking (Local)	Refers to actor-networks at a local level in relation to the municipality.
	Networking (National)	Refers to actor-networks at a national level.
	Networking (International)	Refers to actor-networks at an international level.
	'Niche Manager'	Refers to the individual whose significant role in the development of the niche is emphasized by at least two interviewees.
	Management of Expectations	Refers to the quality of communication (e.g. Frequency and content of meetings; mediums of communication) between the management team and the participants.
	Objectives (Long-term)	Refers to the all-encompassing objective of the

		local energy initiative.
	Objectives (Short-term)	Refers to the short-term goals of the local energy initiative that are "smaller steps" towards achieving the bigger goal.
	Milestones	Refers to what the interviewee would define as a noteworthy achievement.
	Social Learning	Refers to activities and projects that stimulate social learning. Also includes evidence that reveals changes in participant's behavior towards renewable energy (e.g. Purchase of electric vehicle).

3.3.1. Comparative Analysis

A comparative case study approach is chosen in order to bring into view the differences and similarities these initiatives had throughout their development. From a MLP approach (chapter 4), the national energy situations of the Netherlands and Germany were examined to get a grasp of the regime these initiatives are faced with and whether these systems support or hinder the development of the 'abstract' niche. After which, the characteristics of the two initiatives are then compared – which covers the number of participants, the size geographically and population-wise, the number of years officially in existence, the source(s) of renewable energy, and the organizational arrangement (how relevant their organizational arrangement is to the definition of local renewable energy initiatives by Boon, 2012:10).

Zooming in further, the development of the 'abstract' niche is then examined from SNM lens (chapter 5). The SNM theory suggests that the building of social networks, the effective management of expectations, and the facilitating of social learning best support niche development. The guiding question at this point then becomes – how well have these initiatives attended to these factors? The codes under the SNM category will serve as gauges for comparing the two case studies central to this research, Lochem Energie and Klimakommune Saerbeck. This will be based on the interviewees' responses regarding how these initiatives define and measure development (based on what they identify as objectives and milestones), how they are working towards further development, and whether they have identified the building of networks, the management of expectations, and the stimulation of social learning as reasons behind their development.

This study examines the extent of which the SNM literature is able to explain the driving factors in the development of these empirical phenomena with the aim that this may lead to insights as to how the effectiveness of these factors may be enhanced. In addition, this study aims to contribute to the development of the theory to better understand the role of grassroots innovations in the governance of transitions.

4. MULTI-LEVEL PERSPECTIVE: THE NETHERLANDS AND GERMANY

The sociotechnical regime and landscape of the Dutch and German energy situation are assessed in this chapter in order to better understand their influence on the developments of the energy systems of the municipalities of Lochem and Saerbeck.

4.1. The Netherlands

4.1.1. The Dutch Energy Situation

The Netherlands lags behind most countries in the EU in the relative production and consumption of energy from renewable sources, despite the association of the Dutch with the windmill and the nations historical usage of wind power to drain water and grind grain. The Dutch energy regime is dominated by natural gas, covering roughly 50% of the primary energy supply. As of 2010, renewable energy sources contribute around 4% (Statistics Netherlands, 2010).

The goal of national energy policy during the 60s and 70s was the high penetration of natural gas for various applications and in all sectors, which at the time was based on the large Groningen gas field (Nijkamp and Perrels, 2009). Then came the first oil crisis of the 1970s, which led the nation to reexamine their energy sources and thus increased the involvement of the national government in the energy field. Attention focused on the diversification of primary sources and improvement of energy efficiency, which included shifts in the shares of primary sources used for power generation. This meant more coal and virtually no oil.

But the disaster that was the Chernobyl Accident of 1986 left the nuclear debate unsettled. This brought rise to discussions of diversifying the energy mix with the growing awareness of global warming and the need to reduce CO_2 emissions. Borssele (apart from Dodewaard plant that halted production in 1997) is the only active nuclear reactor used to produce energy in the Netherlands that came in operation in 1973, currently accounting for 3.9% of the country's electricity (World Nuclear Association, 2014). In 1994, the parliament voted to phase out nuclear power in line with the nuclear waste management. But with the new government in power in 2003, the shutdown was delayed up until 2006 when they decided that Borssele would remain open until 2034. After the elections in 2010, the government was open to the idea of building a "Borssele 2." Although, this idea was abandoned in 2012 by Delta Energy, a prime investor, due to the NIMBY (Not In My Backyard) community protest, the overcapacity of the Dutch grid following the economic crisis, the uncertainty about Dutch policies on CO_2 emissions trading and the negative image of nuclear power succeeding the Fukushima incident of March 2011 (Delta, 2012).

As a response to the EU directive on renewable energy (EC Renewable Energy Directive 2009/28/EC), the government set a target of 14% renewable energy by 2020, which is modest compared to their European counterparts. The Sustainable Energy Incentive Scheme Plus (SDE+) was launched in July 2011 to foster the most cost-effective technologies as a follow-up to the Sustainable Energy Incentive Scheme (SDE). Through the SDE+, the government subsidizes RE through feed-in

tariffs for the purchase of private solar panels and by compensating wind turbine exploiters for net losses. Part of the policy framework was the Green Deal that was presented in October 2011, constituting an arrangement between the Dutch government and society.

In order to reach the goal of 14%, the government turns towards large business partners rather than the local communities. This is due to the dominance of the Ministry of Economic Affairs in the Dutch energy sector. Also working closely with the Agentschap NL, the Environmental Assessment Agency (PBL) and the Social and Economic Council (SER), this creates an approach on renewable energy planning that is more economically inclined (Oteman, et al., 2014). Apart from government actors, market parties that are mostly fossil fuel-oriented also play an influential role (Royal Dutch Shell, Exon and Gasunie).

Gas revenues of 14 billion euros in 2012 explain the Netherlands' interest in the domestic gas and fossil-fuel dependent industry. In 2008, the government stated that it facilitates the energy industry and that market parties determine the energy mix by investing in production facilities and by engaging in international trade (CBS, 2012). Apart from these "fossil lobbyists"[3] or companies with electricity or gas as their products, sectors such as agriculture and transport are also heavily subsidized for their use of fossil fuels, forming a strong lobby as well. In addition, there is no large industry for building renewable energy facilities (unlike the solar panel industry in Germany) and although a few NGOs for renewable energy exist, they have relatively little political influence or financial means (Oteman, et al., 2014).

As Oteman et al. (2014) conclude, renewable energy in the Netherlands can be described as having a business-oriented policy arrangement. Recent policies have become more economic-oriented, focusing on 'high potential' projects through the Green Deal subsidy system that rewards projects that are economically viable. Policies are framed in terms of cost-benefit analysis, risk avoidance rather than innovation. The primacy of the department of Economic Affairs means that policies lean towards achieving energy security and affirming the international competitive position of the Netherlands. Market parties remain dominant in terms of steering the energy mix. Although policy-making is centralized, provinces and municipalities are given the freedom to implement their own strategies. The government does set minimum requirements for renewable energy production and consumption and the upcoming Energy Agreement promises a more active and steering role for the government for RE production. Looking at the bigger picture, sustainability and climate change are not considered big issues and hardly part of the dominant policy discourses (Ibid).

4.1.2. Local Renewable Energy Initiatives in the Netherlands

With the exception of the traditional wind cooperatives, Dutch community initiatives are relatively new. Oteman et al. (2014) characterize community initiatives in the Netherlands as a very young yet rapidly developing phenomenon. However, these initiatives have small influence and receive little attention from the dominant

[3] This collectively refers to actors in the market parties, large natural gas-, oil- and coal-based companies alike, including: Gasunie, Royal Dutch Shell, Exxon, Eon, Nuon/Vattenfall, Essent/RWE and Electrabel/GDF Suez (Oteman et al, 2014).

government and market players and are thus limitedly supported through rules, subsidies and other active governmental support.

There are two types of initiatives in existence in the Netherlands today: the classic wind cooperative and, what Oteman et al. (2014) like to call, the "new style" local renewable energy companies (*Lokale Duurzame Energiebedrijven* in Dutch or LDEB). In the late 1980s and early 1990s, 25 wind cooperatives emerged from the anti-nuclear and pro-environmental movements. Most of them still exist while some have merged and only a few have emerged in the past decades. Usually found in rural areas, more commonly near the shores, members of such wind cooperatives collectively own and exploit one or more wind turbines. Apart from this, these initiatives became involved in other activities such as: providing information about other renewable energy or sustainability practices. Collectively owned facilities usually sell their electricity on the market to large RE suppliers, such as Green Choice and Eneco. It is unprofitable for these cooperatives to collectively exploit facilities for decentralized energy provision to their members since net metering is not prohibited. Out of 31 wind cooperatives, two (Zeewind and de Windvogel) sell directly to their members (Oteman et al., 2014).

There are over 200 of these local initiatives involved in renewable energy or LDEBs (Ibid, 2014). Found in cities and rural areas alike, these initiatives adopt a municipal identity as reflected in their names. Most of these initiatives are still in the planning phase, focused on the internal organization and the development of a sound business plan. Although most LDEBs do not produce renewable energy yet, there are a wide variety of plans including the installation of solar panels on public roofs, the purchase of "green electricity" through collective contracts, and even manure fermenting. These initiatives aim to promote energy savings, promote private renewable energy production, facilitate collective renewable energy production and supply renewable energy to their members. Overall, these initiatives aim to strengthen the local economy through energy savings and revenue from joint projects; and to provide a sustainable environment for their residents (Ibid, 2014).

4.2. Germany

4.2.1. The German Energy Situation

Germany's renewable energy sector is among the most innovative and successful worldwide, even being called "the world's first major renewable energy economy." In the first half of 2012, Germany produced a record high 26% of energy from renewable sources, with an energy mix consisting of 9.2% wind, 5.7% biomass and 5.2% of solar power (BDEW, 2012). In line with the EU directive on renewable energy (EC Renewable Energy Directive 2009/28/EC), the government set a target of 35% renewable energy by 2020 (2.5 times the goal set by the Netherlands).

Behind Germany's reputation is the *Energiewende* (The literal translation from German is "Energy Turn". But in a cognitive linguistic sense, *"Wende"* could mean a transition or switch), which encompasses a transition from petroleum and nuclear-based energy towards sustainable energy. It was initiated in the early 1980s as people became more aware of environmental and climate issues, with the Chernobyl disaster of 1989 acting as a catalyst. The attention shifted from the

management of supply to demand – from a centralized to a decentralized provision of energy. The planning process for renewable energy thus became more democratic, even though the state maintains a dominant steering role where overall targets are decided top-down (Oteman et al., 2014).

The system of energy production consists of actors from multiple government levels, large market parties and a large number of small locally owned renewable energy facilities. The so-called "big four," Eon, EnBW, RWE (three predominantly German-owned utilities) and Vattenfall, are market parties that own over 80% of fossil fuel and nuclear-based energy production facilities in the country (Buchan, 2012). These large industrial players represent an influential lobby for fossil fuels and nuclear power. Only 6.5% of RE facilities are owned by the 'big four,' in comparison to the 40% owned by private households and another 10% by farmers, reflecting their lack of interest (Ibid). These numbers represent the public's opinion that is strongly in favor of renewable energy over fossil fuels. In addition to growing concerns about nuclear power exploitation, renewable energy projects also create revenue, financially benefiting villages and private owners (Oteman et al., 2014).

The "big four" are behind the nuclear lobby that traditionally had a lot of power in Germany. Effectively arguing that nuclear power will serve as a 'transition tool,' a national long-term strategy for extending the run-time of nuclear power plants changed, the course of the *Energiewende* in 2010. However in 2011, the argument of the "big four" was refuted after the Fukushima incident alongside strong anti-nuclear protests throughout Germany. Public opinion dominated over the strong nuclear lobby. Chancellor Merkel designed a new RE policy scheme in which nuclear power will be phased out completely by 2022. This will be replaced by electricity form renewable sources, natural gas turbines, a decrease in consumption coupled with demand side management.

Part of this policy scheme is the Renewable Energy Act (*Erneuerbare Energien Gesetz*, EEG) that initially came into force in 2000 and was revised in August 2014, which promotes renewable energy mainly through feed-in tariffs with set rates for 20 years to ensure the profitability of each renewable energy technology. For 20 years, renewable energy producers receive technology-specific and guaranteed payment for their electricity generation. This Act, one of the numerous means of subsidizing renewable energy for private households, includes a subsidy scheme for renewable heating in building renovations. In addition to this, Germany has an environmental taxation scheme for environmentally unfriendly activities (e.g. use of fossil fuels) under the Polluters Pay Principle, which in essence translates to "whoever consumes more, pays more."

The discourse that surrounds German government policy is an integration of multiple motivations including energy, anti-nuclear sentiments, climate change, and environmental protection. Industrial opportunities, security of supply and the reduction of greenhouse gas emissions are the main drivers of German energy policy. But nonetheless, policy-making is based on ethical issues regarding the environment. Compared to other European countries, this is more heavily considered in the decision-making in Germany (Oteman et al., 2014). In comparison to the Dutch policy discourse, energy policy in Germany is part of open public debate, including demonstrations of 210,000 people demanding the closing all nuclear power plants following Fukushima and the historic win of the Green Party in the Baden-

Württemberg state election of 2011. As Oteman et al. (2014) point out, the German government highly prioritizes the energy transition and it acknowledges an active role for decentralized projects, including different renewable energy initiatives of different sources and ownership.

4.2.2. Local Renewable Energy Initiatives in Germany

The growing number of citizens' energy cooperatives (*Energiegenossenschaften* in German) and municipal energy companies (*Stadtwerke* in German) add to the political and social aspect of Germany's energy transformation, mostly because their bottom-up approach is in line with the federal government's goals (Buchan, 2012). Dating back to the early 20th century, decentralized cooperatives (based on fossil fuels) have already been in existence to assure the provision of electricity in remote areas. The *Stadtwerke* that provide heat and electricity were initially owned by the municipality and are now partly privatized or owned by local energy cooperatives. Their number have risen dramatically since 2009, reaching over 650 today (September, 2014), with a growing interest in local 'green' solutions for energy. Most of them have their own facilities or are in the process of construction (Jobert et al., 2007). Their projects include PV systems on public roofs, biomass-based heating and even manure fermenting.

Although a relatively new phenomenon in Germany, solar cooperatives make up the largest group of cooperatives in the country. Their number has risen drastically in the past years from 4 to 200 in just four years from 2007 to 2010. Wind cooperatives (*Bürgerwindparks* in German) on the other hand, form a smaller group but have a longer history of development and a larger installed capacity. Founded in the early 1990s and enabled by the 1991 feed-in legislation, there are 45 wind cooperatives operational or under development today. These wind parks adopt a different model of ownership in comparison to the traditional cooperatives. In 2010, private citizens and local initiatives owned an estimated 50% of onshore wind turbines (Schreuer and Weismeier-Sammer, 2010).

There is a variety of renewable sources and models of participation used among local energy initiatives in Germany. Private households own half of the renewable energy production facilities, 40% being owned by cooperatives and 10% by farmers. Solar powered cooperatives and wind parks have proven most successful and prominent. These initiatives can be found in both rural and urban areas, while there is increased attention and urgency for sustainability in cities.

4.3. Local Energy Initiatives as Sociotechnical Niches

This study conceives the case studies of Lochem Energie and Klimakommune Saerbeck, local energy initiatives in the Netherlands and Germany respectively. Both are grassroots innovations – examples of a sociotechnical niche where new social institutions, values and priorities are practiced in a space distinct from mainstream society (Seyfang and Haxeltine, 2012).

Referring to the definition of local energy initiatives given by Boon (2012: 10) as projects *"initiated and managed by actors from civil society, that aim to educate or facilitate people on energy use and efficiency, to enable the collective procurement of*

renewable energy or technologies, to provide, generate, treat or distribute renewable energy derived from various renewable resources for consumption by inhabitants, participants or members who live in the vicinity of the renewable resource or where the renewable energy is generated;" this section will assess to what extent these initiatives fit this definition followed by the application of the SNM framework in the next chapter.

4.3.1. Lochem Energie

The rural municipality of Lochem, with a population of around 33,000, is found in the Actherhoek region in Gelderland, in the East of the Netherlands. Lochem Energie is an energy cooperative that fits the description of "new style" LDEBs, as described by Oteman et al (2014). Founded in 2010, it now has over 500 members and 200 clients of whom they supply with locally generated solar power. The initiative has gained nationwide attention through the years because of its dynamic bottom-up approach to energy transition (Hoppe et al., 2014).

The residents of Lochem sensed a lack of initiative from the government in enabling sustainable means of energy production. And so a handful of the residents, including the current researcher on improving public participation, the former alderman of Lochem (who served as a public official between 2006 and 2014) and four other individuals, agreed that it would be in the best interest of the community to take matter into their own hands and create their own renewable energy company (Personal communications with Interviewee 1, 2014). As described by Oteman et al. (2014) regarding most LDEBs across the Netherlands, Lochem Energie also wishes to strengthen the local economy by redirecting the money of civilians spent on energy towards maintaining or even improving the municipalities standard of living. This objective is coupled with the aim of reversing the adverse effects of climate change.

The initiative sees a clear correlation between the number of their participants and development, striving for 2,000 clients in the coming years (Personal communications with Interviewee 1, 2014). In achieving these objectives, the organization is now preoccupied with a number of different projects as mentioned on their websites. This includes: Supporting households by installing PV-panels on their roofs, creating a collective PV-panel park; collaborating with the different partners on Slim Net[4]; renting out electric cars made available by Liander; engaging in further technological research on wind energy and hydro energy; and also social research on means of stimulating public participation (lochemenergie.net, 2014). So far, they have managed to install 110 solar panels with a total of 1MW on the roof of the municipality that provides energy for 200 households (Ibid, 2014).

In relation to Bonn's (2012: 10) definition of a local renewable energy initiative, Lochem Energy is indeed a grassroots initiative that started from an idea shared by a few residents that was developed in consultation with the municipality.

[4] Slim Net is an IPIN (*Innovatie Programma Intelligente Netten* Dutch for Innovative Program of Smart-grids) project between Alliander, University of Twente, Eaton and Locamation that aims to tackle the inconsistencies (ex. lack of sun or wind during times when there is an urgent demand for energy) that come in gathering green energy. Lochem is one of the twelve pilot projects in the Netherlands.

With guiding help from the alderman of Lochem at the time, they developed a business plan that aims to exploit solar energy (with discussions of including hydro and wind in the energy mix) for the consumption of their inhabitants. However, the organization is struggling on reaching their goal of contracting more houses. Apart from external factors (ex. through competition against larger energy companies, immobility of Dutch energy market, conservatism of Dutch consumer), there are also internal factors such as the organizations lack of clear communication with the public. To give an example, one of the more "active" residents of Lochem, who is also a supporter of renewable energy, refused to be a member of the organization because in her opinion, communication is principle (personal communications with interviewee 3, 2014). Therefore, the current size of the organization reflects their struggle in facilitating social learning on efficient energy use.

4.3.2. Klimakommune Saerbeck

Saerbeck is a small a municipality, with only 7,200 inhabitants (almost five times smaller than Lochem), found in the district of Steinfurt in the state of North Rhine-Westphalia, Germany. Despite the municipality's size, they are known in Germany and in other countries as a model example on how to organize energy transitions at a local level (Hoppe et al., 2014). It all advanced in 2008-2009 when the federal state of North-Rhine Westphalia (NRW) started a competition called *"Aktion Klima Plus – Klimakommune der Zukunft"* (German for Climate Action Plus – Climate community of the Future) inviting all towns in the region to develop a climate protection and adaptation concept. Saerbeck along with the city of Bocholt in the North-West of North Rhine-Westphalia (which is 10 times the population size of Saerbeck) was awarded with a grant for proposing the best scheme (Personal communications with Interviewee 5, 2014). Hence, *"Klimakommune"* is the title given to the municipality of Saerbeck for winning the competition. The organization worked on shaping climate neutrality for more than 10 years. The idea of utilizing green energy was sparked by the residents when they came to the mayor, requesting that PV panels be installed on the roof of the municipality building (Personal communications with interviewee 5, 2014).

At this point, it is important to differentiate the *Klimakommune* from the *Energiegenossenschaft*. The *Klimakommune*, or the steering committee as they prefer to call them, refers to the 12 to 14 individuals that were invited by the municipality mayor to develop the climate adaptation and mitigation concept. This includes the mayor himself, and the two interviewees: the project manager and the public relations manager. The *Energiegenossenchaft* in Saerbeck was founded a little while after winning the competition, when the residents became more aware and informed of the benefits of a transition towards renewable energy (Personal Communications with Interviewee 6, 2014). Officially called *Bürgergenossenchaft Energie für Saerbeck*, this organization consists of residents (as of today comprises of 389 individuals) who invested in the Bioenergy Park at a minimum amount of €1.000 with a return of 4% profit after the first year (Energie für Saerbeck, 2014). In

principle, the societal arrangement that all residents are a part of is simply referred to Klimakommune Saerbeck[5].

Three key projects have been implemented since 2009: the 1) "sunny side" of Saerbeck that involves the installment of PV panels, 2) the transparent central heating system[6] and the energy-experience path, and the 3) Bioenergy park. Today, more than half of the municipality's energy demand comes from renewable sources. In the long term, Saerbeck aims to be energy neutral and fully energy self-sufficient by 2030. The core project behind Klimakommune Saerbeck is the 'Bioenergy Park', which came into construction in 2011 on a former storage area for ammunition of the *Bundeswehr* (The Federal Defense or Armed Forces of Germany) located 3km from the village. Producing a total of 29MW of renewable energy, the Bioenergy Park is powered by seven wind turbines, two biogas plants, a fermentation plant, and PV panels. Within the village, there are a lot of private households installed with solar panels. The *Gläserne Heizzentrale*[7] (Transparent central heating system in English) serves as the organizations main office and also houses the common heating facility that provides heat to different public building including the schools and the parish church of St. Georg (Personal communications with Interviewee 5, 2014).

With regards to the relevance of the definition given by Bonn (2012: 10), although members of civil society sparked the idea of sustainable energy, the establishment and development of was mostly due to the efforts of the mayor. The initiative aims to educate its residents, both the old and young members on not just the efficiency of energy but of the potential harm of climate change and the promising solutions that come with striving for sustainable development. Klimakommune Saerbeck allows for the collective procurement of renewable energy by its residents and is constantly looking for new ways on how to fully exploit these resources. The Klimakommune's public relations manager (Personal communications, 2014) states that their organization continuously strives to be this idealistic description of a local renewable energy initiative.

Table 3. An overview of Lochem and Klimakommune

	Lochem	**Saerbeck**
Country	Netherlands	Germany
Province	Gelderland	North-Rhine Westphalia
Size	216 km2	58.98 km2
Population	33, 227 (May 2014)	7, 203 (Dec 2010)
Name of Coop	Lochem Energie	Klimakommune Saerbeck

[5] This will also be applied throughout the rest of the paper where Klimakommune Saerbeck will be used to refer to the initiative as a whole; unless stated otherwise, where the *Klimakommune* or the *Energiegenossenschaft* is being referred to specifically.

[6] Two large wood pellet boilers operate the central heating system, which supplies heat to most municipal buildings including the schools and the sports center. Wood pellets from forest residues are used instead of fossil fuel.

[7] In an interview, interviewee 5 (Personal communications, 2014) mentioned that the transparent glass building is an integral part of educating their residents on this kind of technology. He further explained, *"We want people to see that this is normal technology and works just like any normal heating system – it is nothing to be intimidated of."*

Founding Year	2010	2008
Type of Initiative	*Lokale Duurzame Energiebedrijven*	*Energiegenossenschaften*
No. of Members	Around 500 households (members), around 200 are provided with Green Energy	389 members
Form of RE	Solar; currently exploring opportunities for wind energy and central heating powered by forest residues	*Bioenergy Park:* Solar, wind, biogas and fermentation plants. *Village:* PV panels on municipality building and schools; Central heating system powered by wood pellet boilers
Amount of RE produced	1 MW	29 MW

5. STRATEGIC NICHE MANAGEMENT: LOCHEM ENERGIE AND KLIMAKOMMUNE SAERBECK

The previous chapter justifies the framing of Lochem Energie and Klimakommune Saerbeck as grassroots innovations and at the same time described the landscape and regime that these initiatives are going against. Therefore they can now be mapped against the SNM framework to assess how these local renewable energy initiatives can further increase their influence at a regime scale.

The SNM scholars claim that successful niche development and growth depends on the following: 1) the *building of networks* contribute when membership is broad (in numbers of members) and deep (substantial resource commitments by members); 2) the *management of expectations* and visions contribute when they are robust (shared by many actors), specific, and of high quality (substantiated by ongoing projects); and 3) the *learning process* contribute if they not only accumulate first-order learning, but also enable second-order learning where in people begin to question the norm and value the niche (Hielscher et al, 2011). This chapter will now assess the extent of which both initiatives have attended to these factors.

5.1. Lochem Energie

5.1.1. Building of Networks

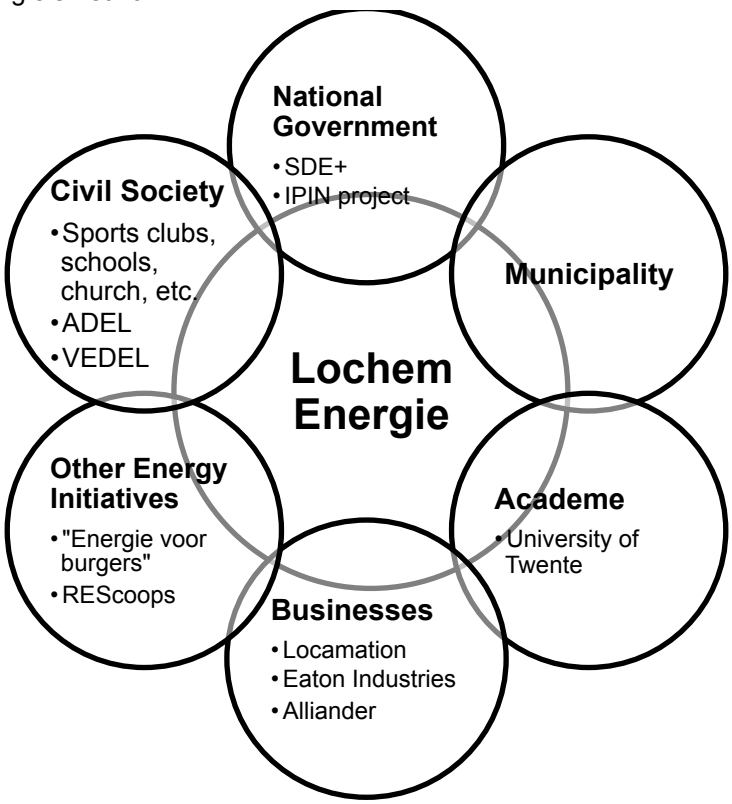
In the early years of Lochem Energie, the cooperative was able to establish significant networks that support hold a good community project: with the government, both at the national and local level; with businesses; with civil society, with the academe, and with other local renewable energy initiatives (this network is summarized in fig 3 below). Just a year after the founding of the Lochem Energie, the cooperation saw the opportunity in a smart-grid project called IPIN (*Innovatie Programma Intelligente Netten* Dutch for Innovative Program of Smart-grids) was developed. IPIN is part of a three-year (2012-2014) project of the Ministry of Economic Affairs where a grant is given for research on intelligent energy networks. Several universities and businesses are involved in the pilot project, including the University of Twente, R&D, Locamation, Eaton Industries, Trianel Energie BV and Alliander. The municipality of Lochem promotes and facilitates this project by having the roof of the municipality building available for the installation of solar PV panels (Lochem Energie, 2014).

"Opgewekt Lochem" (Dutch for Generated Lochem) is an initiative based on Bouwend Nederland (Dutch for Construction Netherlands) adapted for Lochem, which combines forces of local construction and installation companies to renovate Lochem. Once again, this is done sustainably to contribute to the Lochem Klimaatneutraal 2030 target with a more business-oriented approach. The collaboration between Opgewekt Lochem and Lochem Energie should lead to mutual benefits, including economic, for local entrepreneurs and will speed up energy savings (Hoppe and Van den Akker, 2014).

One of the founding members of Lochem Energie was serving as a public official (alderman) at the time. His substantial role in broadening the network of Lochem Energie has been pointed out by one of his fellow founding members in an

interview, saying that he “always spoke good things about us [Lochem Energie] with other members of the political arena. They did all the promotional work [regarding the political aspect]” (Personal Communications, 2014). The former alderman endeavored to translate the Nationaal Energieakkoord (National Energy Agreement) into one that suited Lochem’s arrangement, which later on was called the “Lochemse Energieakkoord” (Dutch for Lochem Energy Agreement). It’s an agreement between the municipality and civil society about cooperating in achieving the “Lochem Klimaatneutraal 2030” (Dutch for Lochem Climate Neutral 2030) target (Hoppe and Van den Akker, 2014). Now Lochem gets recognition at a national level, allowing Lochem to learn about developments at a national level (Hoppe and Van de Akker, 2014).

Fig 3. Lochem Energie’s network



Apart from developing good communication with actors from the political arena within their network, Lochem Energie did not neglect the role of local civil society. The residents of Lochem have always been consulted and involved in the founding of Lochem Energie. For example, the municipality conducted a survey among the residents of Lochem if they would be willing to participate in a renewable energy cooperative (Hoppe and Van den Akker, 2014). Furthermore, better communication with the active members of the community (regardless of their field of interest) and with other local groups such as sports or cultural clubs was made. These groups would cover the social aspect whereas Lochem Energie attended to the technological and business aspects of introducing the utilization of renewable energy sources into society, such as the installation of PV panels and thermal insulation in homes (Personal Communication with Interviewee 1, 2014).

The organization also developed a stronger network with other renewable energy initiatives. An international seminar titled “People to People Project: Burgers voor Energie / Bürger für Energie” was hosted by the Lochem City Hall. More than 50 participants (among this, 17 were representatives of energy cooperatives) from all over, including the Actherhoek region, the Twente region and also in Germany, were welcomed to attend the meeting. This platform allowed for the exchange of facts, knowledge and starting points that could lead to new social and organizational arrangements among stakeholders (Lochem Energie, 2014).

Even reaching further than just across the border, Lochem Energie has made connections with its fellow REScoops. REScoop, which stands for Renewable Energy and Sustainability cooperatives, is an initiative launched in April 2012 by the federation of groups and cooperatives of citizens for renewable energy in Europe with the support of the Intelligent Energy Europe Program (European Commission). Twelve Initiatives from seven countries (Belgium, Denmark, UK, France, Germany, Italy, and the Netherlands) have joined forces to increase the number of successful citizen-led renewable energy projects across Europe. The project researches the best practices, business models and financing schemes that the REScoops could adapt into their own systems (REScoop, 2014).

As part of achieving the local governments objective of being climate neutral by 2030, projects ADEL (*Armhoede Duurzaam Energielandschap*, which is Dutch for Armhoede Sustainable Energy Landscape) and VEDEL (*Verwolde Duurzaam Energielandschap*, which is Dutch for Verwolde Sustainable Energy Landscape) are two sustainable landscape initiatives that were developed next to Lochem Energie. ADEL is a result of a subsidy program by the Dutch central government called IKS-2 (Innovatieprogramma Klimaatneutrale Steden or Innovative Program for Climate Neutral Cities) in 2009, where €500.000 went to its research and development. The project consists of a group of residents and agricultural companies that are exploring the possibilities on how to transform the former landfill area of Armhoede near Lochem for a sustainable energy landscape to be realized. VEDEL is also made up of local residents interested on whether it is feasible for the estate of Verwolde to be climate neutral. The property owner is also involved in the project and is implemented through the village association of Wake Laorne (Gemeente Lochem, 2014).

Similar to Lochem Energie, these initiatives provide residents with the opportunity to participate in sustainability activities. It seems logical for local projects to seek supportive partnerships with other local organizations. Creating a network with these organizations would be internal to the niche itself, supporting its own development (Seyfang and Haxeltine, 2012). However, interviews with the “active” resident of Lochem and the former village ambassador reveal that Lochem Energie might have neglected networks within Lochem.

In the early beginnings of ADEL, an “active” resident of Lochem who is also a process facilitator for the project, attempted to collaborate with Lochem Energie given the knowledge they have gained through the past years of researching renewable energy. But according to the process facilitator, “Lochem Energie simply said ‘no’” (Personal Communications, 2014). Interviewee #4 volunteered to be village ambassador in Laren for Lochem Energie. But since the responsibilities of a village ambassador were not clearly defined, the communication with Lochem Energie

slowly depreciated. Given his withstanding interest in introducing renewable energy into the village, de Koning decided to establish a renewable energy initiative in Laren called Laren Energie. Although, de Koning explains that it was not his intention that this initiative be completely separate from Lochem Energie, Lochem Energie simply lacked interest in collaborating with Laren Energie (Personal Communications, 2014).

Despite being grouped together as the three sustainable cooperatives are grouped that are part of the municipality of Lochem's broad program for sustainable energy landscapes (Gemeente Lochem, 2014), these cooperatives have not communicated with each other as much as one might expect them to. The former alderman of Lochem explains that Lochem Energie, being in their young state, could have struggles in prioritizing what the organization must handle first in order to best achieve their objectives. Lochem Energie at the time probably did not see how collaborating with the even younger projects ADEL and VEDEL could be beneficial for their development (Personal Communications with Interviewee 1 and 3, 2014). Only until recently has Lochem Energie begun collaborating with ADEL and VEDEL. There is no cooperation between Laren Energie and Lochem Energie at the moment.

5.1.2. Management of Expectations

The management team of Lochem Energie is made up of volunteers with various professional backgrounds ranging from business management, public management, economics and engineering. The combination of these different skills is a strong point for Lochem Energie. At the moment, Lochem Energie has 930 local supporters, from whom 50 are active members and form proactive contacts related to business (Hoppe and Van den Akker, 2014). Communication between the management team of Lochem Energie and the participants takes several forms. A general meeting takes place once a year where all members and stakeholders are invited to discuss the next steps of Lochem Energie. Once every three months, a volunteer meeting takes place where the most active volunteers (around 20 individuals) gather to discuss coordination and to review ongoing projects. The board of Lochem Energie meets once a month, inviting interested or knowledgeable individuals, to brainstorm for new ideas and projects that the initiative should take on next (Personal Communications with Interviewee 1, 2014). Apart from meetings, the management team of Lochem Energie also sends out a monthly newsletter and updates the website (www.lochemenergie.net, 2014) to update their participants (Personal Communications with Interviewee 3, 2014).

The management team is highly ambitious and so the public places high expectations. Despite having these channels of communicating with the public, the initiative struggles in balancing and prioritizing the interests and requests of their volunteers. The concept of renewable energy can further be subdivided into more topics and it could be overwhelming to manage the expectations and demands of participants with different priorities, concerns, and interests. Since there is no standard procedure on decision-making, the management team decides on a matter of urgency – "when the deadline is coming, then the pressure is finally there to do something about it" (Personal Communications with Interviewee 1, 2014).

Lochem Energie has been clear about their objective of becoming self-sufficient on renewable energy by 2030. To achieve this, they have designed a business plan based on contracting 2,000 households. Out of the 470 households, only 200 are supplied with renewable energy at the moment. The challenge of converting the "normal people" (people who are not concerned about their energy supply) is a daunting one the researcher on public participation is currently taking on in collaboration with the University of Twente[8]. Furthermore, competing against large-sized energy companies, in the Netherlands does not make this challenge any easier to Lochem Energie.

5.1.3. Social Learning

The municipality of Lochem began experimenting as early as 2006, when the alderman at the time approached the citizens asking them for ideas on societal- and policy-related issues (this, at that time, was considered an unconventional approach). Multiple ideas rose on how the local government could further improve was presented from the perspective of the citizens. After receiving the IKS-II subsidy in 2009 was Lochem able to further experiment with citizens' initiatives. Much attention was given to process management, public participation and support from intermediaries. 500,000 euros was put into the research for the ADEL project and the IPIN project for smart-grids followed in 2011. Deviating from "normal" ways of governing a municipality, the civil servants of the municipality of Lochem were not initially receptive to the idea of projects developed by the residents. It took a while before the civil servants felt comfortable with the innovative ideas headed by the alderman.

Not all government bodies or organizations have the courage to experiment with radical ideas. Especially when it came to an idea like the decentralized provision of renewable energy – a niche or a space where the rules are different. But this attitude of pushing beyond the boundaries and the drive to discover and improve the policies that hinder development was present within the former alderman.

Lochem Energie implements different workshops, projects and seminars in efforts to educate and raise awareness among their participants. For example, Lochem Energie together with ADEL, VEDEL and Lochem Fair-trade arranged a fair-trade breakfast open to the residents. To give another example, Lochem Energie made electric vehicles available for the residents of Lochem to test out. The researcher on public participation noticed that this project has been effective in encouraging the use of electric vehicles as the number of residents driving one is increasing (Personal Communications with interviewee 1, 2014). No research has

[8] Lochem Energie, a cooperative managing over 1,000 members, is conducting research in partnership with the University of Twente, particularly on the improving the management of the cooperative. One report entitled "Leren van Lochem: Praktijkvoorbeeld van hoe lokaal bestuur vertrouwen schenkt aan maatschappelijke partners" (Dutch for "Lessons from Lochem: Real-life examples of how the local government places trust in social partners) completed by Thomas Hoppe and Donald van den Akker from the University of Twente was commissioned by the Rijksdienst voor Ondernemend Nederland. One of the founding members of Lochem Energie who is also the researcher for public participation is currently collaborating with Dr. Maarten Arentsen from the University of Twente to identify factors that could gather more support for energy cooperation's in order for them to flourish (Personal communications with interviewee 2, 2014).

been done among the participants of Lochem as to whether or not being a member has led to changes in their energy consumption habits or into other sustainability practices in general. Although, this is something the organization would like to look into.

5.2. Klimakommune Saerbeck

5.2.1. Building of Networks

Klimakommune Saerbeck came in good contact with other local renewable energy initiatives within the region after they won the NRW competition out of twenty participants back in 2009. There are other similar competitions that take place all over Germany. This provides a suitable platform for energy initiatives to exchange knowledge, ideas and learning experiences. However, there are no project collaborations happening between Klimakommune Saerbeck and other initiatives. The municipality of Saerbeck is also in good contact with the federal government of North-Rhine Westphalia. Aside from providing the initiative with subsidies and financial aid, the regional government has actively shown its support for the municipality. “Klimakommune” was the title given to Saerbeck for winning the contest in 2009, but developing a concept was only the beginning. Klimakommune Saerbeck was challenged to put their winning concept into practice and update all stakeholders about their developments, including the regional government. And for this reason, the federal government would refer to Saerbeck as a model municipality for organizations and institutions who are visiting the region that would like to learn more about renewable energy.

Similar to Lochem Energie, Klimakommune Saerbeck has established networks in the four dimensions that best support a community initiative: the government, businesses, the local community and the academe. Figure 4 below gives a visual explanation of Klimakommune Saerbeck’s network and organizational characteristic. Regarding the relationship with the local municipality of Saerbeck, the arrangement is entirely different in comparison to Lochem Energie. Although in both cases, both municipalities were involved in the founding of their respective energy cooperatives, the difference arises in the decision-making procedures. In Lochem, there is a clear separation between the municipality and Lochem Energie, emphasizing the fact that it is an initiative driven at a grassroots level. While in Saerbeck, the local government, specifically the mayor, Wilfried Roos, has the final decision regarding the future steps of the Klimakommune. In this sense, the initiative of Klimakommune Saerbeck derived in fact from the municipality [9] (Personal communications with interviewees 5 and 6, 2014).

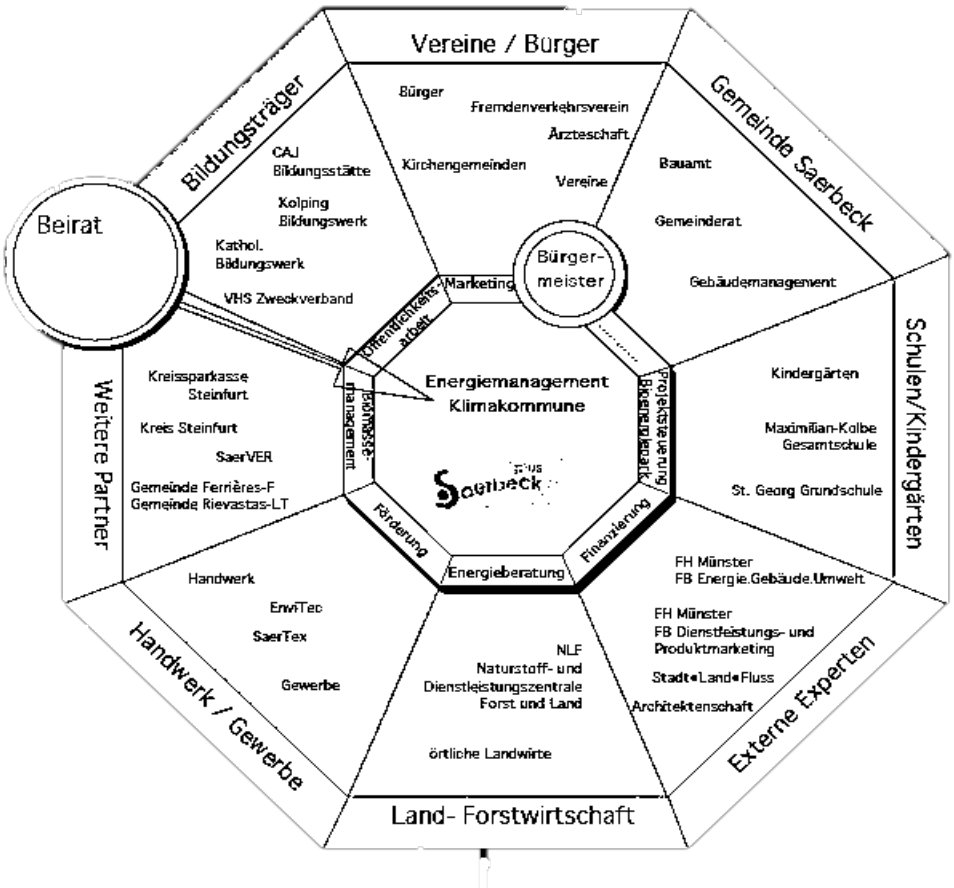
Klimakommune Saerbeck’s reputation for green energy is not only known all over Germany but has even gained the attention of distinguished visitors from the Middle East. The head of the Sustainability Committee of the Dubai municipality

[9] The steering committee of 12 to 14 individuals, where the mayor is also directly involved in, is also considered the Klimakommune. The public relations manager (Personal communications, 2014) explains that the distinction between the Klimakommune from the municipality of Saerbeck is not straightforward. The organizational arrangement of the Klimakommune is put into picture in figure 4.

came to visit the village to plan an upcoming project. Dubai is planning to build a city powered completely by renewable energy in the desert for 160,000 people, and the Bioenergy Park will serve as an example (Westfalisch Nachrichten, 2014).

It is also worth mentioning that the reputation of the municipality of Saerbeck has attracted companies that focus on renewable energy technologies. There are two energy companies they are currently in collaboration with: EnviTec Biogas and Saertex. Envitec is one of the largest biogas producers in Germany based in Saerbeck. The other one is Saertex and they develop carbon fiber textures for wind turbines, for example (they supplied the company the built the bioenergy park's wind turbines). There are other innovative projects in Saerbeck aside from sustainable energy generation, such as research on energy storage techniques, power to gas (P2G) and designs for heating networks (Personal Communications with Interviewee 6, 2014). Experts (including professors and students) from the University of Applied Sciences in the neighboring city of Münster take part in these research projects, even having their own laboratory located on the Bioenergy Park for experiments.

Fig 4. Klimakommune Saerbeck's network and organizational arrangement (Klimakommune Saerbeck, 2014)



Klimakommune Saerbeck avoids large energy companies and prefers smaller companies to get involved in their projects. In the early beginnings, the municipality's plan of extending their electricity grid was delayed due to the ineffectiveness one of these utility companies. The mayor then decided to sell all their shares of that

company. From that money they were able to start their own utility company that is currently handling the grid. Similar to Lochem Energie, they are also having difficulties contracting more houses since households simply would not switch their energy contracts when they are not experiencing any problems with their supply of energy (Ibid). The local establishments within the town - the school, the church, the sports center, and the bank – are also involved in the projects (Klimakommune Saerbeck, 2014). The students in the local secondary school assisted in the installment of PV panels on the roofs of their school. The sports hall also has PV panels installed on their roofs, as well as the bank along with a couple of charging stations enough to recharge electric bicycles. Although the church does not allow for the installment of PV panels in respect of religious and cultural traditions, the priest of the local catholic church of St. Georg actively advocates the transition to renewable energy (Personal Communications with Interviewee 6, 2014).

5.2.2. Management of Expectations

Involving and informing the wider public is always taken into account before moving forward with any project. The small size of Saerbeck becomes advantageous when taking civil society into account. In developing a concept for the NRW competition, a survey (created by secondary school students as part of their geography class) was sent to all the residents of Saerbeck asking questions such as: how much electricity and heating do you need in a year? What kind of heating system do you have? Do you have solar panels on your roof? If not, would you interested in making an investment? If not, would you be willing to rent your roof to someone else?" 23% of this survey was sent back and the results were presented at a public event. The results revealed that many from the public were interested and optimistic about renewable energy. This led to the founding of Saerbeck's Energiegenossenschaften (German for Citizen's Energy Initiative), officially called the *Bürgergenossenchaft Energie für Saerbeck*.

The Klimakommune or steering committee of Saerbeck is made up of 12 to 14 individuals that the mayor invited early on to develop the climate change adaptation and mitigation concept, including the mayor himself and the project manager. This also involves individuals from the academics (a professor from the University of Applied Sciences in Münster), from the municipality (who deal with bureaucratic issues related to infrastructure), and the media. The steering committee meets every two months. There are multiple ways in how the residents of Saerbeck communicate with the steering committee. One way is through the contact person in the city hall who handles calls from the residents. Since the members of the team are assigned to different sectors of Saerbeck, the contact person simply links the call to whoever is responsible (Personal Communications with Klaus Russel-Wells). Guido Wallraven's work with Saerbeck has also gained the attention of many residents. He has his own office open to the residents for inquiries and suggestions (Personal Communications with Guido Wallraven, 2014).

When it comes prioritizing and handling the demands and expectations of the public, the clear hierarchy in the organizational arrangement of the Klimakommune becomes advantageous. In case there would be difficulty in deciding which projects to take on hand before the other, this is first discussed by the steering committee and

is then presented to the mayor for the final decision-making (Personal Communications with Interviewee 6, 2014).

Similar to Lochem Energie, Klimakommune Saerbeck also holds events open to interested residents. One example would be the "Energiestammtisch Saerbeck" mentioned earlier, where experts in renewable energy come together once a month to simply talk about energy, exchange ideas, and to assess their progress. This event is also open to residents. Whenever there are town events, such as the Christmas Market for example, the initiative would set up a booth along with a suggestion box manned with members from their team to answer questions from residents who are, for example, curious about the long-term benefits of installing PV panels. The "energy experience path"[10] is also another project that clearly illustrates to the public what has been achieved so far, and at the same time crosses over with social learning.

5.2.3. Social Learning

The education of their residents is key to Klimakommune Saerbeck. The initiatives scope is not limited to renewable energy; they also include topics covering climate mitigation and adaptation. For them, it is not simply education - it is the building of relationships with fellow enthusiasts (like the "*Energiestammtisch*" for example). The *Gläserne Heizzentrale* provides more than central heating, the building itself serves as a platform for the exchange of ideas and serves as the hub of the climate-friendly community.

Facilitating social learning is not only limited to the grown-up members of their community but is extended to the young members in kindergarten, primary school and secondary school. The "*Forscherpass*" (German for researcher passport), for example, is a project designed for the kindergarteners, where their "passport" gets a stamp every time they visit the central heating station or the Bioenergy Park. In the secondary school level, speakers from the University of Applied Sciences in Münster were invited to talk about the harms of ultraviolet light.

Surrounded by solar panels, the residents of Saerbeck are forced to think about the topic of renewable energy day by day. People learned the habit of taking the environment into consideration before buying a new heating system, for instance. Both the project manager and public relations manager agree that the importance Klimakommune Saerbeck placed on their educational component is a large reason behind their success (Personal Communications with Interviewees 5 and 6, 2014).

[10] The "energy experience path" is a 1.2 km long route that begins at the *Gläserne Heizzentrale.* It consists of 10 stations (a building with the energy consumption indicated on the wall to indicate that it is part the path) which cover topics related to energy saving, energy efficiency and renewable energy, usually accompanied with different forms of media such as graphs, photos, and videos.

6. COMPARATIVE ANALYSIS

This study looked into how the local energy initiatives of Lochem Energie and Klimakommune Saerbeck worked towards further developing a niche. Drawing on the previous analyses, this section compares both cases by answering the six sub-questions found in Chapter 1 (p. 5). After which, some preliminary insights are presented regarding to further improve niche development.

1) What factors stimulated the emergence of these local energy initiatives? Who started them and what were the prerequisites necessary to develop these initiatives?

Most local renewable energy initiatives develop in an organic way – people start a usually small yet substantial project while the starting of an organization follows after. To some extent, a similar instance transpired in both Lochem Energie and Klimakommune Saerbeck. With the case of Lochem, it grew from an idea among six individuals who later on became the strong core of the cooperative. As for Klimakommune Saerbeck, the idea of green energy began from a handful of incessant residents who requested for solar PV panels to be installed on the roof of the municipal building. In both municipalities, local public officials, the former alderman of Lochem and the mayor of Saerbeck, picked up these ideas. These public officials then called for the assistance special-skilled individuals to be part of the management team to develop a framework for a cooperative that would be appealing to the residents. Furthermore, the residents from both municipalities were also consulted during the early developments of these initiatives to gauge their willingness and interest in participating in such an initiative for renewable energy (Personal Communications with interviewee 1, 2, 5 and 6, 2014).

Cooperatives are often formed out of a specific need where the driving goal is to fulfill the requests of its members. For the case of Lochem, the residents were not satisfied with how the government was handling the transition towards sustainable energy and so decided to take matters into their own hands. Therefore, the organization set an objective to independently produce and supply the residents with green energy by 2030. According to the former alderman of Lochem who was also a founding member, sustainability was just one of the many motivations behind Lochem Energie. He, for one, sought out business-minded individuals. One of the main objectives of Lochem Energie is the strengthening of the local economy in order to ultimately improve the municipality's standard of living (Personal Communications with Interviewee 1, 2014). The former alderman selected individuals based on profile matching although he did not instantly get it right. He selected an individual who did not perform as expected and was therefore dismissed after two years and was later on replaced (Hoppe and Van den Akker, 2014).

With the case of Saerbeck, in comparison to Lochem, there were no talks about dissatisfactions with government, with the electricity provider or with other actors in the regime. The mayors concern for energy security and climate change was one of the motivating factors behind Klimakommune Saerbeck's objective of being energy independent and climate neutral by 2030. According to Seyfang and Smith (2007), in establishing a cooperative, an initiative requires a particular

combination of skills, key individuals and champions, resources and supportive contextual factors. These prerequisites necessary in developing grassroots initiatives are addressed in the following questions.

2) What were the challenges present in the socio-technical regime that the initiatives had to overcome?

The main challenges faced by local energy initiatives are typically non-technical. Seyfang and Smith (2007) identify two types of challenges faced by local renewable energy initiatives: challenges that are intrinsic and diffusion-related. Intrinsic challenges are those that confront grassroots innovations from the moment of their inception. After starting up, the challenge is to survive and keep going - a challenge that requires additional skills, a sound resource base and resilience. Local renewable energy initiatives are mostly dependent on volunteers who are willing to dedicate a portion of their (spare) time to the cooperative.

As the former alderman of Lochem explains, the difficulty faced by the young cooperative of Lochem Energie in expanding to 2,000 households is "completely logical." For one reason, he points out that most local renewable energy initiatives in the Netherlands are focused on business and technology and are therefore male-dominated. Consequentially, he further explains, action is prioritized over communication and transparency. Because Lochem Energie fails to properly manage their volunteers, they lose interest and drift away. One of the steps Lochem Energie is taking to attend to this problem is to widen up and add more women on the board (Personal Communications with interviewee 1, 2014).

Diffusion challenges, the second category of challenges identified by Seyfang and Smith (2007), relates to the wider institutional context. This also includes those imposed from higher levels – within incumbent regimes and overarching socio-economic processes. Klimakommune Saerbeck, for example, experienced a few difficulties regarding the building of wind turbines. One reason was because the European nature reserve located just a few meters outside of the Bioenergy Park was heavily protected by the EU. Following this regulation the federal government stated that wind turbines must be at least 1,000 metres away from the wind park site. And hence the cooperative was forced to invite experts to catalog the amount of animals, to see where they were during which time of the day, and to record their migration patterns. The experts discovered that the northern area of the park, although not officially recognized as part of the nature reserve, is still of ecological value. In the end, experts were able to identify areas in the Bioenergy Park where it is safe to build the wind turbine without harming the nature reserve and were able to justify this to the regional government and get their approval. Another problem was the airport of Münster Osnabrück located 5km away. The wind turbines could disrupt signal from the radar tower. To avoid this, the wind turbines were built on one line from the radar tower and leave three degrees empty in between turbines (Personal Communications with Interviewee 6, 2014).

Compared to traditional energy companies who already know their way around the energy market, local energy initiatives must learn to deal with the government bureaucracy. There are many differences in the European energy market concerning regulations and market structure. In the Netherlands, eight

regional electricity grid operators controlled by public shareholders own the market and act autonomous but are owned by the national government[11] (NL Agency Ministry of Economic Affairs). Therefore, citizens are not capable of developing and owning electricity grids themselves. The national government developed a program for pilot smart-grid projects in which Lochem Energie participated. Part of this pilot project is the installment of solar panels on the roof of the municipality building free of charge, which at the same time exhibits how the local government supports Lochem Energie (Lochem Energie, 2014). Members then rent these solar panels at a price related to the cost of energy production. Unlike the Netherlands, there are almost 900 small grid companies all over Germany, some even owned by local initiatives (Saerbeck has their own grid company called "Energie für Saerbeck"). This example shows that Germany has electricity grid policies that are less restrictive than their Dutch counterparts.

Furthermore, the Dutch have to go through a lot of bureaucratic processes when switching energy suppliers. In contrast, Lochem Energie takes care of the switching of contracts in a more customers-friendly way – "it will only take 5 minutes" - but most residents are not aware because this benefit is not clearly communicated or highlighted to the residents (Personal Communications with Interviewee 3, 2014). Even the larger energy companies around the Netherlands are complaining about the immobility of the market. When the Dutch government started privatizing and liberalizing the electricity and gas market through 1998 to 2005, the open market gave energy consumers the freedom to choose from a wide variety of energy providers but also placed them in danger of making sub-optimal decisions due to unregulated and therefore volatile energy prices (Verbong and Geels, 2007). This could be an explanation behind the conservatism behind the Dutch consumer's attitude towards the energy market that is, according to the former alderman of Lochem, difficult to change (Personal Communications with Interviewee 1, 2014).

A similar mentality drives the German consumer in the energy market. Even though the liberalization of the German energy market has fragmented into multiple small companies, over 80% of fossil fuel and nuclear-based energy production facilities in the country are still controlled by the four giants: Eon, EnBW, RWE and Vattenfall (Buchan, 2012). Klimakommune Saerbeck stands firm in supporting their own utility company, "Energie für Saerbeck," by avoiding large companies of getting involved in their projects. Even though, expanding their own company is hindered by the challenge of convincing more residents to make the switch (Personal Communications with Interviewee 6, 2014).

3) What are the key actor-networks in these (niche) initiatives and the key actor-networks in the regime?

[11] The eight regional smart-grid operators in the Netherlands are: Cogas Infra en Beheer, Delta Netwerkbedrijf, Endinet, Enexis, Liander, Rendo Netwerken, Stedin, and Westland Infra. In a document by the Ministry of Economic Affairs (Who is Who Guide: Players in the Dutch Smart-grid Sector, 2013), they identify and categorize over 60 smart-grid companies who offer diverse innovative products and services under engineering, grid operation, consultancy, information and communications technology, and energy.

For both the cases of Lochem and Saerbeck, we see that their networks based on actors from civil society, the government sector, the business sector, knowledge institutes, and other local renewable energy initiatives. Two categories of networks can be identified, as suggested by the question above: key-actor networks that are internal to the niche and key-actor networks in the regime. Actor-networks that support the development of the niche from within include civil society, or the volunteers and members that make up the cooperative; the local government (although to a different extent in both cases); and also other local renewable energy initiatives.

Both cooperatives show an interest in expanding their member bases. As the number of members grows, it becomes more diverse, while active members also gain more practical knowledge and experience. It also increases support coming from the local community for decision-making of the municipality, hence improving the legitimacy of the cooperative. The spare time members put into projects are therefore key assets to any cooperative. One of the founding members of Lochem Energie explains how he believes that their management team is strong because it is made up of a mix of individuals with skills and competences (including backgrounds in business, economics, engineering, public management) that complement each other for the benefit of the cooperative (Personal Communications with Interviewee 2, 2014). The importance of having a good combination of skills and combinations was also considered a key asset in the Klimakommune Saerbeck case (Personal Communications with Interviewee 5, 2014).

Civil society not only refers to particular individuals but also includes societal institutions that make up the municipality such as the local church, sports club and the school. Both organizations have sought supportive partnership with these local institutions in order to endorse, encourage, and support the spread of the niche from a social aspect. To give a few examples of how these societies show their support for the cooperatives, the church would support the organization by allowing Lochem Energie (its network contacts, including the municipality of Lochem) to use their building when hosting meetings for their members (Personal Communications with Interviewee 2, 2014). The kindergarteners of Saerbeck participated in an art project where they painted what they thought being “environmental friendly” means. These pictures were combined together into one big artwork that covered an entire wall on the outside of the school for the residents to see (Personal Communications with Interviewee 6, 2014).

The local governments of Lochem and Saerbeck both played important pioneering and supportive roles in the development of their respective cooperatives but with different approaches. From the beginning, there was a clear separation between the local government and the cooperative. Lochem Energie is an initiative that was found in consultation with the local government. But the alderman was clear that this is meant to be a citizens’ cooperative and that the local government would have no influence in organizations decision-making processes (Personal communications, interviewee 2). Lochem Energie therefore had the freedom to independently carry on with their projects with minor influence from the local government.

With the case of Saerbeck, the mayor was and remains to be very hands-on in the development of the Klimakommune. This organizational arrangement worked

to the cooperatives advantage when it came to setting objectives and prioritizing tasks. In comparison to Lochem Energie, the board does not have a clear protocol regarding urgent decision-making and would instead decide on when the deadline is coming up because their cooperative is comprised mostly of volunteers. On the other hand, the organizational arrangement and clear hierarchy in the Klimakommune gives the mayor the final say. Furthermore, his right to decision-making becomes credible given the fact that the residents of Saerbeck directly elected him for the position of mayor.

Key actor-networks in the regime include the government, businesses, and the knowledge institutes. Both initiatives came into contact with other local renewable initiatives nationally as well as internationally to exchange knowledge and learn from each other's experiences. Also, both cooperatives of Lochem and Saerbeck have called on the University of Twente and the University of Applied Sciences in Münster respectively to take part in research that is both technological and social oriented.

The establishment of networks can work out beneficial to the cooperatives in developing the niche if all parties know and recognize each other's interests. The objectives of Lochem Energie were in sync with national policies and local policies on sustainable development through renewable energy. But the alignment of interests did not come naturally with the grid-company. The grid-company wanted to do a traditional research project. "Traditional" in the sense that a project will only be initiated once the necessary knowledge has been acquired. The Dutch government funded the smart grid pilot, and Lochem Energie also made a total investment of €700,000 (also for three other energy innovation projects with the same smart-grid company) obtained from the provincial government which they would have to pay back. Lochem Energie insisted that the energy produced locally also remains in the community. And in order for the business plan to be financially stable even after the project is ended, a portion of the money would be invested into solar panels that were to be installed locally (Personal Communications with Interviewee 1, 2014).

For the case of Klimakommune Saerbeck, their objectives of being climate neutral by 2030 are in line with those of the national government with the "Energiewende"; of the federal government of North-Rhine Westphalia as it further develops its "Sustainable Strategy NRW"; and of the district government of Steinfurt with their objective of being energy independent by 2050 (the Klimakommune set a deadline that is even 20 years earlier) (Personal Communications with Interviewee 5, 2014). The steering committee is also on the same page with their business partners that both have facilities based in the Bioenergy park: Saertex and Envitec. Saertex develops carbon fiber textures that were used in building the wind turbines on the Bioenergy Park. The cooperative is also interested in developing effective ways of energy storage, including P2G and CHP units – a field that Envitec specializes in. These business partners are not directly involved in the Klimakommune, but both parties benefit from each another.

4) Who were the 'pioneers', 'enablers', 'facilitators' and so-called 'niche managers' that set the local transition in motion?

Kemp et al. (1998) note that niches are platforms for interaction; they emerge out of a process of interaction shaped by many actors. They cannot be controlled –

but can be facilitated to a certain extent. They further emphasize that niche management, just like any other form of management, is not the obligation of a single actor but is a collective endeavor. Some actors are likely to take on a more dominant role as niche managers than others, and may thus be labeled a "niche manager". Depending on who is best qualified to take on this task, the responsibility as niche manager can be given to different actors: the state, policy-makers, a regulatory agency, local authorities, a citizen group, non-governmental organizations and the like. The niche may be a person or even an organization. Two notable individuals have been identified by the interviewees for the significant role they played in the development of these initiatives: Thijs de la Court for Lochem Energie and Mayor Wilfried Roos for Klimakommune Saerbeck.

The commendable reputation of the former alderman of Lochem, Thijs de la Court, is one that is not just known in Lochem but also across the Netherlands. He is very active and therefore has a broad network in the environmental movement scene in the Netherlands. Being a member of the Groen Links (Green Leftist) political party, he has a keen interest in sustainable development with a good understanding of what renewable energy initiatives are and their connection with the local government[12]. During his time as an alderman, he supported Lochem Energie from the very beginning when they had 35 volunteers to set up the cooperative. He also actively supported the initiative in facilitating financial support from the government. According to one of the founding members of Lochem Energie, "he spoke good things about us [Lochem Energie] with other players in the political arena. He had contacts with administrators, politicians, and civil society organizations. He made use of this network to gather funds for local initiatives including Lochem Energie (Personal Communications with Interviewee 1, 2014). His vision (translated from Dutch): "The current generation is faced with an enormous challenge. There is no more room to exploit natural resources from our world. We're building a debt that our children and grandchildren will have to pay back. This is the century of the changing climate and it is up to us, our generation, to turn a new leaf." The alderman's vision and work ethic guided the direction of the municipality from 2006 to 2014 that is supportive towards society (Hoppe and Van den Akker, 2014).

The work of the mayor of Saerbeck, Wilfried Roos, has often been praised in the municipality of Saerbeck. The idea of installing PV panels on the roof of the municipality building was sparked by the residents and was later on picked up by the mayor. It is worth pointing out that the mayor of Saerbeck is not affiliated with any political party. Although in some cases, links to a particular political party allows for better networking with governmental actors. But in this case, the mayor is able to avoid political debates and focus on more practical matters with a more hands-on, instructive approach. As the project manager of the Klimakommune explains, "For a cooperative to move forward, it must have strong support coming from the municipality" (Personal Communications with Interviewee 5, 2014). The NRW competition gave Saerbeck the extra boost to develop an overall concept for climate

[12] In an interview with the former alderman of Lochem (Personal communications, 2014), he mentioned that he was very cautious about representing the residents, clarifying that this project was independent from his prospects as a member of GroenLinks (Green Leftist) political party. He emphasized the importance of Lochem Energie being perceived as a bottom-up initiative rather than top-bottom initiative.

adaptation and mitigation – a project that the mayor personally took on. “It started with the mayor,” as the public relations manager for Saerbeck put it. He invited a team of skilled individuals, from engineers, scientists and economists, and also residents from all over Saerbeck to be part of this project. The mayor especially understood the importance of having the residents involved in the development so it can be “a project we all could live with” (Personal Communications with Interviewee 6, 2014).

There are also a handful of noteworthy, special-skilled individuals, whom out of the many members from their respective cooperatives, volunteered to formally take charge over the management of their cooperatives endeavors. During his time as alderman for the municipality of Lochem, Thijs de la Court approached Denise de Jonge to be an *opbouwwerker* (Dutch for community capacity development worker). Given her background in *Orthopedagogie* (the closest translation from Dutch is Clinical and Adolescent Studies - a study to be a special needs teacher), she is trained to create a comfortable environment for people (Personal Communications with Interviewee 3, 2014). Being so, Thijs de la Court chose Denise de Jonge for her familiar “human face” and informal relationship with project participants to represent the municipality. As a process manager and project mediator, her responsibility was to support community initiatives (including Lochem Energie and ADEL) and at the same time gain the trust and confidence of the project participants (Hoppe and Van den Akker, 2014).

The projects of Lochem Energie are handled by a board of nine people, which includes a president, a secretary, a treasurer, three other committee members and three promoters (www.lochemenergie.net, 2014). These individuals, without a salary, devote a few hours from their week to Lochem Energie to come up with new ideas, decide on a funding scheme, attend to promotional aspects, and the like (Personal Communications with Interviewee 2, 2014). The initiative in Saerbeck also has their equivalent of the board, which is the *Klimakommune* or steering committee. This group is made up of 12 to 14 people whom the mayor invited early on to develop the climate adaptation and mitigation concept, which includes the mayor himself, the project manager and the public relations manager. These individuals officially gather every two months at the *Gläserne Heizzentrale* to deliberate about past achievements and future plans. Unlike Lochem Energie’s board, whom are all unpaid volunteers, particular members of the steering committee who take on more time-demanding tasks (such as the public relations manager) are hired as part-time workers and are paid a small compensation by the municipality for their service to the Klimakommune (Personal Communications with Interviewee 6, 2014).

5) How did civil society reinterpret, reinvent and reinforce the practices and norms? And what work was needed, and by whom, for social learning to take place?

When it comes to the introduction and use of a new technology does social learning become an important aspect in forming a common frame or understanding of it? One of the more socially active residents of Lochem explains how ‘sustainability’ remains to be an abstract idea to most people, let alone ‘renewable

energy' that can even be broken down into further aspects; the unfamiliarity with the science behind new technologies along with new user practices become intimidating (Personal Communications with Interviewee 3, 2014).

In the social learning process, new patterns of behavior are acquired through direct experience or by observing the behavior of people around them. And so, both the board of Lochem Energie and the steering committee of Klimakommune Saerbeck have been busy in creating educational events and opportunities for their members and residents that are both cognitive and experiential. One good example is the "energy experience path" as mentioned earlier, which is a tangible project that is both cognitive and experiential approach designed for the residents of Saerbeck. While in Lochem Energie, four SMART electric cars are available for the residents to test drive. Not only do the participants learn about the benefits of driving an electric vehicle to the environment, they also experience that driving an electric car is no different than a car fueled by gasoline or diesel (www.lochemenergie.net, 2014).

Neither of the cooperatives has conducted any interviews or surveys to look into the changes their participants have made when it came to sustainability practices such as purchasing energy efficient appliances or being generally conscious about ones energy consumption. It is therefore difficult to tell how deep social learning has tapped the everyday lives of project participants. Furthermore, it also becomes difficult to gauge the effectiveness and success of the initiative in challenging mainstream practices of energy provision, and most importantly in from this perspective, energy consumption. But the public relations manager of Klimakommune Saerbeck assumes that the residents must take into consideration the consequences of their actions to the environment since this is a topic the they are faced with every day (Personal Communications with Interviewee 6, 2014). One of the founding members of Lochem Energie also notices a rising number of residents driving electric vehicles, which may say something about how social learning may have driven them to make this change (Personal Communications with Interviewee 2, 2014).

6) What were the breakthroughs that lead to change?

In an interview with the former alderman of Lochem, he points out that the successes of Lochem Energie are always the outcome of engaging in better communication with the public. One success was the installment of a solar park on top of the municipal building was an idea developed by the cooperative together with the residents. Another success was the fact that Lochem Energie officially started selling energy in March 2013, thanks to a sound business plan that was effectively communicated with potential clients. Another milestone that was identified by both the former alderman of Lochem and the board member of Lochem Energie is the "Slim Net" project conducted in partnership with Alliander, Eaton, Locamation and the University of Twente. A board member of Lochem Energie explains, "this network we create is very important to us. It opens a lot of doors to opportunities." By being a part of this network, the cooperative receives financial support in the form of subsidies, and is also gaining knowledge and practical experience in renewable energy. Although both the board member of Lochem Energie and the former alderman of Lochem consider these achievements to be rather small in comparison

to their objective of contracting 2,000 households in the coming years, they still consider these as milestones (Personal Communications with Interviewee 1 and 2, 2014).

Just like in Lochem, the residents of Saerbeck have also been surveyed about their interests in renewable energy. The public relations manager of Klimakommune Saerbeck considers this as one of the stepping-stones that led to the development of the cooperative. This gave them the assurance that they had the support of the public in developing the winning climate change and mitigation scheme. Even without winning the NRW climate community competition in 2009, the cooperative was determined to carry on with the plan. And so, both the public relations manager and project manager of Klimakommune Saerbeck pointed out that the prize money the cooperative won in the NRW competition in 2009 set the entire project in motion sooner than planned. This led to the establishment of the Bioenergy Park that was bought in 2011, completed in the end of 2013, and has since then began providing the small town of Saerbeck with energy - “It went so incredibly fast!” (Personal Communications with Interviewee 5 and 6, 2014). The municipality and the citizens financed the Bioenergy Park through the cooperative, Energy for Saerbeck. At the moment, the climate-friendly energy mix composed of 24,000 solar panels, seven wind turbines, a biogas plant and composting plant produces 29MW. Saerbeck has already outdone its objectives way ahead of schedule (mostly due to the prize money won from the NRW competition in 2009). This milestone has gained the praise of the federal and national government, and the attention of visitors from all over the world. In 2012 alone, Klimakommune Saerbeck has already welcomed around 3,500 visitors (Personal Communications with Interviewee 6, 2014).

A core activity of Klimakommune Saerbeck is to inform and educate their residents. Therefore, both the public relations manager and the project manager agree that the building of the *Gläserne Heizzentrale* along with the Energy Experience Path, as discussed earlier, consider these as milestones for it facilitates social learning among the resident of Saerbeck. Located in the heart of Saerbeck and visible to all members, these two projects function as an information and communication platform between the municipality and the residents. In relation to the role of civil society, it is also important to highlight that it was the residents of Saerbeck who developed the contents for the ten stations that make up the Energy Experience path; including the students from the local kindergarten, to the local football team, and even the church (Personal Communications with Interviewee 6, 2014).

7. CONCLUSION

This study was designed to answer the following research question: *What were the key drivers for change in the local energy systems of Lochem and Saerbeck and how do these compare from an SNM standpoint?* Therefore, this chapter will summarize the findings regarding what the SNM literature had to say about the driving factors that led to change in both case studies. Before carrying on with the study, the adequacy of the theoretical framework was first questioned. Strategic Niche Management (Kemp et al., 1998; Schot and Geels, 2008; Raven et al., 2010) is a theoretical framework in the transition studies literature that was initially presented as a research model and policy tool to manage technological innovation within so-called niches from a top-bottom approach. For this study the challenge was to find out whether it makes sense to apply SNM theory to bottom-up civil-society based niche development of sociotechnical innovations?

Local energy initiatives can diverge in relation to their focus of improving the energy system, energy efficiency, behavior towards change and even their main source of renewable energy, which can further be subdivided into solar, wind and hydro. Lochem Energie and Klimakommune Saerbeck are both what Seyfang and Smith (2007) would refer to as 'grassroots initiatives' or local renewable energy initiatives that developed from the bottom-up with the aim to locally produce green energy for the consumption of their residents. The unit of analysis in this study therefore becomes the 'abstract' niche or the manner in which these initiatives organized new social arrangements, habits and practices that are different than those in the sociotechnical regime (Raven et al, 2010). By framing both local renewable energy initiatives as 'grassroots innovations', this study showed that the applicability of the SNM theory does make sense because system innovation is at the heart of both initiatives. This study illustrated that the three factors Kemp et al (1998) claim to be vital for technology-centered niches (building networks, managing expectations and learning processes) appear to be suitable for 'social' niche innovations. Each of these factors have been addressed by Lochem Energie and Klimakommune Saerbeck, and it appears that this has allowed these initiatives to overcome some of the common obstacles that grassroots innovations typically face.

In building social networks, the SNM theory suggests that niches are best supported when they embrace a variety of different stakeholders, who can call on resources from their organizations to support the niche's growth. This claim is verified by both of the investigated cases. Klimakommune Saerbeck and Lochem Energie have effectively taken steps in building their network in various sectors: with the government, business firms, knowledge institutes, civil society, and other local renewable energy initiatives. A board member of Lochem Energie believes that the contacts the cooperative has with the local government and with other local energy initiatives in the Netherlands have contributed to expanding the network of Lochem Energie, and therefore considers networking as one of the core activities of their cooperative (Personal Communications with interviewee 2, 2014). The public relations manager of Klimakommune Saerbeck also acknowledges that the support they received from civil society and from the federal government has especially helped their development but is not the principal reason behind their success (Personal Communications with Interviewee 6, 2014).

SNM theory claims that niche development is best supported if expectations of what the niche can deliver are widely shared, specific, realistic, and achievable. When a new technology is developed, people are not usually aware of the advantages. In order to familiarize the public with a new technology, the niche managers must make promises and raise expectations on what the technology can deliver. These promises are especially powerful if they are shared, credible, (supported by facts and tests), and specific (with respect to technological, economic and social aspects) (Kemp et al., 1998). Furthermore, transparency is important for members to feel included and empowered. It is crucial that they can trust, know, and understand the organization, its goal and methods. Transparency can be achieved through continuous communication to inform the members about the status of projects, the underlying values, its implications and benefits. Although both cooperatives give their participants multiple channels for communication, Lochem Energie seems to be having more difficulties in this aspect in comparison to Klimakommune Saerbeck.

The management board of Lochem Energie claims that the contracting more households will spur further development of the cooperative. However, Lochem Energie struggled to clearly conveying to the public their visions about what the initiative could deliver in terms of practical opportunities and specific economic benefits that appeal to the targeted audience. This shows a lack of realistic goals both among the board members (internally) and in relation to the wider public (externally), which hampers development and weakens public trust in the cooperative, which ultimately results to lesser members.

But apparently, the alderman of Lochem was using this supposed "weakness" to an advantage of Lochem Energie. To begin with, there was no such thing as a "shared vision" among the members of Lochem Energie back in 2010. The alderman kept his visions on a low key because he was opposed to setting goals that are not feasible and realistic. Failing to reach an unrealistic goal would lead to dissatisfaction, which could have a detrimental effect to the niche especially during the early stages of development. Therefore, he decided to set the bar low for the public. He used these times of "vagueness" to give space to quietly create the conditions necessary to gather support from the society and the municipality. Timing became crucial. In releasing the vision document called '*Regisserend Lochem'* in 2011, the alderman learned that his radical ideas would only be received with resistance by the old system, and would therefore cause problems and delays. In order to avoid this, he along with his partners, decided to quietly create a strategy (informally documented) that identifies ways on how to overcome the hurdles faced by Lochem Energie and at the same time slowly build support from civil society (Hoppe and Van den Akker, 2014).

However, it appears that even at this point in time Lochem Energie still struggles to clearly get their projects across the public. For example, the residents of Lochem no longer need to go through exhausting bureaucratic processes when they wish to switch their energy contract, if they do so through Lochem Energie. Apart from this, Lochem Energie made an agreement with a local housing association. The association's tenants were asked if they would be interested in having solar panels installed on their roofs. The deposit costs would be €50, and by the end of the year they were guaranteed to earn €100 including their deposit and more because of the

decrease in their energy bill. But as one of the active residents of Lochem pointed out, the cooperative had a hard time in getting people interested. The benefits of what people could get out of it were not clearly presented and so they had no reason to leave their current energy provider (Personal Communications with interviewee 3, 2014). In addition, based on how the residents of Lochem are behaving (low turn-up of the residents at events hosted by the cooperative) at the moment, it can be expected that a majority of participants will not want to be involved too intensively.

The "*Energiestammtisch*" is the main platform of Klimakommune Saerbeck for communicating with their participants (and is also a means of facilitating social learning through the exchange of knowledge and experiences among regular residents and experts). The *Energiestammtisch* is a recreation of a *"Stammtisch"* (German for regulars table), a practice that is deeply ingrained in German culture, which refers to an informal meeting held on a regular basis to discuss relevant topics over beer. Interested residents, renewable energy enthusiasts and environmentalists alike all gather at the *Gläserne Heizzentrale* to discuss various topics that change from session to session, ranging from climate change, energy efficiency or electric mobility. Klimakommune Saerbeck informs the residents of the topic, date and time through their own newsletter and also through the local newspaper. From an SNM standpoint, the *Stammtisch* is vital in constructing a common understanding among the participants of the problem at hand as well as solutions to the problem. This also ensures that expectations of what the organization and the technology can deliver are widely shared.

Lastly, SNM theory suggests that to spur niche development, social learning not only needs to be at the first-order, where participants expand their knowledge of renewable energy; but also at the second-order of learning, where participants gain an even higher level of understanding that leads them to question systems and framings within existing regimes. However, educating people about climate change, peak oil, energy security and the like alone will not lead to a change in lifestyle. Experiential learning above a cognitive approach is more likely to deliver change. Indeed both cases experimented with radical and innovative ideas that, despite not succeeding in the first instance, led to lessons and realizations.

Research (Jackson, 2007; Røpke, 1999; Shove, 2004) has proven that widespread public engagement is more achievable through the doing of community-based activities, which offer immediate benefits. It is evident that both initiatives have given their participants the opportunity to engage in different educational projects although one has been more active in this field than in the other. It appears that social learning is highlighted to be of most importance to the development of Klimakommune Saerbeck. On the other hand, when asked about the importance of facilitating social learning to the development of Lochem Energie, the board member says that social learning is important, "but it is no different from any other organization". From this sentence an under-appreciation of the potential transformative capacity of social learning in relation to business-oriented initiatives - such as Lochem Energie – becomes clear. The cooperative equates progress to the increasing number of members, which in the opinion of the board member is something that cannot be achieved through social learning by rather through effective networking (Personal Communications with Interviewee 2, 2014).

The project manager of Klimakommune Saerbeck cannot emphasize enough the importance of educating their participants is to the cooperative (Personal Communications with Interviewee 5, 2014). As the public relations manager describes it, “In social learning, we take people ‘by the hand’ and just lead them from one topic to the other and try to have them participate in whatever they want people to participate in”. The cooperative was able to use their internal network with local institutions to further facilitate social learning. For example, their collaboration with the kindergarten, primary and secondary school allows the cooperative to educate the younger generation of Saerbeck. In this way, the initiative is already shaping the minds of the younger generation who are not subject to path dependencies brought by the current energy regime - “these kids will grow up knowing nothing but renewable energy” (Personal Communications with interviewee 6, 2014). What these kids learn at school is also something that may be shared with the rest of their family over the dinner table.

In conclusion, this study has explored how the local renewable energy initiatives of Lochem Energie and Klimakommune Saerbeck have developed in attempts to infiltrate society’s mainstream practices of energy production from an SNM standpoint. In both case studies evidence of verification of all three explanatory factors from SNM theory was shown, although in differentiating ways and intensity. With the case of Lochem Energie, the building of social networks appears to be one of their main activities (headed by the former alderman and “niche manager,” Thijs de la Court) over the management of expectations and facilitation of social learning. Although improvements still need to be done regarding the cohesiveness within Lochem’s network, given the fact that they are far from reaching their goal set for the number of members and also given the lack of collaboration with other local initiatives such as ADEL and VEDEL. While in the case of Klimakommune Saerbeck, all three factors were present, and were specifically identified as reasons behind the local cooperative’s success, with more emphasis placed on the importance of facilitating social learning. The steering committee also recognizes the efforts of the federal government in creating opportunities in support of the development of local energy initiatives such as Klimakommune Saerbeck in the form of the NRW-competition, as one example, which they won. The prize money has given Klimakommune Saerbeck the extra push to realize their goals sooner than expected (Personal Communications with interviewee 5 and 6, 2014).

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Appendices:

A. Questions for Interviewee 1:

Name: Mr. Thijs de la Court
Position: Founding member of Lochem Energie and former alderman of Lochem

1) Are you still affiliated with Lochem Energie at the moment? Are you / were you ever a part of the board?
2) Where did the idea behind Lochem Energie come from?
3) What do you think was the role you played in the development of Lochem Energie, given your position as alderman?
4) What drove the residents of Lochem to carry out an energy transition? Was there any concern for the environment? Were there any complaints about energy companies or the national government?
5) Did you encounter any opposition from the residents, from energy companies or from the municipality?
6) What measures did you take to get more people interested in the initiative?
7) Why do you think Lochem Energie is struggling to expand to 2,000 households?
8) In what ways did the network change, as the initiative grew larger? To what extent were these actors involved in the decision-making processes of the initiative?
9) How does social learning occur among the members of Lochem Energie? Do you think that being a member has expands ones knowledge on renewable energy? Do you see any changes in their behavior or way of thinking towards sustainability?
10) What do you think were the key developments from the initiation of the projects up to today and why would you consider these as milestones?
11) What do you think were the reasons behind Lochem Energie's success?
12) What do you see for the future of Lochem?

B. Questions for Interviewee 2:

Name: Mr. Tonnie Tekelenburg
Position: Founding member and Researcher in Client Participation for Lochem Energie

1) My research defines local energy initiatives as the following:

Local energy initiatives are projects *"initiated and managed by actors from civil society, that aim to educate or facilitate people on energy use and efficiency, to provide, generate, treat or distribute renewable energy derived from various renewable resources for consumption by inhabitants, participants or members who live in the vicinity of the renewable resource or where the renewable energy is generated."*

To what extent do you think this definition fits Lochem Energie?

2) What drove the residents of Lochem to carry out an energy transition? Was there any talk about compassion for the environment; concern for climate change, peak oil? Were there any complaints about energy companies or about the national government?
4) What are the overarching objectives of your initiative?
5) Did you encounter any opposition from the residents or from the large energy companies?
6) What measures did you take to get more people interested?
7) What do you think was the role of the local community in establishing Lochem Energie?
8) In what ways did your network change, as your initiative grew larger? To what extent were these actors involved in the decision-making processes of your initiative?
9) How does interaction take place between the board members and the public?
10) Given the multiplicity of your participants, how do you balance their demands given their different priorities, concerns and interests?
11) How does social learning occur among the members of Lochem Energie? Do you think that being a member has expands ones knowledge on renewable energy? Do you see any changes in their behavior or way of thinking towards sustainability?
12) What were the key developments from the initiation of the projects up to today and why would you consider these as milestones?
13) What would you say were the biggest challenges you faced in the past years, how were these challenges addressed and what did you learn from them?
14) What do you think are the main reasons behind your success?
15) What do you see for the future of Lochem?

C. Questions for Interviewee 3

Name: Ms. Denise de Jonge
Position: *Opbouwwerker* (Dutch for community capacity development worker); Process manager and mediator for community initiatives in Lochem

1) How are you affiliated with Lochem Energie?
2) Why did you decide not to be a member of Lochem Energie?
3) How did you end up becoming the process manager and mediator for Lochem?
4) What are your responsibilities as process manager and mediator for the community initiatives in Lochem?
5) How would you define good communication? What do you expect from Lochem Energie if you were to be a member?
6) Is there any collaboration happening between Lochem Energie and ADEL?
7) Why do you think is the reason behind why Lochem Energie is not collaborating with ADEL?

D. Questions for Interviewee 4

Name: Mr. Paul de Koning
Position: Former village ambassador for Lochem Energie, currently involved in Laren Energie

1) How are you connected to LochemEnergie? Are you still acting as village ambassador for the organization? Is this different from being chairman of LarenEnergie?
2) Were you asked to be village ambassador / chairman of LarenEnergie or did you volunteer?
3) What is/was your role as a village ambassador for LochemEnergie?
4) Can you tell more about LarenEnergie? Is it a project that started from the local government of Lochem or of the local residents? How is this different from ADEL and VEDEL?
5) What do you think is the role of the local government of Lochem? Do their policies support local sustainability initiatives?
6) How do collaboration, communication, decision-making and the sharing of resources take place between Laren Energie and Lochem Energie? Are you working on projects together?
7) Why do you think there is no collaboration happening between Laren Energie and Lochem Energie?

E. Questions for Interviewees 5 and 6

Name: Mr. Guido Wallraven
Position: Member of the steering committee as project manager for Klimakommune Saerbeck

Name: Mr. Klaus Russel- Wells
Position: Member of the steering committee as public relations manager for Klimakommune Saerbeck

1) My research defines local energy initiatives as the following:

Local energy initiatives are projects *"initiated and managed by actors from civil society, that aim to educate or facilitate people on energy use and efficiency, to provide, generate, treat or distribute renewable energy derived from various renewable resources for consumption by inhabitants, participants or members who live in the vicinity of the renewable resource or where the renewable energy is generated."*

To what extent do you think this definition fits Klimakommune Saerbeck?

2) What drove the residents of Saerbeck to carry out an energy transition? Was there any talk about compassion for the environment; concern for climate change, peak oil? Were there any complaints about energy companies or about the national government?
4) What are the overarching objectives of your initiative?
5) Did you encounter any opposition from the residents or from the large energy companies?
6) What measures did you take to get more people interested?
7) What do you think was the role of the local community in establishing Lochem Energie?
8) In what ways did your network change, as your initiative grew larger? To what extent were these actors involved in the decision-making processes of your initiative?
9) How does interaction take place between the steering committee and the public?
10) Given the multiplicity of your participants, how do you balance their demands given their different priorities, concerns and interests?
11) How does social learning occur among the members of the Klimakommune? Do you think that being a member has expands ones knowledge on renewable energy? Do you see any changes in their behavior or way of thinking towards sustainability?
12) What were the key developments from the initiation of the projects up to today and why would you consider these as milestones?
13) What would you say were the biggest challenges you faced in the past years, how were these challenges addressed and what did you learn from them?
14) What do you think are the main reasons behind your success?
15) What do you see for the future of Saerbeck?