LUND UNIVERSITY
SCHOOL OF ECONOMICS AND MANAGEMENT

Bachelor's Programme in Economy and Society

# The Role of Energy Initiatives in the Energy Transition

*A Comparative Study of Two Local Energy Initiatives in Skåne*

by

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**Abstract**

Transitioning away from fossil fuels is prominent to stay within the 1.5-degree limit outlined in the Paris Agreement. For this to occur, the socio-technical energy system needs to become more flexible and support decentralized systems. One way to do this, as advocated by the European Union as well, is to support local energy initiatives. This paper examines how different local energy initiatives in Skåne, one bottom-up initiated by the citizens, and one top-down initiated and operated by an energy company, can contribute to the energy transitions at different geographical scales. To do this, semi-structured interviews were conducted and analyzed with the frameworks Multi-Level Perspective (MLP) and the Multi-Scalar MLP. The paper revolves around how the initiatives influence and are influenced by different geographical scales during its operation, and how each amplifies to contribute to the energy transition in different ways. The results demonstrate that the bottom-up initiative interacts with the local scale the most, whereas the top-down initiative has more transnational interactions. This shows that the bottom-up initiative contributes by stabilizing and scaling deep, meaning to change norms, increase the number of members, and continue with its vision for enhancing the transition. Contrary, the top-down initiative is scaling up and spreading, meaning that the initiative is spread to other contexts and more networking and advocating for a different system is conducted. Contributions of this paper include policy implications of at which scales appropriate policies can be implemented, as well as a larger understanding of the diversity of local energy initiatives in Sweden.

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## List of Abbreviations

BESS - Battery Energy Storage Systems

DSO - Distribution System Operator

EC - Energy Community

FiTs - Feed-in-Tariffs

LEI - Local Energy Initiative

MLP - Multi-Level Perspective

PV - Photovoltaic

RED II - Renewable Energy Directive

RES - Renewable Energy Sources

TSO - Transmission System Operator

# 1. Introduction

Energy is at the core of our societies. Without energy, we would not be at the economic or social levels we are today (Stern et al., 2017). However, the high use of energy based on fossil fuels has come at a cost - environmental degradation and climate change. This has spurred the need to shift from fossil fuels to renewable energy sources (RES), enabling an energy transition (World Meteorological Organization, 2023). Transitions are crucial parts of societal development. The Industrial Revolution and the ICT Revolution were initiated because of technological advancements and resulted in large restructurings and impacts on society (Vickers & Ziebarth, 2019). What differentiates the energy transition from these two is the urgency. There is an urgency to transition away from fossil fuels because of the large impacts on societies, businesses, politics, and institutions there will be, regardless of whether it succeeds or not (IRENA, 2022a). Because of this urgency, this paper will explore how local energy initiatives (LEIs) can contribute to the energy transition at different geographical scales and what factors impact their initiation and operation.

A central part of the energy transition is the need to change the model of our energy systems. Currently, because of the extensive use of fossil fuels which are extracted in a few areas, a central system is required (National Geographic, 2023). However, as RES like wind and solar are intermittent and spread over more areas, a decentralized energy system is also required (IRENA, 2022b). A crucial part of decentralized energy systems is local energy generation. One part of local energy generation is energy communities (ECs). The European Commission defines ECs as: “Citizen-driven energy actions that contribute to the clean energy transition, advancing energy efficiency within local communities” (European Commission, n.d.). Since 2019, the European Union has emphasized an active role of citizen engagement in the energy transition, when they released their Clean Energy For All Package (European Commission, Directorate-General for Energy, 2019). Whereas some member countries, including Germany and the Netherlands, have come a long way in legislation and establishment of ECs, Sweden is still in a development phase due to a lack of legal incentives (Kooij et al., 2018).

Another way of organizing local energy initiatives is through a top-down approach. Unlike the EU’s definition of EC, top-down initiatives are not initiated by the citizens. Initiators for this type of local energy initiative include energy companies and municipalities. In comparison to bottom-up energy initiatives, top-down initiatives are more influenced by new

technological tests, and the involvement of several actors with an interest in energy development (researchers, businesses, etc.) (Álvarez et al., n.d.). Thus, although both top-down and bottom-up initiatives have the aim of generating local energy, the reason why they started, their operation, and the results they generate can differ.

## 1.1 Aim and Research Question

This difference in organization, operation, and impacts of local energy initiatives, is the focal point of this study. By comparing two local energy initiatives in Skåne, the study aims to understand the different contributions to the energy transition local energy initiatives can have depending on whether it is a bottom-up or top-down initiative. The aim is to provide an increased understanding of local energy initiatives in Sweden, where academic, institutional, and economic insights are lacking. By comparing two different initiatives, additional aims include understanding how the two are operating differently and with what geographical scales (local, regional, national, transnational, global) the initiative generates impacts on, and which scales they are getting impacted by as well.

> ***RQ:*** How do two different local energy initiatives in Skåne contribute to the energy transition on different geographical scales, and how do these scales influence the initiatives over time?

> ***Sub-RQ:*** How does a bottom-up initiative compare to a top-down initiative?

## 1.2 Relevance and Contributions

The relevance of this study stems from institutional changes in the EU and Sweden. Since the EU's Clean Energy for All package from 2019, the EU has demonstrated that larger contributions to the energy transition are required from all parts of society - ranging from large multinational companies to the individual consumer (European Commission, 2019). Since this entails a large transition away from the traditional centralized energy system, research on the local energy initiatives that are operating is relevant to understanding the mechanisms of the energy transition. Additionally, the Swedish government assigned the Agency of Energy (Energimyndigheten) the task of investigating what the prerequisites for energy communities in Sweden are currently and how they can be improved (Palm, 2021;

Regeringen, 2024). This research will therefore provide insights into the prerequisites of two energy communities before this report's deadline and is of current relevance.

The contributions of this study therefore relate to how policies and frameworks can be created to work towards Sweden's ambitions to generate clean energy and induce the operations of local energy initiatives. Since decentralized energy systems and LEIs are not extensively developed in Sweden, this research provides insights into how they can develop in different ways and what contributions a bottom-up vs. a top-down approach might have on Sweden's energy transition. Additionally, by understanding how different LEIs interact with geographical scales at different stages, a further understanding of what type of policies are needed for supporting different types of LEIs is given. Although the study is based on two case studies in Sweden and the results are difficult to generalize, the approach of analyzing interactions from different initiatives can have contributions internationally by inspiring similar research, to understand spatial interactions from more LEIs. Additionally, few studies have conducted a comparative approach of LEIs with a geographical lens, hence marginally contributing to the academic field of socio-technical transitions in Sweden as well.

### 1.5 Thesis Outline

The thesis begins with a background (2) of the energy transition historically, globally, and in Sweden. Additionally, it provides a context of the energy markets and legislations in the EU and Sweden. Following the background, a literature review (3) is conducted to understand previous research in the field. After this, the theoretical framework (4) is presented, which the analysis will be based on, followed by the research design (5). The results section (6) is divided into the categories of *start, operation, and impacts,* followed by the analysis and comparison (7), where the theoretical framework is applied. Lastly, a conclusion (8) sums up the main points of the thesis.

## 2. Background

### 2.1 The Energy Transition

The energy transition, as defined by Fouquet and Pearson (2012) as "/…/ the switch from an economic system dependent on one or a series of energy sources and technologies to another." (Fouquet & Pearson, 2012, p. 1) is what our global economic and energy systems are undergoing today by switching from fossil fuels to renewable energy sources like hydro,

solar, and wind (IRENA, 2022b). Historically, energy transitions have occurred when biomass was exchanged for fossil fuels, as a consequence of the discovery of oil and coal and the commencement of the Industrial Revolution (Solomon & Krishna, 2011). However, as Solomon and Krishna (2011) note, this transition proceeded for several decades, at different paces in different parts of the world. The current energy transition needs to occur within three decades to stay within the 1.5-degree goal, as agreed upon globally in the Paris Agreement (IRENA, 2022b). Figure 1 shows how the deployment of RES has increased in electricity generation in the last decade, but where coal is still the predominantly used energy source for electricity.

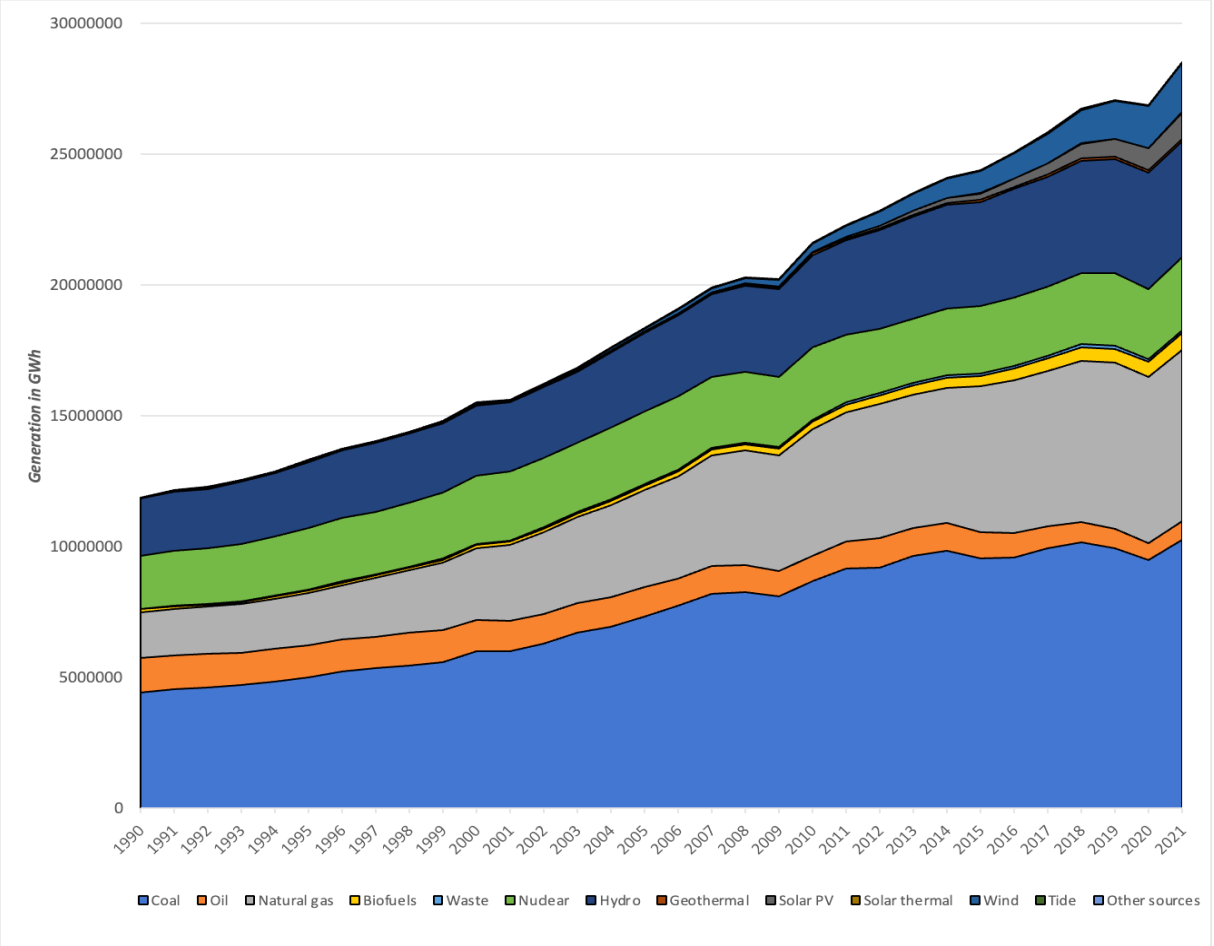


**Figure. 1.** The energy mix for electricity generation globally in GWh, 1990-2021 (IEA, n.da.)

Due to Sweden's abundance of rivers, hydropower has long been the most used energy source (IEA, n.da). The last 10 years have seen a large increase in energy produced from wind and solar as well. In addition to renewable energy sources, nuclear power, and imported oil have been utilized for power generation (ibid). Figure 2 shows that the last 20 years have seen an increase in biofuels, solar power, and wind power as well. Although solar is still Sweden's

least prominent energy source, partly due to the unfavorable solar hours during the winter period, solar has increased by 46% between 2020 and 2021, totaling 92,359 grid-connected PV systems in 2021 (ibid).

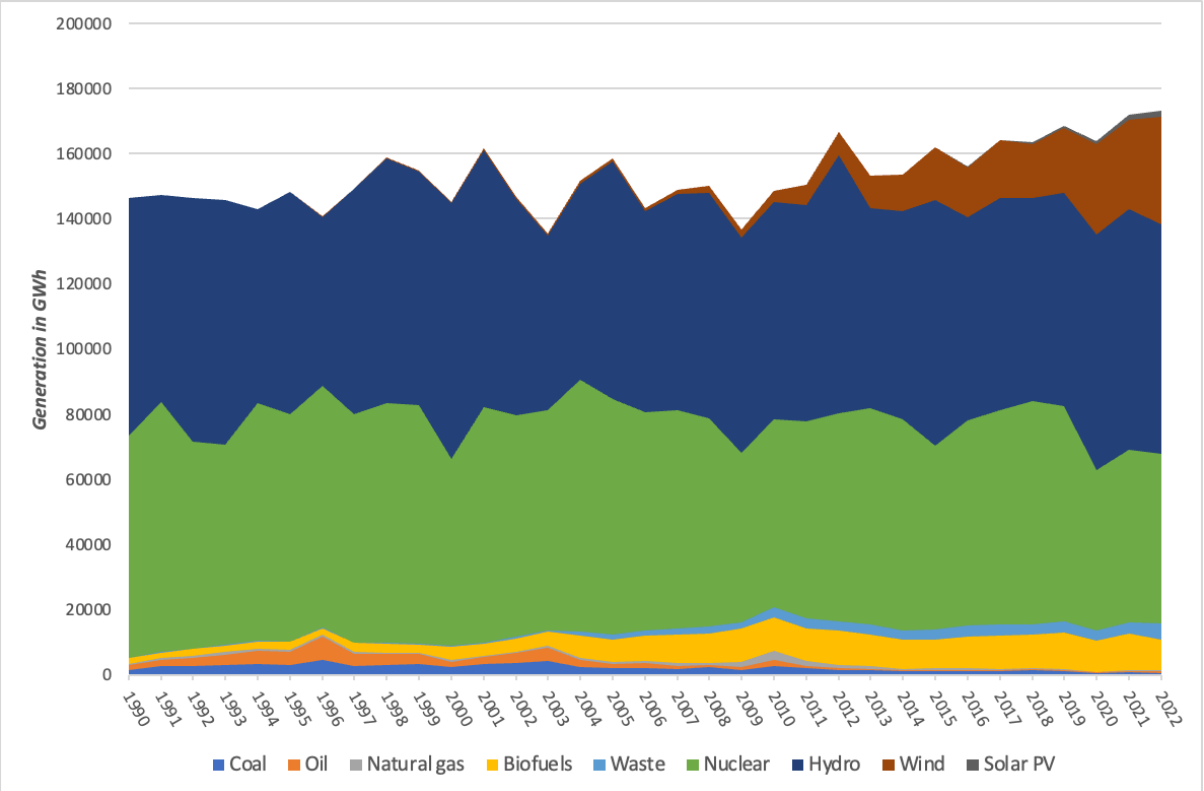


**Figure 2.** The energy mix for electricity generation in Sweden in GWh, 1990-2022 (IEA, n.db)

## 2.2 Energy Legislation in the EU and Sweden

One solution to induce the speed of the energy transition is policies and frameworks that aim to improve the feasibility and viability of renewable energy. After the implementation of the Renewable Energy Directive (RED II) in 2018, the EU released its Clean Energy for All Europeans Package in 2019 to enhance efforts to decarbonize along with the previously released Green Deal and the RED II (European Commission, 2019). A crucial part of the Clean Energy for All Europeans includes the Internal Electricity Market Directive. This is the first directive in the EU where local energy initiatives, and specifically energy communities are both defined and promoted. The EU also encourages all member states to implement measures to facilitate the initiation and development of energy communities in their legislation, due to social, economic, and ecological benefits (European Commission, 2019). After its release in 2019, numerous member states have introduced legislation concerning

energy communities. However, Sweden is one of three member states that have not implemented any legislation concerning energy communities (Eurogeographics, 2024). However, as stated, this might change following Sweden's Energy Agency's investigation of the legal prerequisites for energy communities in Sweden (Regeringen, 2024).

## 2.3 The Electricity Market in Sweden and Technologies

To understand the workings of local energy initiatives in Sweden, it is useful to understand how the electricity market in Sweden is operating. Since 1996, the Swedish electricity market for trading has been deregulated, whereas the distribution of electricity is still regulated (Holmberg & Tangerås, 2022). Sweden is part of the Nordic-Baltic electricity market, which is where Sweden both sells and buys electricity (ibid). The distribution of electricity however is regulated by the Swedish Energy Markets Inspectorate. The Swedish grid consists of three levels: the transmission network, the regional networks, and the local networks. Svenska Kraftnät is the Swedish Transmission System Operator (TSO) and, hence owner of the transmission network. Over 170 other companies are so-called Distribution System Operators (DSOs) and are responsible for the transmission and sustainability of the regional and local networks (Svenska Kraftnät, 2023). Lastly, Sweden is divided into four electricity zones, ranging from SE1 in the northernmost parts to SE4 in the South. Due to the higher availability of hydropower in the north, electricity prices are generally lower in SE1 and SE2 than in SE3 and SE4 (Svenska Kraftnät, 2022).

As electricity consumption increases with higher rates of electrification and higher levels of income, so does the burden on the grids. If energy usage is higher than production, the capacity of the grids' transmission is overloaded and could cause issues for energy distribution, so-called grid stress (Energimarknadssinspektionen, 2021). This is where off-grid systems and battery energy storage systems (BESS) play a crucial role as electricity demand increases with the electrification of for example transport systems, the need to store energy production when it is high increases. Additionally, when the use of RES increases, the need to store the energy from high production periods and exploit it later increases (Hesse et al., 2017). Thus, energy storage batteries can both decrease grid stress and increase RES's viability. Off-grid systems are usually combined with solar PV installations but can occur with wind parks as well. Off-grid means when a household or community can be totally disconnected from the national grid and only use the energy they produce themselves from

these sources (Weinand et al., 2023). Local energy initiatives are often formed around the concept of being off-grid or enabling the use of BESS, thus they play an important role in the energy transition (IRENA, 2023).

## 3. Literature Review

Research about local energy initiatives generally covers conditions that spur or obstruct the establishment and operation of them (Lode et al., 2022; Caramizaru & Uihlein, 2020) the effects of ECs (Berka & Creamer, 2018; Brummer, 2018). Nevertheless, before reviewing the research in these aspects, it is convenient to understand the different forms local energy initiatives can take.

### 3.1 Types of Local Energy Initiatives

Local energy initiatives and energy communities are often considered through exactly the notions of "community" and "local", meaning that they are created, operated, and confined by the local citizens (Creamer, et al, 2018). However, Creamer et al (2018) challenge this proposition of a sole bottom-up approach and geographically bounded. Instead, they point to the interaction of communities, the state, and the private sector and mean that energy communities are always operating at different scales with different actors and institutions that coordinate and operate together. Additionally, Berggren, et al. (2015) demonstrate how technological niches can be operated by companies that, due to market competition, develop novel technologies and therefore can in some instances act as a local initiative as well. A study by Horstink, Wittmayer, and Ng (2021), who have used a mixed-method approach and studied 1700 prosumer initiatives in Europe, is also pushing for a rather pluralistic view of LEIs. They found that energy initiatives could be organized into three main types: *Self-focused, Civic-focused,* and *Prosumer-focused.*[1] This shows that there are numerous ways local energy initiatives can evolve and operate.

[1] **Self-focussed** include *Organizational* Prosumers, which consists of Business, Public, and Not-for-profit Prosumers.
**Civic-focussed** include Formal, Informal, Neighbourhood, and Virtual Energy Communities, as well as Civic Energy Cooperatives.
**Prosumer-focussed** includes groups that facilitate, benefit or influence conditions for prosumers. This includes local, regional, national, and EU authorities, energy agencies, energy lobby groups, independent energy aggregators, regional energy agreements and non-commercial peer-to-peer energy trading platforms.

### 3.2 Europe and Sweden

As stated, ECs in Europe have recently gained increased attention along with the publication of the EU's Clean Energy Package. However, research about ECs in Europe has been prominent before the EU's publication. The countries with the highest number of ECs are the UK, the Netherlands, and Germany (Eriksson Berggren et al., 2023). This is in line with van Bommel and Höffken's (2021) study which showed that LEIs are most concentrated in countries where the citizens have the highest disposable incomes, meaning North-Western Europe, and less in the South and Eastern. Hewitt et al. (2019) mean that the promotion of feed-in tariffs (FiTs) and tax subsidies in Germany, Denmark, and the UK has been one of the major factors leading to a high concentration of local energy initiatives. Dewald and Trufer (2011) have also shown in their study that LEIs played an important role in the diffusion of solar PVs in Germany, as they were established before the legal changes of FiTs and taxes. Additionally, the price of electricity has been noted to impact the deployment of LEIs, as shown by Capellán-Pérez, Campos-Celador, and Terés-Zubiaga (2018) in their case study of renewable energy cooperatives in Spain.

Authors (Envall et al., 2023; Magnusson and Palm, 2019) have analyzed the institutional settings of ECs in Sweden and found that due to the high availability of hydropower, and hence centralized systems, relatively few ECs have been established in Sweden. One study by Magnusson and Palm (2019) has mapped Sweden's ECs. Through interviews and mapping, they concluded that the main drivers of CEs were economic incentives to impact their economy, drive to make an impact on the environment, and suitable policies for establishing ECs. Considering barriers, they found low economic support, technical issues, and poor engagement amongst the citizens to be specific barriers. This, as Eriksson Berggren et al., (2023) also found, is one of the reasons Sweden has relatively few ECs and is still in the initial development phase.

### 3.3 Conditions for local energy initiatives to emerge

Lode et al. (2022) conducted a systemic and content-based literature analysis of the conditions of *why* energy communities arise globally. They found that the most prominent conditions that spur local energy initiatives are institutions that support local energy initiatives, including laws, regulations, administrative support for markets, technology, and innovation. They found that if these institutional settings were in place, the factors that

impact individuals and communities to establish local energy initiatives, e.g. norms, motivation, and values are more likely to develop and spur local energy initiatives. Additionally, they showed that the individual and community factors impact the institutions interchangeably, rather than in a one-way direction. Curtin, McInerney, and Ó Gallachóir (2017) also show in their systematic literature review, how energy policies including FiTs, tax incentives, and renewable support schemes also benefit energy initiatives.

### 3.4 Impacts of ECs

Regarding the impacts of ECs, Brummer (2018) analyzed the impacts of ECs through a systematic literature review of ECs in Germany, the US, and the UK. Common impacts included economic benefits, education and acceptance, and meeting renewable energy generation targets. Nevertheless, the impacts varied depending on the countries, e.g. the second most-cited impact in Germany was innovation, whereas this was not mentioned at all in the British cases. Nevertheless, Berka and Creamer (2018) note from their study in the UK that social impacts are dependent on the context and specifically the organization model of the EC. Through Berka and Creamer's (2018) literature review, they find that ECs that have a profit-based model generate less social impacts compared to when the community and social impacts are pronounced parts of the aim of the EC.

Blanchet (2015) studied the impacts of grassroots initiatives within energy in Berlin. He showed that grassroots initiatives can impact local perceptions and openness to renewable energy. However, to make grassroots initiatives have a larger impact on wider energy policies, local and direct elections are needed for larger impacts. Bauwens and Devine-Wright (2020) conducted a quantitative study based on survey results from two wind energy cooperatives in Belgium. They aimed to compare the attitudes towards wind energy between members and non-members of the cooperatives. The results showed that members were more positive about wind energy, whereas non-members were either uncertain or indifferent. This shows how models in local energy initiatives that allow citizens' participation can change the attitudes towards renewable energy projects more.

### 3.5 Scaling of Local Energy Initiatives

Another strand of research considering local energy initiatives concerns their ability to scale up. By using Qualitative Comparative Analysis, Petrovics, et al (2024) studied 28 LEIs in

Europe and their abilities to scale. Drawing on the study of Petrovics et al (2022), which analyzed the conditions to scale through a systematic literature review and found three dimensions of scaling: conditions that are *internal* to the communities, conditions concerning the *interactions between* communities, and conditions that regard the initiatives *external context,* Petrovics et al (2024) develop these conditions and found 8 conditions that in combination would imply scaling of an initiative. These included capacity support (leadership, learning, and communication), formalization, clear vision and purpose, availability of networks and learning between initiatives and lastly being open to innovation and flexibility.

Instead of conditions to *scale,* Lam et al. (2020) investigate processes for local sustainability initiatives to *amplify* through a systematic literature review. They mean that when researching initiatives' ability to grow, the term *scale* infers how initiatives evolve through size or space, whereas amplify can indicate a changing of internal values and mindsets and thereby grow as well. Although demonstrating 8 different amplification processes, they conclude that there are three categories similar to the ones proposed by Petrovics et al (2022), meaning amplifying *within,* amplifying *without,* and amplifying *beyond.*

### 3.6 Research Gaps

Although extensive research has been conducted on the conditions and implications of local energy initiatives, research is still lacking on how different types of initiatives work, for instance comparing how initiatives that are bottom-up and top-down based operate (except for Međugorac and Schuitema's (2023) study, which explored the attitude differences towards bottom-up vs. top-down energy project). This gap is what this research aims to fill by comparing two of these types of projects in Skåne. Additionally, due to Sweden's early stage of developing local energy initiatives, and specifically energy communities, there is a need to research the Swedish context of energy initiatives. Considering the EU's formulation of energy communities in its Clean Energy for All Europeans and the current investigation of how energy communities can be introduced in Swedish law, this area of research in Sweden is both current and much needed. Lastly, a geographical lens of the interactions of initiatives on different scales and how they are confined by place-specific contexts is lacking, which this thesis also aims to contribute.

# 4. Theoretical Framework

The energy transition is one of many large societal transformations that include several systems, including social, economic, political, and technological, that interact (Geels, 2002). These types of transitions that include both social and technological aspects are called socio-technical transitions and thus occur when a socio-technical system is transformed (Kemp, 1994). Over the last two decades, the Multi-Level Perspective (MLP) has evolved as a prominent theory to examine socio-technical systems.

## 4.1 Multi-Level Perspective

MLP's current framework was initially based on evolutionary economics, innovation theory, and institutional theory and has been applied to research areas ranging from sustainable agriculture to energy systems and transport (Geels, 2019). The basis of the MLP is that socio-technical transitions occur when the *regime* is changed by influencing forces from the *landscape* and/or *niches*.

A niche is a space that is separated and protected from market competition. This allows for the development and trials of innovations without the pressure of competition (Smith & Raven, 2012). Whereas the initial focus of MLP studies was on technological innovations, a broadening of the concept of "innovation" in the theory has allowed for studies on a variety of niches and innovations, including social and economic innovations (Smith, Voß & Grin, 2010). Schot and Geels (2008) assert that niches can be generated through both bottom-up initiatives by citizens, as well as organizations that want to develop and try novel technologies. Thus, in this paper, both case studies are considered as niches.

Niches are constrained by the *regime* they are operating in. A regime is where the rules and norms are based on interactions and decisions of intermediaries, where rules imply the legislations and policies that impact the establishments and operations of niches (Geels, 2011). However, the regime is also characterized by social norms that could either constrain or encourage niche development. Due to lock-ins in socio-technical systems, e.g. cognitive oppositions or institutional lagging, this change is prone to inertia and can take several years, or never occur at all. However, it is when the regime changes large transitions can occur (Klitkou et al., 2015).

Lastly, the *landscape* consists of conditions that are over-arching and considered more global (Geels & Schot, 2007). Like the regime, the landscape can impact niches in both positive and negative ways. Climate change might for example increase the incentives to install more renewable energy. However, if climate change increases the risks of disaster, it might do the opposite. Wars, demographic changes, and macroeconomics are other aspects of the landscape (Geels, 2014). Together, these three levels constitute the *socio-technical system*.

## 4.2 Multi-Scalar Multi-Level Perspective

One of the cited shortcomings of the MLP framework is the low regard for geographical levels and spatial considerations of transitions. Because of this, the multi-scalar MLP has been developed by geographers and economic geographers (Coenen et al., 2010; Miörner & Binz, 2021). The multi-scalar MLP asserts the importance of how place-specific contexts are important as to why certain niches and transitions occur where they are geographically due to the norms, cultures, and natural endowments of a place (Späth & Rohracher, 2010). In the multi-scalar MLP framework, proximities are important to transition away from the normative local, regional, and national scales often contained in MLP research. These proximities are elaborated by Boschma (2005) to include organizational, cognitive, social, institutional, and geographic proximities. These infer that transitions can occur through collaborations based on the aspect of having similar organizational set-ups or part of organizational collaborations (organizational), sharing values and ideas in specific spaces for instance conferences or meetings (cognitive), sharing similar values and norms (social), having similar institutional set-ups that lead to collaboration (institutional) or being geographically close than enhance meetings and relations in-person and thereby collaboration (geographic) (Boschma, 2005).

Another aspect of multi-scalar MLP considers structural coupling, which considers how the elements of local initiatives, including networks, institutions, and the actors embed knowledge locally, or connect knowledge in certain networks and organizations, leading to these different types of proximities as Boschma (2005) acknowledges (Bergek et al., 2015). Additionally, these couplings can occur at different scales simultaneously, hence being viewed in a multi-scalar way (ibid).

Lastly, multi-scalar MLP also considers how niches can scale up differently. Whereas researchers within MLP (Petrovics, 2022) have evaluated how niches can scale up and impact the regime, multi-scalar scholars mean that this discards contributions of initiatives that have other aims and fewer resources to impact the socio-technical regimes. Because of this, Lam et al. (2020) developed a framework that considers how niches can *amplify* as well, and thereby impact a transition on different scales. They note that whereas the term *scale* infers how initiatives evolve through size or space, amplify can indicate a changing of internal values and mindsets and thereby grow as well. Through this, Lam et al. (2020) have proposed eight categories of how niches can amplify, which are part of three different main categories of amplifying - amplifying *within, out,* and *beyond* (summarized in Table 1).

As seen in Table 1, Lam et al. 's (2020) eight processes of how niches can generate change in transitions include *stabilizing,* which means that the initiative becomes more strongly integrated into the context where it is already operating. This includes increasing the number of members, expanding already existing opportunities, and improving their current vision. As a result, this way initiatives become more resilient and can last longer. The second process is *speeding up*, which they assert is important for issues like climate change and involves enhancing efficiency and organizational processes. Third comes the category *growing*, which means when an initiative expands to contexts that are similar to the initial initiative, which is different from the fourth category *replicating* where the initiative is copied but put into a different context. *Transferring* means when a niche is transferred to a new place where the initiative in its operation is similar to the initial niche, but where it is operating independent of the initial one. *Spreading* however is a niche that rather is influenced by the values the initial niche had, but which operates independently and is adapted to the new context than the original niche (Lam et al., 2020). Lastly, the scaling-up categories involve both *scaling up* and *scaling deep,* where scaling up is when a niche aims to impact the regimes' institutions and logic, which could be executed by lobbying, advocating, and networking to demonstrate how the regime can change. *Scaling deep* is when niches instead change people's mindsets and values. Therefore, this does not consider policy changes but rather focuses on the informal institutions that are prevalent at both local levels and the higher regime levels. From these eight categories (see Table 1), they assert that niches' potential to impact a transition could be by amplifying *within* (stabilizing and speeding up)*, out* (growing, replicating, transferring, and spreading), and *beyond* (scaling up and scaling deep) (Lam et al., 2020).

| Main Category of Amplifying | Sub-Category | Actions | Implications |
|---|---|---|---|
| **Within** | *Stabilizing* | Increase members / Expanding already existing opportunities / Strengthening and improving the current vision of the initiative | More strongly integrated in the context where it already is operating / Improved resilience, lasts longer |
| | *Speeding up* | Enhancing efficiency and organizational processes to fasten change | Quicker transitions / New directions, visions, and organization forms |
| **Out** | *Growing* | Making the same initiative in a similar context by transferring all | The initiative expands to contexts that are similar to the initial initiative |
| | *Replicating* | Making the same initiative in a new context, but not adjusting to the different context in the initiative | The initiative is copied but put into a different context |
| | *Transferring* | Only the main lessons and contributions of the initiative are transferred but to a similar context | The initiative amplifies to a context that is similar to the origin initiative, but the initiative is still slightly changed |
| | *Spreading* | Considers the new context and adjusts the new initiative to fit the new conditions, but where the main lessons and contributions are kept | The initiative amplifies to a context that is different from the origin initiative and the initiative is adjusted, but keeps the main lessons |
| **Beyond** | *Scaling up* | Lobbying / Advocating / Initiating discussions and visions for how a new regime is possible | Changing the rules and policies of the current regime |
| | *Scaling deep* | Presenting new ways of relating to innovations / Changing perceptions / Introducing new value systems | Changed values, norms, and beliefs of what is considered acceptable and normative in the current regime |

**Table 1:** Summary of Lam et al.'s (2020) processes of how sustainable initiatives can amplify

Thus, the multi-scalar MLP framework contributes insights into how geographical conditions and the MLP levels both impact and get impacted by each other, consequently impacting how and where niches develop.

### 4.3 Limitations and critique of the theories

Although MLP has been used in many fields of research within sustainable transitions, there are certain shortcomings with the theory. Hielscher, Seyfang, and Smith (2013) note that the theory lacks social aspects since the initial entry point of analysis is technological advancements and not social innovations. Genus and Coles (2008) also state that MLP has certain theoretical and methodological shortcomings, where they question the systematic processes that support the MLP framework. For this research, one limitation of using the MLP theory is its focus on how stakeholders can incentivize and create policies to induce the establishment of niches. Since this research aims to compare how bottom-up vs. top-down niches operate, and how they contribute to the energy transition, this perspective of governance is not included to the same extent. Nevertheless, since MLP is a broad theory that encompasses economic, social, political, and technological perspectives that are crucial to the development of LEIs, it is useful to use, despite its limitations. Additionally, the lack of geographical considerations is why the multi-scalar MLP is included as well. However, the multi-scalar MLP also has limitations, including limited considerations of the role of individuals to enable transformation, for instance, particularly innovative and motivated people. This is an aspect that the original MLP also lacks. Nevertheless, it does not impact the outcome of this research since the main focus is how niches interact with different geographical levels at different stages of the process and how they contribute to the energy transition.

## 5. Research Design:

This thesis will be based on a comparison of two energy projects that both help to induce the energy transition in different ways. One is a bottom-up cooperative created and operated by local citizens in the village of Röstånga and the neighboring regions. The other one is a top-down initiative in Simris operated by the DSO E.ON.

### 5.1 Case Studies

*Röstånga Energy Cooperative*

The energy cooperative Röstånga is located in the Scanian village of Röstånga. The cooperative was started in 2019 by four citizens who wanted solar panels. The cooperative operates by installing solar panels on the citizens' roofs but also follows the other practicalities that a cooperative needs to have, which are the dissemination of information, which means that other events like information meetings and education sessions regarding solar panels and energy efficiency are held. Today the number of members is over 100 and includes businesses and individual households.

*Simris - E.ON and EU InterFlex Project*

In contrast to Röstånga, the energy initiative in Simris was initiated by the DSO E.ON in 2017 and continued until 2019. With funding from the EU, as a result of being one of six local energy projects in Europe in the InterFlex project, this is a top-down initiative which also emphasizes local importance. The project in Simris aimed to improve grid stability, and energy resilience, and create an energy community by using peer-to-peer and demand response technologies (InterFlex, 2019). In addition to installing solar panels on the participants' roofs, they also installed energy storage batteries, heat pumps, and energy meters in some of the participants' households to control the energy demand and supply to the grid. The aim was thus to create a local energy initiative by engaging and supporting the citizens to install solar panels and to disconnect the households entirely from the local grid in certain periods, hence attempting both to go off-grid and increase the use of BESS (InterFlex, 2019).

## 5.2 Choice of Case Studies and Limitations

The reason for choosing these two is because both contribute to the energy transition by engaging the inhabitants and creating an energy community. Additionally, they are both situated in smaller villages in Skåne. Lastly, they both fulfill the criteria of one being initiated and operated by the citizens, and another being operated in a top-down process. The limitations of using these two case studies are the differences in capital access. Since E.ON is a large DSO and received EU funding for the project, the economic differences and hence the possibility to invest in technology, up-scaling, etc. are evident without the need for analysis. Nevertheless, depending on *how* these resources and capital are used, the differences might generate interesting and useful analyses as well.

## 5.3 Method

The research will be conducted with a qualitative method, based on the phenomenology and inductive methods of these case studies. The phenomenology part includes the aspect of including the opinions and thoughts of the inhabitants about their parts of the local energy initiatives in their communities. As Bryman et al. (2021) point out, a phenomenology approach ensures that the subjective experiences and thoughts regarding phenomena in their lives are included. The research will also be based on inductive research, meaning not to test a theory from the beginning, but to construct a theory and understanding from the research (Bryman et al., 2021). Although a framework is used to construct the questions for the interviews, the theory is not tested to see how these cases fit into the theory, but rather to understand how these cases operate with regards to these cases (Bryman et al., 2021). Case studies are appropriate for this research since the aim is to examine *how* LEIs operate and impact the energy transition differently. This is an argument put forward by Yin (1994), who states that case studies are relevant to use when examining how a process is occurring and thereby testing it in specific contexts to retrieve more details.

## 5.4 Data

The data to examine the LEIs is received from 6 semi-structured interviews with both founders and citizens of the initiatives. Each interview lasted between 30 minutes and 1,5 hours with four being over Google Meets, two of them were held in person. The questions for the interviews were based on the theoretical framework of MLP and categorized into the themes of Start and Visions, Operation, Collaborations, Learnings, and Effects. Semi-structured interviews were chosen because they provide a general framework that keeps the interviews within the theme of LEIs and energy niches, at the same time that the interviewees can provide insights they find valuable and fill in gaps that the posed questions might not account for (Bryman et al., 2021). Thus, although the interviews touched upon these general themes, the interviewees could add other relevant information and potential sub-questions were added. Additionally, the questions posed to the founders and the citizens differed slightly. Since the aim of the interviews with the citizens was based on phenomenology and to understand their thoughts and opinions about the project, questions concerning the details of the operation, start, and vision were excluded. Instead, the questions were more personally framed and based on their views and opinions (Appendix C and D). In

contrast, the interviews with the founder and project leader were more related to how it started, how it operated, and their impacts (Appendix A and B).

The choice to use both founders and citizens was based on their ability to provide useful but complementary insight into the LEIs, which is crucial to understanding their roles in the energy transition. The founders were included to provide an understanding of how the visions and goals were pursued in the initiation of the initiatives and which possibilities and challenges were evident in the first stage. Additionally, they could provide details of the initiatives and account for the years of operation that either members of Röstånga or citizens in Simris would not have insights into. However, the citizens and members of the initiatives are also prominent to understand how the different initiatives lead to impacts amongst the citizens as well. This is particularly important when comparing differences between bottom-up and top-down initiatives since the support and perceptions of the initiatives could differ depending on the approach of the initiative.

Although an understanding of which people from the LEI's respective groups (member, participant, founder, etc.) had to be interviewed in order to get a sufficient understanding of their operation, the snowball effect was also used to get the interviewees' contacts. The snowball effect is a sampling strategy commonly used in qualitative research methods based on interviews. By using the interviewees' social networks to get in contact with other useful interviewees, the method enables a broader interview base that would not have been accessed without the snowball effect (Kirchherr & Charles, 2018). This thesis hence used the snowball effect to retrieve contact with the citizens and members of respective LEIs. The first interviews were conducted with the founders and project leaders of the initiatives, and they were asked after the interview if they knew other appropriate interviewees to contact as well. Lastly, all interviewees participated voluntarily and agreed on the rules of data protection and GDPR, which they acknowledged by signing the agreement paper from Lund University.

In addition to the interviews, project reports were used to evaluate the impact and operation of the Simris project. The reports were released as a part of the InterFlex project to evaluate and compare the impacts between the projects that were participating in the project (InterFlex, 2019). Although the data from the interviews have been used as the primary data, these secondary reports were used as a triangulation of the data, meaning to complement the potentially biased information from the interviews and use the reports to account for missing

information (Patton, 1999). Since reports like these are not available for Röstånga Cooperative, there is a risk of data availability bias. Nevertheless, the data from the interviews from Simris have been more useful for this study when accounting for people's experiences, hence the reports have mostly been used for understanding technological aspects.

| Local Energy Initiative | Person and Role | Duration of Interview | Contribution to research |
|---|---|---|---|
| Simris | J.R, Project Leader of Simris | 1 hour 20 min | Process of establishing and operating the project, knowledge of the technologies, management, funding, and external collaboration |
| Simris | K.L, a citizen of Simris | 30 min | Opinions and experiences of being part of the Simris project, local impacts in Simris |
| Simris | L.L, a citizen of Simris | 30 min | Same as K.L |
| Röstånga Cooperative | C.S, cashier on the board and founder | 1 hour 30 min | Why it started, how it has worked, outlooks for ECs in the future |
| Röstånga Cooperative | K.K, member of the cooperative | 30 min | Why becoming a member of the initiative, what impacts it have personally |
| Röstånga Cooperative | C.L, member of the cooperative | 40 min | Same as K.K |

**Table 2:** Summary of the interviews

After the interviews were conducted, the recordings were transcribed using Microsoft Word's dictation program. To improve the correctness and reliability of the transcription, the sound files were listened to and the words that had been wrongly transcribed were corrected. When the transcriptions were correct, translation of the interviews was conducted, since all interviews were held in Swedish. This was conducted with Google Translate. Following the same procedure as with Microsoft Word's dictation programme, the inaccurate translated words were corrected. After the translation, the interviews were coded along the themes of how they interacted with different geographical scales, as well as divided into the processes

of start, operation, results, and contribution to the energy transition. This was conducted in order to do a thematic analysis, where the themes were decided based on whether their answers included aspects of external collaborations, place-specific conditions, or transnational interactions. These were then further categorized based on whether they pertained to the start, operation, or impacts of the initiatives. This approach keeps the originalities of their answers, whilst understanding both common and differentiating traits between them (Bryman et al., 2021). Although a limitation of coding and thematic analysis is the fragmentation and generalization of otherwise detailed answers, it allows for an overview of common answers. Lastly, the theoretical framework of multi-scalar MLP was applied analytically in relation to the empirical data. AI has been used in this paper for grammar and spell checks, which was conducted with Grammarly's generative AI, in addition to the transcribing programme on Word.

## 5.5 Limitations

Limitations of this method include the time limit. Since the project is limited to almost 3 months, the desirable number of interviews to retrieve an extensive overview is not possible. This also means that the research is limited to focusing on Skåne, instead of larger areas of Sweden, implying a limitation in the generalization of the results and a need to account for the context when interpreting the results. This limitation of generalization is further underscored by the use of two case studies, hence results solely alluding to their respective context. Additionally, because of the time limit and propensity of the interviewees to participate, the low number of interviewees leads to a limited understanding of the initiatives. For instance, including citizens who are not part of Röstånga Cooperative or the Simris project would have improved the analysis. The interviewees might distort their answers as well because of bias and attempt to align their answers with what the study is aimed at. Although there was an ambition to decrease this bias by interviewing more than one person from the respective category and not explaining the details of the paper, this is still a potential limitation. Another limitation is that triangulation of the data from the interviews was not possible to conduct with Röstånga Cooperative since their answers are subjective and other sources to back up their responses do not exist. Thus, as Patton (1999) states, this would have increased the comprehensiveness and validity of the data and is therefore a limitation. Nevertheless, the study can contribute to further understanding of how some LEIs operate in Sweden and ways to encourage them for the energy transition.

# 6. Results

This section will present the results from the semi-structured interviews and will follow a chronological structure according to the period of the initiatives, starting with the initiation, then motivations for the inhabitants to join, followed by the operation, and lastly the impacts. Each period will also be divided into what interactions are prominent at the local and place-specific contexts, and what are rather part by their interactions with other (not local) scales.

## 6.1 Start of the Initiatives

### *6.1.1 - Place-Specific Contexts*

**Röstånga**

In Röstånga, several place-specific aspects were notable in the initiation of the project. Firstly, there is a strong culture of local initiatives and cooperation in Röstånga, which both C.K (Röstånga), K.L (Röstånga), and C.S (Röstånga) note as important for the initiation and further diffusion of the cooperative. An example of this culture and how it impacted the initiation is the development of the cooperative as "an offshoot from it" (C.L, Röstånga), referring to an eco-village that was initiated before the cooperative in Röstånga. C.S (Röstånga) explains this off-shooting from the project:

> *We had a development project around an eco-village and energy solutions /.../ They wanted to see something more concrete and thought that the energy issues are so fundamental /.../ and then we had like a workshop with about ten participants where we sort of tried to come up with which energy service it would offer in a cooperative*

This also shows the importance of dialogue at the local scale for the initiation of Röstånga Cooperative. Secondly, why the founders of Röstånga initiated a cooperative specifically because they "wanted to be an actor here in the countryside, in this village and the district" (C.S, 2024) and because they valued the knowledge-sharing principles that cooperatives need

to follow. This further emphasizes the local space as an important factor in itself as to why the cooperative was initiated.

Thus, the local and place-specific conditions of Röstånga influenced the initiation of the project by having a supporting culture of social organizations, from which the cooperative expanded. Additionally, the aim of starting the initiative was also to make a local impact, hence emphasizing the importance of how the cooperative impacts the local place as well.

***Simris***

In Simris, the initiative was initiated and operated by E.ON, a DSO that operates on a transnational and regional level. However, since the aim of the project was to test technologies to improve the resilience of the grid, another aspect was also the formation of an energy community with energy trading amongst the citizens. This points to an aim that is dependent on local support and trust. As J.R (Simris) himself notes, moving the initiative from the planning stage at the regime scale, which the DSO could be considered to operate within, to the local and place-specific scale, was one of the most difficult parts of the initial stage:

> *Here comes a large company called E.ON and says we will control your heat pump. And it is perhaps not completely obvious then for the 74-year-old.*

Additionally, since the place for the initiative is not chosen organically by the founders, as in the citizen-initiated cooperative, there is a need to choose an appropriate place for the niche. This difficulty is demonstrated in E.ON's initial phase when the project was supposed to be located on an island in the Northern part of Sweden instead. However, this island required E.ON to establish wind parks, which they did not get permission from, and the inhabitants of the island showed resistance to the project. As a result, they had to find another place for their project, which became Simris. In contrast to the island outside of Sundsvall, Simris already had a solar park and wind park, which E.ON was able to lease for the time of the project, as well as engaged inhabitants. Additionally, Simris had the other benefits of being "/…/ located in the south close to us, geographically easy to get there and network topologically it was quite optimal." (J.R, Simris).

The place-specific contexts for the Simris project therefore include the geographical proximity to their main office, already existing wind- and solar parks as well as a need for local support in the initiation of the project.

### *6.1.2 - Interactions With Other Scales*

***Röstånga***

Although a large part of the initiation of Röstånga Cooperative was developed through local-specific conditions, the impact of the global scale, namely the EU market, was also influencing the choice to become a cooperative. This transnational dimension and impact of the regime at the EU level on the formation of Röstånga Cooperative is illustrated by C.S (Röstånga):

> *And we experienced that there was such a big price difference in the EU between, for example, Sweden and Germany or Sweden and Poland, and we are in the EU, so it's just to go ahead and trade across borders, or there are no borders. It's a common market like that.*

Thus, the notion of being part of a transnational common European market and understanding one's agency in using this position impacted the reason why the cooperative was started.

***Simris***

As stated, the energy initiative in Simris was not initiated by the citizens, but by the energy firm E.ON. This, as Berggren, et al. (2015) elucidate, poses an example where the actor could be considered to both be part of the regime, as an established DSO, as well as being a niche when attempting to transform the socio-technical regime through innovating new technology in market protected niches. Thus, this specific case demonstrates an example of when the firm operates as a niche. This, by itself, shows how the Simris initiative from the start has inter-relations with other geographical scales than Röstånga, where the initiation of the project was developed by a DSO that *also* operates on the regime level, starting from an entirely different scale in the beginning. J.R (Simris), the project leader of the LEI in Simris elaborates how the Simris project was mainly aimed at testing technical innovations related to the grid and what they wanted to test:

> *One of the visions then was to build what we called Peer to peer. /.../ Not only to support the network, but also for the residents' and owners' way of being able to exchange energy.*

This vision was predominantly developed by E.ON as a company. However, since Simris was part of the EU project InterFlex, influences on the formation of the project and what they had included in the testing came from the EU, hence a transnational scale. As J.R states, although the aim of the project was initiated by E.ON before they applied to be part of the project, there were changes in the scale of different techniques they had to test: "*We had to design /.../ Simris a little differently, test more stuff so that it would be interesting from an EU perspective then."* (J.R, Simris). This shows how the interactions of local conditions and tests can be modified to suit the interests and motivations of the EU as well, hence the inter-related exchanges of local and more global adjustments and impacts on the initiative.

## 6.2 Motivations for Joining the Cooperative

Analyzing why citizens join the cooperative, instead of getting solar panels themselves or not installing them at all, is important to understand because it gives clues about how the LEIs operate to establish and interact with the local scale. Additionally, the members are not excluded from the socio-technical regime, since they in fact are crucial for realizing what Rip and Kemp (1998) see the importance of technologies as: "configurations that work" (Rip and Kemp, 1998: 330). Additionally, the levels of influence of the members' motivations for joining are also important to analyze from a multi-scalar perspective.

**Röstånga**

In Röstånga, the reasons for joining the cooperative include relations with other members and the founders, a will to support local environmental initiatives, the good economic opportunity to buy panels from the cooperative, and a will to learn more about solar panels and the energy transition in general.

K.K emphasizes how the local anchoring of the cooperative enhanced trust in the process. She states: *I wouldn't have done it if it wasn't for the support and help I had during both planning and practical execution* (K.K). C.L further emphasizes this aspect of local relations, when stating that one factor for joining the cooperative was because she knew C.S well.

Additionally, both mention certain aspects of their personal economies. K.K mentions the beneficial economic opportunities for getting solar panels, which K.K thought she never would have been able to invest in if it were not for the cooperative.

However, more global aspects of why K.K and C.L became members of Röstånga Cooperative included environmental concerns and being able to make a difference as well. Since climate change and the energy transition are global issues that have originated at the landscape scale, the citizens are aware of this issue and want to make a difference in it where they can, on the local scale.

**Simris**

When talking to L.L and K.L, they mention the ability to be role models for their grandchildren, an interest in the energy transition, and a will to contribute to it as reasons for joining. J.R also notes that he had reports of numerous citizens stating the good economic deal the project provided because of the funding from the EU, which could elevate some otherwise evident costs (e.g. paying for the batteries for storing the solar energy) and that it coincided at a time when the energy bills were high.

In contrast to the members of Röstånga, the demographics of being older and being able to impact coming generations were important reasons for the Simris inhabitants. Thus, this emphasizes the importance of the certain demographics in the place for not only difficulties in establishing it, as J.R noted, but also the enabling aspect of it as a reason to join the project. However, L.L also notes that their age was part of why he was reluctant at first: "*I thought it was a bit tricky, how are we going to get payoff on this at our age?"* (L.L, Simris). Thus, the demographic specificity of Simris was both an aspect of joining the project, as well as a reason for being reluctant.

## 6.3 Operation

### *6.3.1 - Place-Specific Contexts*

**Röstånga**

Analyzing Röstånga Cooperatives's vision:

> *Röstånga energy cooperative is a local energy community and the area's development engine for renewable energy and energy efficiency. We promote our members' financial interests and generate tangible social benefits when we reduce the environmental impact of energy use, strengthen social relationships and contribute to a thriving local economy.*

it is evident that the main operations of the cooperative are rooted at the local scale. One way of ensuring this operation stays local is by only having members that live in Svalöv municipality or the neighboring municipalities, alternatively, have a business or summer house in these municipalities. C.S states that the use of geographical borders has enabled them to keep the cooperative local:

> */.../ geographical limitation is because an energy community should be local. And then Municipal boundaries are suitable because it is a boundary we know about. Yes. And then it's because we don't want to go to Malmö or Lund and get a job there, but it is more that it is the countryside this is about.*

This shows the particular role of geography and the local scale in ensuring the operation of the energy community remains on the local scale, hence not aiming to scale up to operate regionally. Additionally, by using the geographical boundaries of municipalities, the communication of where the EC is operating is facilitated to both members and non-members.

The aspect of its vision to "contribute to a thriving local economy" is seen in the cooperative's inclusion of local enterprises. C.S states that enterprises want to join because:

> *They want jobs here locally, so for example the most important member is an electrical installation company /.../ and then there are other consultants like smaller electrical companies that do small services such as analyzes and so on.*

This shows that through the cooperative's stated boundary of being a local energy community, the local economy and the resources that are available within the specified place

of the community have the opportunity to both contribute to the cooperative and get economic benefits themselves. The existence of much local knowledge and collaboration within the cooperative is something C.S states as being useful for the development of the cooperative locally since it enables involvement and influences from different perspectives.

K.K also mentions how the organized workshops for the members were a reason for joining the cooperative since she is interested in the energy transition and how installments of solar panels actually work. This demonstrates the operation is rooted in the ambition to contribute at the local scale. As in most cooperatives, the principle of 1 member 1 vote is evident in Röstånga Cooperative as well, where the board members are also citizens of Röstånga or neighboring municipalities.

**Simris**

In Simris, the operation was two-folded. On one hand, the citizens of the project had their solar panels installed and the controlling units in place. On the other hand, E.ON operated much of the technological aspects of controlling the flexibility of the energy in the grid, when they were going to detach from the national grid and be in so-called "island mode", and how the citizens shared energy amongst them (InterFlex, 2019). This two-fold scale, with one controlling the technologies and the other one acting as prosumers, demonstrates the inherent structures of scales operating at the niche level.

This division was also evident in the ability of decision-making, where the citizens of the project, as well as J.R, note that the decisions were made by E.ON and no to little impact was possible during the process of the project. Instead, as seen, the EU was the actor impacting the formation of the project. Thus, the citizens, and hence the scale of the place, had a low impact on the ability to steer the project and align it with their views.

In terms of anchoring knowledge at the local scale, this was not a particular aim of E.ON, as L.L and K.L understood it. This becomes evident when the technical terms peer-to-peer and demand response, which the project aimed to test, were terms that L.L and K.L were not familiar with. This suggests a lack of bridging the knowledge from the regime level of E.ON and the technological aspects to the local level of the niche with the citizens.

However, J.R notes that E.ON tried to spread knowledge and include the citizens in the development of the project in other ways, including installing a charger in Simris for electric cars, having a display that demonstrated the process of electricity sharing and flexibility, as well as recurring information letters about the initiative. However, this type of knowledge-spreading did not influence the citizens particularly, according to L.L and K.L. Additionally, this spread of knowledge did not aim to inform about energy efficiency or the installments either.

Simris also used a local enterprise for the installation of solar panels, which shows interactions with local actors outside of the participants of the project. However, as seen in the next part, the importance of interactions on the transnational levels is more prominent for the operation of the Simris project.

### *6.3.2 - Interactions With Other Scales*

***Röstånga***

The workshops in Röstånga not only demonstrate how the niche operates at the local scale but also how they enable actor networks and collaborations at other scales. Namely, the workshop is conducted in cooperation with Svalöv Municipality and Lund University. C.S also states that they are active in the organization of Swedish Energy Communities (SERO). This demonstrates that although the cooperative's aim has mainly been to play an active role at the local scale, the actor networks and collaborations reach further than the local levels where the niche is operating. Additionally, C.S explains that there is the possibility of engaging in similar organizations on the European level. Although he shows interest in this since he considers his identity of being European and the ability to learn from international ECs as, the uncertainty of what impact the membership actually will have creates a reluctance to join. This shows that the sense of being connected to other niches at the European level is prominent as well, but where reluctance to join is prominent.

***Simris***

Due to Simris' part in the European InterFlex programme with other similar European initiatives, a platform for exchanging knowledge, collaborating, and operating was an inherent part of the operation of Simris. J.R states that they had consortiums where they met

regularly. This included Teams-meetings every other week and physical meetings every other month in one of the respective countries of the other projects (France, the Czech Republic, or the Netherlands). He states the importance of these meetings was to have common workshops and study visits, as well as to "*exchange information with each other and help each other with the results"* (J.R, Simris). Thus, the importance of operating at the transnational level induced the exchange of knowledge between the projects in different countries and helped with achieving the results they aimed for.

As stated, Simris used local enterprises in the process of installing the solar panels. However, since the EU and E.ON had certain regulations regarding which suppliers they could use, there was a larger variety of origins of suppliers in the Simris project. Some suppliers were Swedish, for instance, the Uppsala company Enebe. However, since the project included specific technological aspects, some of which are not produced by local or Swedish producers, the project had suppliers from other European countries too (InterFlex, 2019). Due to this international aspect of the project, there was also large international attention and interest in it, which J.R explained led to several international organizations visiting and learning from it.

## 6.4 Impacts

***Röstånga***

The impacts of Röstånga Cooperative from its initiation in 2019 include the increase in members from four households to over 100 members, consisting of about 75% households and 25% enterprises. This increase in members shows how the diffusion of solar energy has succeeded in the municipalities where the cooperative is active. According to Solcellstoppen, Svalöv municipality has increased from having 123 W/person solar capacity installed in 2019 at the beginning of Röstånga Cooperative, to 585 W/person in 2022 (Svensk Solenergi, 2024). Additionally, through the active participation of the members in installments and in the process of buying cheaper through the common European market, the result of decreasing the costs of having solar panels is an achievement that possibly has enabled the diffusion of solar panels and the increase in members. By becoming the Cooperative of the Year in 2023, Röstånga has also retrieved national acknowledgment, which transcends its local vision and aims (Mattsson, 2023). The workshop series that is executed with Svalöv Municipality and

Lunds University also shows how spaces where the niche and actors from the regime can cooperate and possibly generate larger impacts in the at least local regime. Thus, the impacts of Röstånga Cooperative show how local aspects of improved economies, increased installments of solar panels, and collaborations with regime actors can generate positive impacts for the energy transition in the sub-national regime, including both the local and the regional energy regime.

***Simris***

The local impacts in Simris include the inhabitants' increased use of solar panels. L.L and K.L note that the initial investments that they were required to make have already been paid back. Additionally, they have been able to decrease their energy bill as well after the project and have become more aware of energy efficiency and how the energy system operates. Since the project had a clear start- and end date in the programme of Interflex, the ability for members to join after the programme limits the continuity aspect of the initiative, hence limiting the local benefits. Because as J.R states, inhabitants wanted to join after the project had started as well due to the "snowball effect" (J.R, Simris). This demonstrates a possibility for the project to have induced local impacts if the project was not subject to a time frame when potentially more citizens would have joined due to this effect.

However, the most notable impacts from E.ON were happening at the inter-scale levels. J.R states that the lessons made from the project in Simris were shared with the other initiatives in the InterFlex project as well as with other actors internationally. For instance, similar projects with certain modifications were set up in Spain and in the UK, showing how local projects that need to be rooted in the local scale can still be adjusted to other conditions and place-specific contexts.

## 7. Analysis and Comparison

Based on the results, this section will apply the theory of multi-scalar MLP and Lam et al. 's (2020) framework of amplifying. This section will therefore analyze how the initiatives have interacted with different scales at the initiation and operation stages, and from the amplifying framework demonstrate how the initiatives have contributed to the energy transition in different ways. Lastly, a demonstration of the main differences between a bottom-up and a top-down energy initiative will be conducted.

## 7.1 Interactions at different levels

The analysis will first compare the initiative's main interactions and structural couplings at each spatial scale and how they relate to Boschma's frameworks of proximity, followed by how they impact the energy transition and amplify.

### *7.1.1 - Start of the Initiatives*

In the initiation of the initiatives, figure 3 demonstrates that both initiatives were influenced by place-specific conditions in the formation of the project, as well as had the aim to impact the local scale. How contextual aspects of sustainability initiatives impact the formation of LEIs is something Späth and Rohracher (2010) believe to be important for a spatial analysis of LEIs and can include both natural endowments, cultural norms and values as well as certain demographics. Although both LEIs are influenced by these place-specific conditions, it is evident from Figure 1 that cultural norms of organizing locally and social proximity, as Boschma (2005) is based on friendship and building trust, were most prominent for influencing Röstånga Cooperative. In comparison, the geographical aspects of good already established wind- and solar parks, as well as the relative geographical proximity to the E.ON's office in Malmö. Although the social proximity and endowments of cultural norms and values were more prevalent in Röstånga, geographical endowments have been important too in firstly enhancing social proximities and collaborations in the local organizations, secondly, in creating natural boundaries to the cooperative based on municipal boundaries. Nevertheless, a difference at this scale between the initiatives is that whereas most place-specific endowments and proximities have been enabling the initiation of Röstånga, the place-specific demographics in Simris were partly obstructing for Simris. As J.R states, the demographics of elderly and low all-year-round inhabitants led to a lower number of participants than anticipated and desired for the initiative.

Larger differences in the spatial interactions are seen at the transnational and regime scale, where Simris naturally, as being part of the EU-financed project InterFlex, from the beginning was largely influenced in the formation and financing by this level. Additionally, as Berggren et al. (2015) pose, since E.ON as a DSO is considered to be part of the regime too, this increases the interactions with this scale. Although the types of actors E.ON and the

EU are in the regime vary, there are aspects of institutional similarities of understanding and wanting to develop the regime, hence suggesting institutional proximities (Boschma, 2005). Röstånga Cooperative has also been influenced by the regime at the EU level, however, this was rather due to the market of solar panels and the price differences between different EU members. Thus, whereas this scale influenced Simris in terms of regime actors seeing a possibility to change the regime through technological advancements and financial investments, the more inert conditions of the regime with price differences in the market were influencing the initiation of Röstånga. Lastly, the landscape condition of climate change and wanting to make a difference in this by inducing the energy transition is an obvious influence in both LEIs.

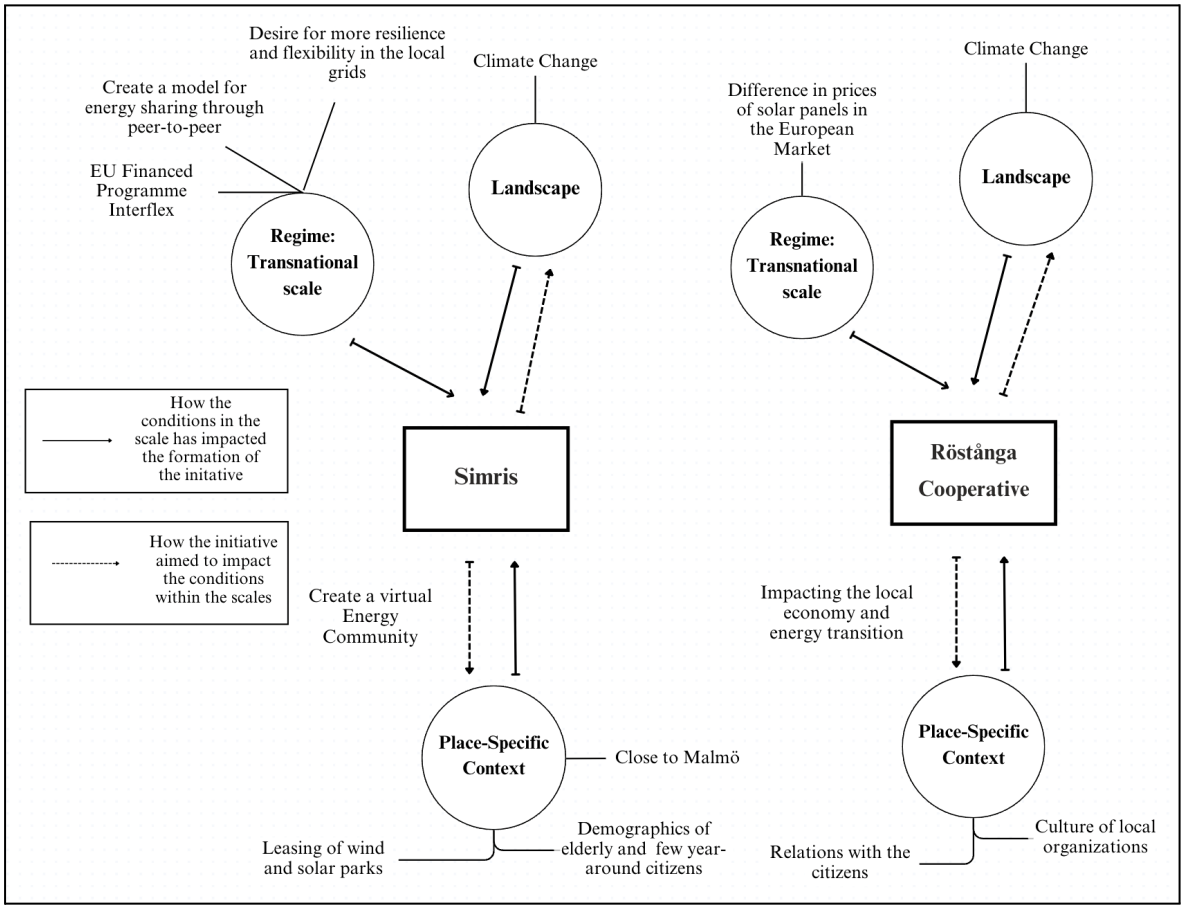


**Figure 3:** The interactions between the different scales during the initiation of Simris and Röstånga Cooperative

### *7.1.2 - Operation*

Considering the interactions during the operation, it is clear that whereas both initiatives had prominent local interactions in the initiation stage, this stage exhibits larger differences (figure 4). As seen in Figure 4, Röstånga Cooperative has through its workshops created structural couplings at the local scale, where knowledge of installing solar panels and improving energy efficiency embedded knowledge of the energy transition locally, which Bergek et al. (2015) consider as important aspects of basing the innovations of niches. These workshops also demonstrate how regime interactions occur at the operation stage in Röstånga since they are organized in cooperation with Svalöv Municipality and Lunds University. Thus, structural couplings also occur between the niche and the vertical regime, which Raven, Schot, and Berkhout (2012) define as the regimes related to local, regional, and national levels. Simris also generates structural couplings through knowledge sharing at the regime level, but instead of embedding the knowledge locally in the niche, the knowledge is embedded within the InterFlex project. Through cooperation with the other InterFlex projects, Simris is part of what Coenen et al. (2012) consider a created space for collaboration. This also shows the importance of cognitive and organizational proximity in Boschma's framework, where the projects are close organizationally through the programme, but also close in terms of sharing knowledge in created spaces of collaboration. Thus, although both operate to enhance knowledge about the energy transition in different ways, Röstånga locally embeds the knowledge whereas Simris worked to spread the knowledge in the created common spaces and at the regime level, with low diffusion (apart from displays and more indirect ways of transferring knowledge) of this knowledge to the inhabitants at the local scale.

Additional differences in the interactions across scales are that Röstånga not only creates workshops for its citizens but also supports local businesses to generate local employment possibilities. Although Simris also used local businesses for installments, the need for more technologies than sole installments required more interactions with the national and transnational scale too (figure 4). Lastly, by following the cooperative principles, the members have throughout the operation of Röstånga the ability to impact and vote for the cooperative's future, which was not prevalent in Simris.

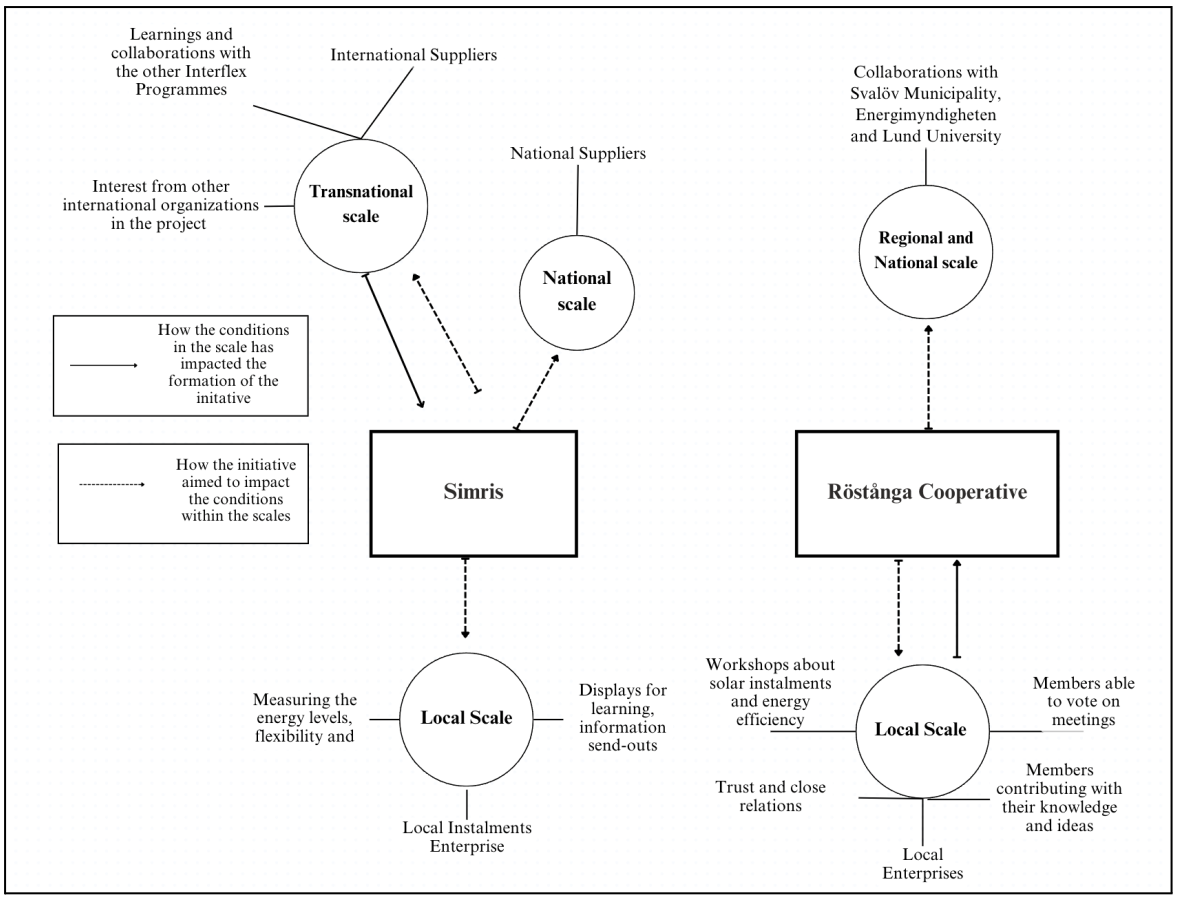


**Figure 4:** The interactions between each scale during the operation of Simris and Röstånga Cooperative

## 7. 2 Impacts and amplifying processes

From the analysis of the interactions at different scales in the initiation and operation stage, it is evident that Röstånga Cooperative is contributing to the energy transition by *amplifying within and stabilizing*. This process of amplification is important since, in contrast to the E.ON niche, this enhances resilience and creates local structural couplings (Bergek et al., 2015). As Bergek et al. (2015) mean, structural coupling is needed for generating new norms, values, and opportunities for local acceptance of change. This was also shown to be crucial for the spread of energy communities in Germany. where it was demonstrated that local acceptance and knowledge had occurred before the regime changes of FiTs which thereby facilitated the spread and success of the new policy shift and spread of ECs (Dewald & Trufer, 2011). Therefore, the stabilization type of amplification creates local spaces where knowledge about the energy transition and diffusion of the technology can facilitate future regime changes in energy communities.

The local aspects of knowledge spreading, collaborations with the municipality, and aiming to make larger impacts in the local place, which Röstånga is characterized by and which constituted the basis for why it amplifies within, were not particularly evident in the Simris initiative. Since the initiative was within a specified time frame, there was no continued process of recruiting participants, nor the ability to improve and strengthen the established vision. Instead, the Simris initiative shows particular signs of amplifying through *spreading* the initiative (Lam et al., 2020). As seen, the Simris project led to similar projects in, for instance, Spain and the UK. Since this means new countries with new regimes and place-specific contexts, the same project could not be executed but had to be adjusted to the place-specific conditions, which is the basis for *spreading* an initiative. Thus, whereas Röstånga contributes to the energy transition by amplifying *within*, Simris rather amplifies *out.*

Although one LEI amplifies out and the other within, both show signs of amplifying *beyond.* Röstånga exhibits characteristics of *scaling deep*, where instead of changing policies directly, the values and mindsets are changed, which could both be locally contextualized or on regime-levels (Lam, et al., 2020). Through embedding knowledge and operating locally, values and mindsets towards the energy transition are therefore changed locally. However, since Röstånga already was characterized by a culture of local sustainability initiatives, the change of mindsets and values might not have been specifically large compared to before the cooperative. Since both C.L and K.K were involved in local organizations and joined the cooperative for the sustainability aspect, it could be argued that the values and mindsets were already in place and not particularly changed because of the cooperative. Nevertheless, through the active efforts to locally embed knowledge and generate structural couplings at the local scale, there are still aspects of scaling deep in Röstånga Cooperative.

Although the project in Simris might have generated a shift in mindsets and values about the energy transition too, the low diffusion of embedding knowledge locally and the limited time frame rather points to the amplifying process of *scaling up.* As Lam et al. (2020) state, scaling up could be executed by lobbying, advocating, and networking to create alternative views and discussions of how the regime can change. Since E.ON already could be considered to be part of the regime, the monetary and social capital E.ON has compared to Röstånga means they have a larger possibility to advocate and show alternative views of how

the energy system can work. This was particularly shown in the recurring meetings with the other InterFlex projects where knowledge was shared and networking conducted to spread the technologies and alternative visions of a decentralized energy system.

Thus, the main differences based on a spatial MLP analysis and amplifying processes between this bottom-up and top-down LEI include more local interactions at the operation stage in the bottom-up project, where most interactions and efforts to generate change occur locally. Instead, the top-down, from also being part of the regime and operating in spaces with other projects transnationally, interactions at the transnational scale are more prevalent. However, both LEIs have many interactions with the local scale in the initiation stage. Whereas both obstructing and enabling interactions are prevalent in the top-down initiative, more enabling interactions at the local scale are prevalent in the bottom-up. Lastly, whereas the bottom-up project exhibits more aspects of amplifying within, the top-down rather amplifies out, and although both show patterns of amplifying beyond, the top-down rather scales up through networking, and the bottom-up scales deep by changing norms and values.

## 8. Conclusion

This thesis has aimed to analyze how two cases of local energy initiatives, one cooperative initiated by the citizens in the village Röstånga, and one project initiated by the DSO E.ON in the village Simris, can contribute to Sweden's energy transition at different geographical levels and which geographical levels they both influence and get influenced by the most. The objective of the study was to explore how local energy initiatives can contribute to the energy transition, considering Sweden's low number of those relative to other European countries. Additionally, to understand its contribution it is crucial to understand how it operates and interacts with different geographical levels. Due to this, the theoretical framework of multi-scalar multi-level perspective was applied, to understand how these interactions between the initiative and the local, regional, national, and transnational levels occur. The framework also considers how niches, which develop new technologies or social innovations in socio-technical systems can diffuse and make changes at regime levels.

The scope of the study was confined to Skåne, which is where the case studies are located. By applying a qualitative method based on phenomenology, semi-structured interviews were conducted with three persons from each case. From the interviews, a thematic analysis was

conducted based on the themes of external collaborations, place-specific conditions, and transnational interactions. These were then categorized based on whether they pertained to the start, operation, or impacts of the initiatives. For the analysis, the multi-scalar framework and Lam et al.'s (2020) framework for amplifying projects were applied to evaluate how the inter-scalar interactions had occurred and to evaluate how the projects have contributed to the energy transition.

The results of the study demonstrate that Röstånga Cooperative had more interactions with the local scale at all stages (start, operation, and impacts). However, interactions with the local scale were prominent in Simris as well during the initiation stage. Both niches were also influenced by the place-specific contexts, including both geographical and cultural endowments, where the latter was more prominent in Röstånga. During the operation, Röstånga Cooperative further entrenched the local interactions by having local organizations as members and executing workshops with Svalöv Municipality and Lunds University as well. This shows how the knowledge became locally embedded in Röstånga, as well as how interaction with actors from the regime has occurred. In contrast, Simris did not embed the knowledge locally to the same extent but shared knowledge with the other InterFlex projects across national borders instead. This shows how social and geographical proximities have been prominent in the interactions between scales in Röstånga, whereas Simris' interactions have been more characterized by common spaces for sharing knowledge (cognitive proximity) and institutional similarities (institutional proximity).

Lastly, both LEIs have amplified and thereby contributed to the energy transition. Röstånga amplified *within* through stabilizing processes, meaning further enhancing the transition locally through increasing the number of members and further developing the vision they have. By changing norms and values, they could be seen to contribute by scaling deep as well. Simris has instead amplified *out* by spreading, meaning taking the core learnings from the initiative and adjusting it to other contexts, e.g. in Spain. Additionally, Simris could be considered to have scaled up, where they have had larger impacts on networking and advocating or showing how an alternative socio-technical energy regime can develop. Thus, a bottom-up initiative can contribute to the energy transition through more local interactions and scaling deep, whereas a top-down initiative can contribute on more transnational scales and scaling up.

The thesis has thereby answered the research questions and fulfilled its aim. However, due to the limited number of interviews, the implications only apply to these two specific cases and are not suitable for generalizing, since interactions at different scales and the operations of energy initiatives vary greatly depending on context. Therefore, it cannot be concluded what role energy communities in general in Sweden can contribute to the energy transition, but rather how these two specific cases have done it.

Thus, the contributions of the study include an enhanced understanding of what role local energy initiatives can have in Sweden's energy transition. Additionally, through the analysis of scale interactions, a more in-depth view of under what conditions local energy initiatives start, which actors are more prevalent in the operation, and through what processes they contribute to the energy transition can be understood. Consequently, a greater understanding of where continued support and policy regulations are needed, depending on which type of energy initiative it is (grassroots initiative or operated by a company), has been provided. The contributions of this thesis are therefore related to a more pronounced view of how local energy initiatives operate differently, which geographical scales are more prominent in respective cases, and therefore how these initiatives can be further promoted and supported through enhanced policy regulations and incentives. Lastly, by filling the research gap of energy communities in Sweden, and particularly through applying a multi-scalar multi-level perspective and comparing two different types of initiatives, the thesis has also made a marginal contribution to the academic area of energy transitions in socio-technical systems.

For future research, it is suggested to do more quantitative research about the initiatives, including impacts from local energy initiatives on CO2 emissions or monetary impacts at the local scale. This is recommended to complement qualitative evaluations and generate a more comprehensive view of the role local energy initiatives can play in socio-technical transitions. Additionally, further research on the power relations and agencies within the initiatives is recommended, since this is crucial to understand when examining the role different energy initiatives have in our societies. Lastly, further exploring the geographical role of where energy initiatives are situated in Sweden and researching how this impacts energy justice is recommended. Since these two case studies are both situated in smaller villages in Skåne where most villages are villas and the majority of the population is a white, further exploration into what effects it has on Sweden's energy transition and energy justice if most of the local energy initiatives in Sweden follow this pattern, and consequently how this could

be limited if this is the case. In general, all research that covers climate change and the crucial transitions that need to occur is suggested for contributing to more relevant and important insights into how all societies can be transformed into more sustainable societies.

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# Appendix A

Outline of questions for interviews with one of the founders of Röstånga Cooperative

**Start and aim:**

1. Why did you start this project? How was it established?
2. Why did you want to start a cooperative and not anything else?
3. What visions and goals did you establish?
4. Did you establish any rules or procedures for the initiative?

**Memberships and local engagement:**

5. How many members are there today?
6. Why do you think there is local support for a cooperative like Röstånga Cooperative?
7. Can anyone become a member?
8. Do all members have one vote for decisions about the cooperative?
9. How often do you have meetings?
10. How is the board decided upon?
11. What leadership roles are evident in the initiative?

**Financials and barriers:**

12. How did you finance it? What financial support have you received?
13. Which financial and legal barriers have you encountered? How did you overcome these?
14. Were there any technological barriers? How were these overcome?

**External cooperation:**

15. Are you cooperating or sharing experiences with other initiatives? In what way?
16. Are there any networks of cooperatives or energy communities you are a part of?
17. What other external collaborations and organizations have been required? How did you access them? What are their roles today?

18. What other local support have you achieved?

**Effect and results:**

19. What results have you seen during these years?
20. How has the attitude towards renewable energy and solar panels in Röstånga developed?
21. Are there any other stakeholders who have seen any effect since you founded Röstånga Kooperativ?
22. Is there anything special about Röstånga that you can point out that has been significant for the development and these results?

**Future visions:**

23. What visions do you have for the future?
24. Do you want to expand the geographical area, or stick to Röstånga?
25. What do you see as the development potential of energy communities and cooperatives in Sweden?
26. What role do you think they can play in Sweden's energy transition?
27. Anything else you want to bring up?

## Appendix B

Outline of questions for interviews with the project leader of the Simris project

**Start and goals**:

1. Why was Simris started as a project?
2. How long did it last?
3. How was it established?
4. Why was it precisely in Simris that you started it?
5. Were there any specific visions and goals you established?
6. What role has innovation played?

**Residents' role:**

7. What was the role of the residents in the project?
8. How were these engaged? Both before, during, and after the project.
9. Why do you think there was local support for this project in Simris?

**External collaborations:**

10. How did you get EU funding? Before or after the planning process? Was it difficult to get them?
11. Which other actors participated?
12. Did you collaborate or share experiences with other similar projects? How?
13. What other external collaborations and organizations have been necessary? How did you get access to them? What roles do they have today?
14. . Have you received any other local support?
15. Were there any clear leadership roles?

**Obstacles:**

16. What obstacles have you encountered - financial, political, technical, political? How did you overcome these?

**Results and Effect:**

17. What results have you seen from the project? Can be economic, social, technological, or political.
18. How would you say that the attitude towards renewable energy and solar panels in Simris has developed?
19. Have any other stakeholders seen any effect from the project in Simris?
20. Is there anything special about Simris that you can point out that has been significant for the development and these results?

**Future visions:**

21. What visions do you have for the future?
22. What is needed to do similar projects in other areas, for example, cities?
23. What kind of development potential do you see for energy communities and local energy initiatives in Sweden?
24. What role do you think E.On and other DSOs have in this?
25. What role do you think they can play in Sweden's energy transition?
26. Which main areas do you think need to be developed to better support the establishment of more energy communities and cooperatives in Sweden?
27. Is there anything else you want to address?

## Appendix C

Outline of questions for interviews with the members of Röstånga Cooperative

1. Why did you decide to become a member of Röstånga Cooperative?
2. What made you join at that time?
3. What advantages and disadvantages did you see in joining?
4. What do the opportunities for influence look like for the members of Röstånga?
5. What is the perception of the cooperative in Röstånga? Even among non-members?
6. What differences have you seen since becoming a member?
7. Were there any differences they had contributed to the village that you noted before becoming a member as well?
8. Have you noticed that your or others' perception of renewable energy and solar panels has changed in Röstånga?
9. What do you think has influenced the establishment and spread of the cooperative in the village?

## Appendix D

Outline of questions for interviews with the participants in the Simris Project

1. Why did you decide to participate in the Simris Project?
2. What made you join?
3. What advantages and disadvantages did you see in joining?
4. What did the opportunities for influence look like for the participants?
5. What was the perception of the project? Even among non-participants?
6. What differences have you seen since the start?
7. What did the opportunities to learn about the project and the energy transition look like?
8. Have you noticed that your or others' perception of renewable energy and solar panels has changed in Röstånga?