Empowering the Transition: The Role of Local Energy-Initiatives in Advancing Renewable Energy in RES-regio Groningen

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Abstract

This thesis explores the role of Local Energy Initiatives (LEIs) in contributing to a just and inclusive energy transition within the RES-regio Groningen in the Netherlands. Specifically, the thesis investigates how LEIs perform with respect to recognitional, procedural, and distributive justice, and how they interact with the dominant socio-technical energy regime. Data were collected through five semi-structured interviews with representatives of energy cooperatives in Groningen. The findings were analysed using two analytical frameworks: the Energy Justice Framework (EJF), which assesses justice dimensions within LEIs, and the Multi-Level Perspective (MLP), which situates LEIs within the broader energy system and examines their potential to scale and influence regime-level dynamics. An inductive thematic analysis was conducted and structured through a SWOT framework (Strengths, weaknesses, opportunities, and threats). The findings suggest that LEIs significantly enhance procedural and distributive justice through democratic governance and local benefit-sharing, while also contributing to recognitional justice through efforts at inclusivity. However, challenges such as grid congestion, limited financial and volunteer capacity, and the risk of excluding vulnerable populations remain. The cooperatives demonstrate active niche development through strategic networking, learning, and managing expectations, but face structural barriers to scaling and embedding within the broader regime. The study concludes that while LEIs have strong potential to accelerate a more equitable energy transition, this potential depends on supportive institutional conditions and their ability to professionalise without compromising their participatory character.

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List of Abbreviations

Acronym	Full Name
EJF	Energy Justice Framework
GA	General Assembly
GHG	Greenhouse Gas
GrEK	Groninger EnergieKoepel
LCOE	Levelised Cost of Electricity
LEI	Local Energy Initiative
MLP	Multi-Level Perspective
REP	Renewable Energy Projects
RES	Regionale Energiestrategie (Regional Energy Strategy)
SNM	Strategic Niche Management
SSI	Semi-Structured Interview
SWOT	Strengths Weaknesses Opportunities Threats

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Introduction

In response to the great threat of climate change, the United Nations introduced the Paris Agreement in 2015 (Paris Agreement, 2015). Additionally, the European Union introduced the EU Green Deal, which strives for climate neutrality in the EU by 2050 (European Commission, 2019). Within this context, the Netherlands drafted *Het Klimaatakkoord*, the Dutch Climate Agreement, outlining goals for reducing greenhouse gas (GHG) emissions by promoting renewable energy, energy efficiency, and sustainable mobility (Rijksoverheid Nederland, 2019). A key component of this document is the Regional Energy Strategies (RES), where 30 energy regions were identified that each need to define a RES, aiming to decentralise the implementation of renewable energy targets, where municipalities and provinces need to collaborate on regional action plans (Rijksoverheid Nederland, 2019).

The development and implementation of these plans are often top-down coordinated. This has led to significant social resistance, in many cases manifesting through protests, threats, legal convictions, with locals frequently expressing feelings of being excluded from the decision-making process (Psarra et al., 2024). Other factors for social resistance against renewable energy projects (REPs) include a lack of transparency or trust in unfamiliar parties, insufficient public participation, perceived inequities in cost/benefit distribution, and concerns about the environmental impacts (Hazrati, 2024).

An alternative to this top-down approach is Local Energy Initiatives (LEIs). LEIs are communities of households, often structured as a cooperative, that self-organise to meet their energy demand with locally produced green energy (Ghorbani et al., 2020). The aim is to actively involve citizens in the production, distribution, and governance of local energy systems (Ghorbani et al., 2020). By focusing on local ownership, democratic participation, and community reinvestment, LEIs may help align renewable energy goals with public values and build greater social acceptance (Bauwens et al., 2016).

RES Groningen is a timely and relevant setting for this study. In the province of Groningen, over 40 cooperatives are already active (figure 1), initiating many projects to provide households with locally generated energy (GrEK, n.d.). Its rural-urban mix, history of gas extraction, and earthquake-related damages have made energy a prominent issue, with residents having feelings of mistrust towards external organisations responsible (Zijlstra et al., 2022). Moreover, the province's energy system is under stress from grid congestion, with very little capacity to help parties still on the waiting list (TenneT, 2025). Combined, this perfectly mirrors nationwide challenges related to the energy system. Groningen is therefore a valuable case study to explore the potential and limits of LEIs in the energy transition.

Both the national and local governments recognise the potential value of LEIs and have put in place multiple support mechanisms to promote the development of LEIs. The SDE++ subsidy (Stimulering Duurzame Energieproductie en Klimaattransitie) aims to compensate the gap between production costs and market returns (RVO, n.d.-a), and the SCE (Subsidie Coöperatieve Energieopwekking) offers financial incentives specifically for collective renewable energy production (RVO, n.d.-b). Local support mechanisms include the Fonds Ontwikkelkosten Energiecoöperaties Groningen which helps cooperatives with early-stage project development costs, such as feasibility studies or permits (Fonds Nieuwe Doen, n.d.-a), and the Fonds Nieuwe Doen provides flexible low-interest loans for sustainable and social

projects, including those initiated by energy cooperatives (Fonds Nieuwe Doen, n.d.-b). For residents, there is the recently implemented Nij Begun subsidy, which supports households in earthquake-affected regions of Groningen in adopting energy-saving measures (Nij Begun, n.d.), indirectly supporting LEIs working with those communities. Together, these support mechanisms aim to reduce financial and organisational barriers and enable LEIs to have a meaningful participation in the energy transition.

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Even though LEIs are identified as potential key actors in a decentralised energy system and are increasingly promoted, it is still important to evaluate how LEIs perform in practice, both socially and technically. This study aims to assess whether LEIs contribute to a just energy transition and whether they can scale beyond small-scale initiatives to influence the dominant energy system. Specifically, this thesis aims to answer the following research question:

What role can local energy-initiatives play in advancing renewable energy projects (REPs) in RES-regio Groningen?

To answer this question, five semi-structured interviews (SSIs) with representatives of energy cooperatives in Groningen were conducted. The findings were analysed using two analytical frameworks: the Energy Justice Framework (EJF) (Jenkins et al., 2016), which assesses justice dimensions within LEIs, and the Multi-Level Perspective (MLP) (Geels, 2002), which situates LEIs within the broader energy system and examines their potential to scale and influence regime-level dynamics. In particular, the MLP enabled assessing how LEIs develop as grassroots innovations, interact with the dominant socio-technical regime, and if and how they can embed themselves in said regime (Geels, 2002). Together, these frameworks offer a perfect lens to examine how LEIs perform regarding an equitable transition, as well as their positioning in the current energy system. An inductive thematic analysis was conducted and structured through a SWOT (strengths, weaknesses, opportunities, threats) framework.

The hypothesis of this thesis is as follows:

LEIs in Groningen contribute to a more just energy system by promoting recognitional, procedural, and distributive justice. If they develop successfully in their niche and can overcome systematic barriers, they have the potential to scale and embed themselves in the dominant socio-technical regime and have a meaningful role in accelerating an inclusive and more equitable energy transition.

Figure 1



Methodology

This study conducted semi-structured interviews (SSIs) to explore the role of LEIs in Groningen's energy transition; specifically, how they contribute to a just energy system and how they develop in the broader energy system. SSIs are a good way of data collection for a qualitative study, because they allow for both consistency in questions as well as flexibility to delve into emerging themes when they come up (Newcommer et al., 2015). It enables the participants to elaborate on their perspectives, providing rich insights. The questions were designed based on the EJF and the MLP. The EJF focuses on the three principles of energy justice: distributive, procedural, and recognitional (Jenkins et al., 2016). The MLP provides a lens to evaluate the positioning and development of LEIs in the current energy system (Geels, 2002). These frameworks not only guided the formulation of the questions but also provided a lens through which to interpret the results.

A total of five interviews were conducted with representatives of energy cooperatives in Groningen, four with board members and one with an active member. This sample group was purposefully selected, as they have sufficient knowledge about the governance of their cooperatives, their community engagement, and their projects. Although the sample size is limited, previous research suggests that small sample sizes can suffice in qualitative research when the population is relatively homogenous and focused (Malterud et al., 2016). A study by Guest et al. (2006) found that the basic elements for establishing themes are present as early as six interviews, especially when the research topic is narrow and the respondents have similar roles or expertise.

The interviews were transcribed and analysed using inductive thematic analysis, a method that extracts and analyses the themes that make up a text containing the perspectives of individuals (Williams & Moser, 2019). The analysis followed a bottom-up approach, meaning no themes or subthemes were defined before engaging with the data (Williams & Moser, 2019). This method is especially useful for exploratory research, which aims to gain unanticipated insights (Clarke & Braun, 2016). To structure the findings, the resulting subthemes were catagorised using a SWOT analysis (strengths, weaknesses, opportunities, threats). This method allows for structuring the insights into internal and external inhibitors and enhancers (Leigh, 2009). Coding was done through line-by-line labeling of text fragments, which were then organised in themes and subthemes. This was done using QDA Miner Lite, which enabled the calculation of the coding frequency of each theme, subtheme, and code. Through this, the subthemes were sorted according to importance. This was done using a qualitative judgement, and using quantitative criteria:

- Most Important: Subthemes with frequency of 8 or more, discussed in at least 3 interviews.
- **Moderately Important**: Subthemes with a frequency of 4-7, or discussed in 2 interviews with moderate emphasis.
- Less Important: Subthemes with frequency 3 or fewer, mentioned in only 1 interview or referenced only briefly.

This method enables the organisation and analysis of many different perspectives and insights gained throughout the interviews, while giving weight to the level of importance. After this approach of

inductive coding, the subthemes were analysed using the EJF and the MLP once again. This ensured that the findings were grounded in theory and could be meaningfully interpreted concerning energy justice and the energy system.

Figure 2

Step-by-Step Data Analysis Process.



Before each interview, participants were informed about the purpose of this study and signed an informed consent form. To ensure anonymity, the names of all participants and their organisations are excluded from this thesis. All data collected are securely stored and only accessible by the researcher. Participants were also reminded of their rights to withdraw at any moment without consequence, and to refuse to answer any questions without explanation.

There are some limitations to this study. First of all, the sample size is relatively small and homogeneous. The absence of the "lived experience" from residents could result in a somewhat skewed representation of the impacts of the cooperatives. Another limitation is the reliance on SSIs for data collection. The absence of other data sources, such as policy documents, limits methodological triangulation. Finally, while the SWOT framework is very useful to structure the results, it could result in some oversimplification of complex dynamics by forcing them into categories.

Theoretical Framework

The Energy Justice Framework

The EJF focuses on fairness and equity within energy systems. It provides a structure to evaluate how an energy system positions itself based on the principles of distributive, procedural, and recognitional justice (Sovacool & Dworkin, 2015). At its core, energy justice is concerned with ensuring that energy systems do not reproduce or reinforce existing social inequalities (Jenkins et al., 2016). The EJF is especially fitting for analysing LEIs, because they aim to provide a more equitable alternative to centralised, market-driven energy systems. By analysing LEIs through the EJF, this study can evaluate if and how LEIs contribute to a more just energy system.

Distributive Justice

Distributive justice concerns the fair allocation of costs and benefits associated with energy systems (Jenkins et al., 2016). In the context of the energy transition, this includes access to renewable energy, ownership of infrastructure, distribution of economic benefits, and exposure to environmental risks.

LEIs can contribute to distributive justice through their democratic character and benefits. In contrast to large-scale, top-down oriented REPs, LEIs aim to keep the social, environmental, and economic benefits of their projects local (Walker & Devine-Wright, 2008). Through cooperatives or community-owned energy infrastructure, LEIs try to ensure that these benefits are distributed more equitably among residents. A comparative analysis of energy cooperatives by Bauwens, Gotchev, and Holstenkamp (2016) finds that community ownership of REPs correlates with increased local benefit-sharing and more inclusive participation in energy planning. Additionally, local ownership of REPs was shown to increase social acceptance of REPs (Bauwens et al., 2015).

However, LEIs do not inherently guarantee distributive justice. LEIs have been criticised for not fully incorporating distributive justice; initiatives may even reinforce existing inequalities if they are primarily accessible to wealthier, educated, or socially connected individuals (Teladia et al., 2023). Having said this, there are insufficient studies to determine with certainty whether LEIs reinforce or reduce inequality through their distribution of costs and benefits (Teladia et al., 2023).

Procedural Justice

Procedural justice concerns decision-making in the energy system, with an emphasis on inclusivity, fairness, and meaningful participation in energy-related decisions (Jenkins et al., 2016). It is not only about who benefits from REPs, but also about who has a voice, and how that voice is heard.

LEIs are often praised for contributing to procedural justice. Their goal is to decentralise decision-making processes, where locals can have a meaningful voice. This is in contrast to top-down energy planning, where local input is limited or non-existent. This is because LEIs typically involve democratic governance structures, through cooperatives or member-based associations. Through these structures, the local community can exercise a meaningful voice in project development and management (Seyfang & Haxeltine, 2012).

Empirical research supports the value of public participation for the legitimacy and acceptance of REPs. Lui et al. (2020) found that meaningful participation of citizens in energy-related decisions increased their sense of procedural justice and resulted in increased public support. However, the quality and inclusiveness of public participation are not always guaranteed. While direct participation in shaping energy policies is found to enhance procedural justice, underrepresented and vulnerable groups may be excluded from the processes unless specific mechanisms are put into place for fair representation (Shejale et al., 2025).

Recognitional Justice

Recognitional justice concerns the need to acknowledge the diverse identities, experiences, and needs of individuals and communities. It addresses structural misrecognition and marginalisation, especially among communities that are historically excluded from decision-making processes or particularly affected by environmental harms, which often result from top-down transitions (Jenkins et al., 2016).

There are three main categories of misrecognition: cultural domination, non-recognition, and disrespect (Jenkins et al., 2016). These misrecognitions exist not only in the impacts of energy systems but also in the ways communities are involved. LEIs can have a positive contribution to recognitional justice because they allow energy communities to define their priorities, recognising their knowledge, experiences, and interests. In the context of Groningen, research by Psarra et al. (2024) found that residents of Hoogkerk felt alienated from formal energy transition planning. They felt that their values, knowledge, and concerns regarding place attachments, landscape aesthetics, and history were not recognised within the planning process. This resulted in a perceived sense of exclusion and resistance to proposed plans (Psarra et al., 2024). LEIs, on the other hand, can act as locally rooted institutions that recognise the lived realities of locals, which can foster a more inclusive and just energy transition.

Recognitional justice also involves understanding which sections of society are ignored or underrepresented (Jenkins et al., 2016). LEIs need to actively engage with marginalised voices to avoid maintaining existing exclusions. Without efforts to include diverse community members, LEIs could risk overrepresenting the interests of more socially dominant or resource-rich actors, which would undermine recognitional justice (Lacey-Barnacle & Bird, 2018).

The Multi-Level Perspective

The MLP is a framework for analysing socio-technical transitions. It conceptualises change as a dynamic between three levels: niche, regime, and landscape (Geels, 2002). Over time, these levels interact and shape how innovations emerge, develop, and potentially transform dominant systems. The MLP is especially relevant for analysing sustainability transitions, because it captures structural resistance to change from the dominant regimes and opportunities for innovations to scale and embed (Geels, 2011). This makes it a fitting framework to analyse LEIs, as they represent alternatives to the dominant energy regime. By analysing LEIs using the MLP, this study can evaluate their internal development through strategic niche management (Kemp et al., 1998) and explore how landscape pressures affect their growth and integration.

Niche

Within the MLP, a niche is described as a protected space where radical innovations can develop without immediately being subjected to pressures from the dominant socio-technical regime (Geels, 2002). Niches function as an "incubation room", allowing for learning, experimentation, and building of social networks.

LEIs can be described as grassroots innovations that operate within the niche level. Niches form protected spaces where new sociotechnical practices can develop, often resulting from dissatisfaction with the dominant regime (Seyfang & Haxeltine, 2012). This is exemplified by LEIs, offering community-led alternatives to the centralised energy system. In contrast to a centralised energy system, LEIs provide local ownership models, renewable energy technologies, democratic governance, and citizen participation (Hargreaves, Hielscher, Seyfang, & Smith, 2013). According to Strategic Niche Management (SNM) theory by Kemp et al. (1998), three processes are key for successful niche emergence and development: managing expectations, building social networks, and facilitating learning.

Managing Expectations. Niche innovations must communicate clear, credible, and realistic promises about their performance and effectiveness. Widely shared expectations can attract external support and justify ongoing investment. However, niches must live up to their promises. Otherwise, public and institutional trust may erode (Kemp et al., 1998).

Building Social Networks. Niches are best supported when they embrace a variety of stakeholders, who can call on resources from their organisations to support their growth and contribute to their legitimacy (Seyfang & Haxeltine, 2012). For LEIs, these could include residents, NGOs, and municipalities. Networks are essential for scaling and embedding LEIs into the broader socio-political landscape (Hargreaves et al., 2013; Ghorbani, Nascimento, & Filatova, 2020).

Facilitating Learning. The learning process of niche innovations should extend beyond everyday knowledge and expertise. To be most effective, the process should contribute to second-order learning where assumptions and constraints of the dominant regime are questioned (Schot & Geels, 2008). For LEIs, this would include reflections on the principles of energy justice, participatory governance, and long-term visions on sustainability.

These processes facilitate the successful development and emergence of niches, but also facilitate niche diffusion of innovative sociotechnical practices and systems (Seyfang & Haxeltine, 2012). There are three different ways outlined by which niches can influence the regime: enabling replication of projects across locations; scaling through increased participation and organisational capacity; and translation of niche ideas to mainstream contexts, influencing market norms or policy (Seyfang & Haxeltine, 2012).

Regime

The regime level represents the dominant socio-technical system, such as fossil fuel-based centralised energy production. The regime is characterised by entrenched infrastructures, regulatory frameworks, cultural norms, and powerful incumbent actors (Geels, 2002). LEIs develop in niches, but their growth and effectiveness are shaped significantly by their interaction with the dominant regime.

LEIs face a significant challenge from the institutional rigidity of the dominant energy regime. Incumbent actors, such as large utilities and regulatory bodies, often resist change that threatens their established interests and control (Geels, 2014; Avelino, 2017). This resistance can manifest in multiple ways. For example, LEIs often struggle to gain access to the main grid or have meaningful participation in

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spatial planning frameworks dominated by large-scale developers (Hoppe et al., 2015). Additionally, LEIs face a complex regulatory and financial environment that often favours large-scale entities. This can put LEIs at a disadvantage, as these community-led initiatives often lack the legal, technical, or financial capacity to compete (Hoppe et al., 2015). Even policies targeted towards sustainability may inadvertently exclude LEIs. This can be the case in the Netherlands, where a strong dominance of the economic discourse leaves limited space for smaller environmental considerations or decentralisation (Kooij et al., 2017).

However, LEIs are not passive in this regime. They actively take strategic actions to influence or circumvent constraints of the regime. For example, some form coalitions or cooperatives like the Groninger EnergieKoepel (GrEK). In this way, LEIs can amplify their voice, share knowledge, and advocate for more favourable regulations. These organisations can serve as so-called hybrid actors, bridging the gap between niche innovations and dominant regime structures (Bünger & Schiller, 2022). Additionally, LEIs can break into the regime through successful pilot projects, support from local municipalities, or formal partnerships with other stakeholders (Hoppe et al., 2015). Local governance bodies play an important role in facilitating these interactions, for example by providing funding or facilitating partnerships (Arentsen & Bellekom, 2014). Municipalities can also act as co-creators of energy projects, together with citizens and LEIs. However, in the Netherlands, municipalities often have to deal with conflicting mandates or limited resources, which can limit their ability to support bottom-up initiatives (Hoppe et al., 2015).

Socio-technical transitions do not happen through simple substitution of the regime, but through a gradual reconfiguration of the existing system (Geels, 2002). Transitions happen through either niche-cumulation, where niches connect and reinforce each other, becoming more influential and able to challenge the existing regime; or through hybridisation, where old and new elements of the niche and regime combine (Geels, 2002). This implies that LEIs do not necessarily have to disrupt the regime, but may also influence the regime by slowly embedding themselves within existing infrastructure and institutional frameworks.

Landscape

The landscape encompasses large, exogenous trends and external pressures that influence socio-technical regimes and niche innovations over time. This includes macro-level trends such as climate change, economic fluctuations, or political dynamics (Geels, 2002). These pressures can destabilise the current regime, creating "windows of opportunity" for innovations to break out of the niche level (Geels, 2002). There are several developments on the landscape level in the energy sector that have facilitated the development of LEIs.

One of the biggest drivers is the global imperative to address climate change. This imperative has resulted in policies and frameworks aiming to reduce GHG emissions. Regulatory frameworks and policies that encourage innovation support the growth of decentralised energy systems (Ashok, 2024). Examples of such frameworks are the European Green Deal, which aims to achieve climate neutrality in Europe by 2050 and promotes decentralised REPs as central to that goal (European Commission, 2019).

In the Netherlands, the Klimaatakkoord supports regional energy planning through the establishment of regional energy strategies (RES) (Rijksoverheid Nederland, 2019). But not only policy dynamics provide windows of opportunity; technological innovation does as well. The fast development of decentralised technologies like solar PV or batteries has significantly lowered the costs of REPs. For example, the global weighted average levelised cost of electricity (LCOE) from newly-commissioned utility-scale solar PV projects decreased by 90% between 2010 and 2023, with a decrease in installation costs in the Netherlands of 41% in 2023 compared to 2022 (IRENA, 2024). Additionally, battery project costs decreased by 89% between 2010 and 2023 (IRENA, 2024). This makes it increasingly viable for smaller actors to initiate local projects.

However, landscape dynamics do not only offer enabling conditions, but can also impose constraints that can hinder the development of renewable energy technologies and LEIs. For example, economic crises can result in a reduction in investments in REPs; global energy investments experienced a significant decline during the COVID-19 pandemic as a result of a decline in global energy demand. This put some renewable energy businesses at risk of financial loss (Hoang et al., 2021). Additionally, studies have shown that political instability negatively impacts renewable energy innovation, especially in countries with a well-established renewable energy sector (Zhang et al., 2024).

Results

Figure 3



Results - Themes and Subthemes for Strengths. The figure in brackets represents the coding frequency.

Note. The figure summarises the key strengths of local energy-initiatives (LEIs) in Groningen. These results are based on coding and thematic analysis of 5 semi-structured interviews with representatives of LEIs.

Figure 4



Results - Themes and Subthemes for Weaknesses. The figure in brackets represents the coding frequency.

Note. The figure summarises the key weaknesses of local energy-initiatives (LEIs) in Groningen. These results are based on coding and thematic analysis of 5 semi-structured interviews with representatives of LEIs.

Figure 5

Results - Themes and Subthemes for Opportunities. The figure in brackets represents the coding frequency.



Note. The figure summarises the key opportunities of local energy-initiatives (LEIs) in Groningen. These results are based on coding and thematic analysis of 5 semi-structured interviews with representatives of LEIs.

Figure 6





Note. The figure summarises the key threats to local energy-initiatives (LEIs) in Groningen. These results are based on coding and thematic analysis of 5 semi-structured interviews with representatives of LEIs.

Strengths (Most Important)

Member Participation

Project Participation. Members are actively involved in the organisation of projects, next to mere participation. Several cooperatives describe how residents are involved in the development of projects like solar roofs or initiate projects themselves. This strengthens commitment and improves the relevance of projects to the community's needs.

Democratic Participation. Cooperatives have a democratic governance structure, where members can exert voting power during General Assemblies (GAs) and are regularly consulted on potential decisions. Although one GA per year is obligated, some cooperatives organise multiple. This participatory structure supports transparency and collective ownership.

Member Education and Information Sharing. To keep members engaged, cooperatives establish continuous communication and provide many educational opportunities to their members. Cooperatives provide updates, for example through newsletters, and organise information sessions to educate members on topics such as heat pumps or bio-based insulation.

Collaboration

Collaboration among Cooperatives. Cooperatives have good contacts to exchange knowledge, align strategies, and support each other's projects. This is properly facilitated through umbrella organisations such as GrEK and the regiotafel (region table, meeting of cooperatives and representatives of the municipality) organised by GrunnegerPower. One interviewee noted that these platforms support smaller cooperatives by providing innovative ways to increase their impact.

Collaboration with Municipalities. Many cooperatives described their municipalities as key partners. They support cooperatives by providing energy coaches for residents or providing support for public outreach. Contacts with the municipalities are good, especially when they provide a specific contact person. For example, the municipality of Groningen appointed an energy coordinator, who facilitates contact between the municipality and cooperatives.

Collaboration with Energy Utilities and System Actors. Some cooperatives mentioned constructive collaboration with larger system actors, such as grid operators (Enexis) or energy suppliers (Equans), albeit less frequently. Contacts with such parties are necessary for technical coordination like grid connections or new infrastructure. Cooperatives mentioned that, although contacts are sometimes limited, they are usually constructive and do not get in the way.

Local Redistribution of Benefits

Community Reinvestments of Profits. Several cooperatives emphasised that the profits from their initiatives are invested back into the community. Examples include financial support for community-led initiatives, supporting energy-saving measures for households, or supporting local sporting clubs. This allows the local community to enjoy the economic benefits from renewable energy projects, instead of everything going to large utilities.

Access to Locally Generated Energy. Through cooperatives, locals can get access to locally generated electricity. This is mainly offered through Energie VanOns; they provide the energy, and the cooperatives get a reseller's fee. This way, locals not only suffer the costs of renewable energy projects, but also get to enjoy the benefits. This model increases the transparency of energy supply and members' sense of ownership.

Inclusive Local Participation. Cooperatives try to ensure that residents have accessible opportunities to participate in initiatives. This is done through, for example, priority access to project shares based on your postal code, or direct invitations through door-to-door visits or flyers. Only locals can participate in projects, but this is not limited to members of the cooperative.

Strengths (Moderately Important)

Inclusiveness

Service Diversity for Broad Inclusion. Many cooperatives try to offer a broad range of services to reach a diverse group of potential participants. Some cooperatives offer multiple services next to only renewable energy, like a shared car, or let members decide on future projects or how to reinvest profits. This way, cooperatives can reach a broader range of people and take different needs and situations into consideration.

Affordable Participation Models. To ensure that low-income households can also participate, some cooperatives try to design accessible financial models. Examples include abolishing membership fees or offering shares in renewable energy projects for 1 cent. Through these efforts, cooperatives try to ensure that participation is fair and inclusive, even for locals with fewer resources.

Local Mindset and Support

Local Support for Renewable Energy Projects. Locally grounded REPs increase local support. Some cooperatives indicated that a community-led model has more trust from locals than large developers. This results in fewer public resistance and more constructive dialogue during planning processes.

Energy Awareness through Ownership. People who are actively involved in their energy production are much more aware of their consumption, sustainability, and climate action. These members are more likely to engage with the cooperatives and explore home improvements like insulation.

Strengths (Less Important)

Public Outreach

Persistent Engagement with Hard-to-Reach Groups. Some cooperatives indicated persistency to reach underrepresented groups, such as renters of non-Dutch speakers. One cooperative mentioned collaborating with local social organisations, while another mentioned efforts to diversify methods of public outreach. However, the lack of public outreach to these groups was acknowledged rather as a weakness, and continuous efforts to reach these groups were seen as an opportunity rather than a strength.

Weaknesses (Most Important)

Public Outreach

Difficulty Reaching the Public. Cooperatives experience challenges in reaching certain audiences who are unaware or uninterested. It is challenging to reach socially isolated people, people who don't

use social media, or have a "no-no sticker" on their mailboxes rejecting unsolicited mail. This could result in unintentionally excluding people who might benefit from these initiatives, undermining the goal of broad, equitable participation.

Communication Barriers. Another factor complicating public outreach is language and literacy. Some cooperatives indicated to find challenges in reaching out to residents who do not speak Dutch or are unfamiliar with energy-related language. Despite efforts to simplify communication, certain groups still find the information inaccessible.

Low Turnout at General Assemblies. Some cooperatives reported having low turnouts at GAs, undermining public engagement. Some interviewees attributed this to time constraints or a lack of interest. A low turnout decreases democratic participation and might result in over- and underrepresentation of specific groups or individuals.

Capacity Limitations

Reliance on Volunteers. Cooperatives are often run by volunteers who take up a lot of the workload. This reliance on volunteers limits their ability to scale and increase their impact, as it is difficult to maintain momentum over time when broader member involvement or professional staffing is limited. This can impair the long-term sustainability and capacity growth of those cooperatives.

Limited Financial Capacity. A lot of cooperatives do not have a lot of capacity or resources, limiting their ability to scale. Cooperatives often rely on subsidies or member contributions and have little room for growth. This impairs long-term planning and constrains their ability to hire staff or take on larger projects.

Energy Supply

Grid Congestion. Grid congestion is a serious problem for local energy production. Several cooperatives faced challenges when wanting to connect new installations to the grid. Some interviewees noted that they had projects "ready-to-go", but were unable to proceed due to infrastructure limitations.

Demand-Supply Mismatches. Most energy initiatives are solar-powered. This can result in seasonal mismatches between supply and demand, or even on a daily timeline. Some cooperatives struggle with excess production, which costs money to deliver back to the grid. Other issues regarding storage or redistribution also undermine their ability to deliver local benefits.

Weaknesses (Moderately Important)

Financial

Dependency on Loans or Investments. Many cooperatives are dependent on external loans or investments from members to finance their projects. This is a serious limitation, as smaller cooperatives

cannot always get big enough loans to finance their projects, and repayment obligations mean profits cannot all be invested into the community.

High Costs of Batteries. Many cooperatives listed batteries as a potential solution to grid congestion and energy mismatches. However, batteries are very expensive, preventing them from being adopted more broadly. This limits cooperatives' ability to store and manage energy efficiently.

Weaknesses (Less Important)

Lack of Structural Engagement with Grid Operators

Some cooperatives indicated challenges in their contacts with grid operators. Contacts were described as sporadic and sometimes absent altogether. Grid operators are described as passive in their contact, where the initiative to maintain contact needs to come from the cooperatives. This lack of structural contact limits cooperatives' ability to influence local energy planning and can slow down the implementation of projects.

Wind Projects

Price. To better ensure a steady supply of energy, cooperatives often mention wind as a potential project. However, wind projects require high investments or a lot of participation to make it economically viable. These high investment costs, combined with uncertain returns, make it difficult for cooperatives to invest in wind projects.

Location. Another challenge is finding a suitable location for wind projects. The municipality of Groningen has a ban on wind turbines on open grounds. Finding a site locally for a small wind turbine was also described as a challenge; one interviewee indicated that, even after personally asking a lot of farmers if they could provide a site for a small-scale wind project, they still could not get it off the ground.

Opportunities (Most Important)

Secure Energy Supply

Scaling Local Wind Capacity. To better match supply to demand, cooperatives mentioned scaling local wind capacity as a big opportunity. Small EAZ windmills are especially suited for rural grounds. Adding wind projects is seen as an important potential development to improve energy autonomy to match the gaps in supply when solar alone cannot deliver. These projects increase in viability with increasing participants.

Energy Communities. Energy communities were also mentioned as a potential future direction, where cooperatives coordinate production and consumption with each other. This is a direction that would add more local value by keeping the excesses of produced energy local, enhancing energy

autonomy, and decentralising the energy system. A promising initiative in this field is the Local4Local initiative.

Professionalisation

Professionalisation of Cooperatives. Most cooperatives indicated a need for professionalisation. A lot of cooperatives currently have a volunteer character, limiting their ability to make a bigger impact. Professionalising the cooperative with more paid labour and roles such as a professional project manager would allow cooperatives to handle bigger and more complex projects, have better engagement with external stakeholders, and scale their operations.

Partnerships with Commercial Actors. Another part of professionalisation is establishing better partnerships with commercial parties, especially parties with technical expertise or infrastructure. Larger and commercial actors are also needed in the energy transition, and collaborating with those parties could help facilitate the development and implementation of projects from cooperatives. Aligning with commercial partners could also mean taking on more ambitious projects.

Opportunities (Moderately Important)

Improving Public Outreach

Inclusive Communication Strategies. To reach a broader part of the community, a wide range of public outreach methods could be effective. Some examples given by the interviewed cooperatives include participating in local markets, using the municipality newsletter, or collaborating with social organisations that work with marginalised groups.

Member Recruitment through Projects. Another way to recruit new members is directly through projects. One cooperative experimented with this; they asked residents who participated in a project if they wanted to become a member, and a lot of participants did. Another cooperative reflected on a project where they should have done the same. Recruiting members through projects is a good opportunity, as people are more likely to become members if they've already experienced the tangible benefits of a project.

Opportunities (Less Important)

Collaboration

Collaborating on Sustainable New Construction. Even though not mentioned much, a promising opportunity that was mentioned was involvement in the construction of new housing projects. This way, cooperatives could be involved from the start and assist the municipality and project developers with the planning of new housing projects.

Threats (Most Important)

Financial

Potential Exclusion of Low-Income Households. Many cooperatives risk unintentionally excluding low-income households from participation. For many households, the financial threshold is too high. People on a tight budget may be unable or unwilling to pay a membership fee, or the cost of investing in REPs may be too high. This could result in a form of structural exclusion that threatens the social mission of cooperatives.

Economic Viability of Renewable Projects. A smaller but still significant concern is the rising costs of REPs. Combined with declining subsidies, some projects can become financially unfeasible. Inflation, difficulties in insuring facilities, and policy uncertainty make it difficult to predict the return on investment. This could threaten the growth and continuity of especially smaller cooperatives.

Public Outreach

Lack of Public Interest. A large part of the public is not interested in sustainability and the energy transition, and views energy as a good. People who do not associate sustainability with personal benefits are unwilling to engage with cooperatives, making it difficult to build a member base or expand outreach, threatening the growth of cooperatives.

Potential Intrusiveness of Outreach. Some cooperatives mentioned persistence in public outreach, especially to harder-to-reach groups. However, there is a fine line between persistence and intrusion. Persistent attempts to reach people, for example through continuous door-to-door visits, may be seen as intrusive or pushy after a while. Cooperatives need to find a good balance between persistence and intrusiveness; otherwise, they could risk residents getting a sense of aversion against them, making it more challenging to expand.

Threats (Moderately Important)

Regulatory Boundaries

Planning Restrictions. Several cooperatives indicated frustrations with spatial planning regulations, especially hindering the implementation of wind turbines. In Groningen, there is a ban on placing wind turbines in open landscapes, hindering the development of new wind projects. Some also experience that rigid municipal policies can make local initiatives unnecessarily difficult, for example by making the process of applying for a subsidy unnecessarily complex. This is a persistent barrier that can hinder long-term planning and development of cooperatives.

Risks of Professionalisation

Risk of Losing Democratic Character. A less mentioned but significant threat is the potential loss of a cooperative's democratic character when growing and professionalising. While this is often

mentioned as an important opportunity to scale and make more impact, it brings the risk of drifting away from their grassroots, member-led character. Hiring a professional staff or partnering with larger commercial organisations can streamline operations and allow for bigger projects. But it could reduce the sense of ownership and democratic control that defines a small cooperative. Additionally, there is a risk that the "top" can become too distant from its members, and that socially or economically more dominant members will influence the course of the cooperative; one participant gives examples of Rabobank or Friesland Campina.

Discussion

In the discussion, the empirical findings from the interviews are discussed in relation to two analytical frameworks: the energy justice framework (EJF) and the multi-level perspective (MLP). Together, they help evaluate if LEIs in Groningen contribute to a just energy system and how they are positioned in the broader socio-technical regime.

Energy Justice

Figure 7

Strengths and limitations of LEIs across the dimensions of energy justice.

Energy Justice Dimension	Strengths	Limitations
Recognitional Justice	 Clear intent to be inclusive. Efforts to reach underrepresented groups. Broad range of services to address diverse needs. Awareness of exclusion issues. Measures to reduce participation barriers 	 Underrepresentation of vulnerable groups. Structural barriers like financial costs and limited outreach. Skewed representation toward well-educated, higher-income individuals.
Procedural Justice	 Democratic governance structures in place. Transparent and regular communication. Active efforts to inform and empower members. Additional meetings beyond legal requirements. 	 Low turnout at general assemblies. Barriers to participation (time, content complexity, disinterest). Risk of overrepresentation by small group of active members. Participatory mechanisms may not be fully accessible or inclusive.
Distributive Justice	 Local reinvestment of profits. Access to locally produced energy via cooperatives and Energie VanOns. Inclusive participation models (e.g., symbolic investment options). 	 Potential exclusion of low-income households. Infrastructural constraints limit access to renewable energy.

Recognitional Justice

Recognitional justice is about the acknowledgement of the diverse identities, experiences, and needs of individuals and communities, addressing structural misrecognition and marginalisation (Jenkins et al., 2016). Based on the interviews, LEIs in Groningen present a mixed picture of recognitional justice. While there is a clear intent to be inclusive, there are structural and practical limitations restricting cooperatives from reaching the full scope of the community.

Cooperatives actively involve the public by being persistent in their efforts to involve hard-to-reach groups and offering a broad range of services to try and take into account the different needs of the broader community. However, vulnerable groups like low-income households, renters, and non-Dutch speakers remain underrepresented. Additionally, low-literate individuals also hardly engage with such initiatives. This means that representation remains skewed towards relatively well-educated, middle- or higher-income households. This aligns with concerns from existing research, which warns of the risk of overrepresenting the interests of socially more dominant or resource-rich individuals when cooperatives unintentionally exclude certain members of the community (Lacey-Barnacle & Bird, 2018).

This shortcoming is recognised by most of the interviewed cooperatives. They recognise that especially financial thresholds and limited outreach capacity can unintentionally prevent wider engagement. Membership fees or investment costs could exclude low-income households from participation. Communication barriers and limited means for public outreach limit the scope of the community that cooperatives can successfully engage with. Cooperatives are aware of these issues and try to address them by diversifying their means of communication, simplifying communications, or lowering financial participation requirements. However, these measures cannot fix the entire issue; there remain individuals who simply have no interest in sustainability or the energy transition, and do not engage with the efforts of the cooperatives to include them.

Procedural Justice

Procedural justice concerns the fairness and inclusivity of decision-making processes within cooperatives, emphasising who has a meaningful voice in shaping decisions and how that voice is acknowledged (Jenkins et al., 2016). In the context of LEIs in Groningen, procedural justice is a clear strength. However, it does have limitations.

All the interviewed cooperatives have a democratic governance structure. Members are actively involved in the decision-making process through GAs, regular consultations, and open discussions on project development. Although one GA per year is mandatory for a cooperative, some cooperatives organise multiple GAs per year or organise additional meetings or participatory events. This enhances the transparency and accountability of cooperatives and provides a platform for meaningful participation of members in shaping the direction of the cooperative. Next to the formal governance structure, procedural justice is also supported through ongoing communication and education. Members are regularly updated through newsletters, and the cooperatives often organise information sessions on relevant topics such as insulation, heat pumps, or renewable energy policy. Efforts like this help bridge information gaps, empowering members to make informed decisions and build trust in the cooperative model.

However, there are limitations despite the participatory structure of the cooperatives. For example, something that was mentioned by some of the cooperatives was a low turnout at GAs. Although these meetings are open to all members, participation sometimes falls short. The reasons behind this, as mentioned in the interviews, could be a lack of interest, time constraints, or unfamiliarity with the content of the topics. This could result in uneven influence in the cooperative, where a small

part of active members is overly represented. This dynamic is reflected in existing literature, which suggests that procedural justice should go beyond merely having participatory mechanisms in place, but also ensure the mechanisms are truly accessible and inclusive (Hazrati, 2024; Seyfang & Haxeltine, 2012).

Nevertheless, the cooperatives have the mechanisms in place and engage in efforts to reach and include a large part of the community. According to existing research, when residents feel they have a meaningful voice in decisions, they are more likely to support initiatives and less likely to oppose new developments (Walker & Devine-Wright, 2008). This was reaffirmed in the interviews, where local support for such initiatives was indicated to be a strength of their cooperatives.

Distributive Justice

Distributive justice concerns the fair allocation of benefits and costs related to energy production and consumption. In the energy transition context, this includes access to renewable energy, ownership of infrastructure, the distribution of economic benefits, and exposure to environmental risks (Jenkins et al., 2016). The interviews make it clear that cooperatives in Groningen make a meaningful contribution to distributive justice, mainly through the sharing of benefits. However, challenges regarding especially financial inclusion and grid constraints remain.

One of the major strengths of cooperatives is the local redistribution of benefits. A key example is the direct reinvestments of profits in the community, for example by funding energy-saving measures, local events, or supporting local institutions. This strengthens ties to the community and ensures the economic benefits of REPs remain local rather than going to large commercial parties. This aligns with Walker and Devine-Wright's (2008) notion of local ownership as a key condition for equitable energy systems. Another distributive strength is access to locally produced energy. Mainly in collaboration with Energie VanOns, members of the cooperatives can get access to energy that is locally generated. This enhances transparency and the feeling of ownership of residents. Some cooperatives initiated projects where residents of a certain postal code can get direct access to energy produced in their neighbourhood. Such projects strengthen the link between participation and personal rewards. Additionally, some cooperatives actively try to reinforce inclusivity through affordable participation models. Some cooperatives abolished membership fees or offered symbolic investment options (e.g., project shares at 1 cent). These efforts are aimed at including low-income households who might otherwise be excluded from participation.

Despite these efforts, financial exclusion in particular remains a challenge. Cooperatives expressed concerns about potentially excluding low-income households who might be discouraged from participation, even when investment requirements are low. In addition, grid congestion and demand-supply mismatches can limit access to local renewable energy. Some cooperatives have projects ready-to-go, but face delays due to limited grid capacity. And because most cooperatives rely mainly on solar for their energy projects, they face challenges when excess energy produced cannot be stored or economically returned to the grid. These challenges put the equitable distribution of energy benefits at risk and might reinforce existing inequalities. This picture is reflected in literature, which suggests that initiatives may reinforce existing inequalities when primarily accessed by wealthier, better-connected

residents (Teladia et al., 2023). This concern was echoed in some of the interviews, noting that participation often skews to individuals who are already relatively engaged and resourceful.

Reflection

These findings suggest that LEIs in Groningen significantly contribute to a more just energy system. However, their contributions are partial and uneven. In all three dimensions of energy justice, LEIs show a commitment to fairness, inclusivity, and local empowerment. This is especially evident from their democratic governance structures, reinvestments of profits in the community, and efforts to include underrepresented groups. This reaffirms findings from existing literature, which suggest that LEIs can be an effective way to make the energy transition more just *(Seyfang & Haxeltine, 2012; Walker & Devine-Wright, 2008).*

However, there are clear limitations to their implementation of the principles of energy justice. Looking at recognitional justice, there is a structural underrepresentation of vulnerable groups such as low-income households, renters, or non-Dutch speakers. Procedurally, participation is fairly limited to a relatively small group of active members, despite the inclusive decision-making frameworks in place. Distributively, despite the benefits of initiatives mostly remaining local, infrastructural constraints and financial thresholds can still potentially exclude individuals who might benefit strongly from these projects. Having said this, these shortcomings are mainly due to structural challenges, and not neglect. Many cooperatives rely heavily on volunteers, have limited financial capacity, and operate in a system that does not always support bottom-up innovation. Despite these barriers, the cooperatives are actively engaged in improving inclusivity and fairness of the energy transition, through efforts like affordable participation models, diversified outreach, and being transparent.

It is important to note that efforts from these cooperatives are not only morally significant, but they also have strategic value. By embedding the principles of justice in their operations, cooperatives help build trust and local legitimacy, which can reduce social resistance to REPs (Hazrati, 2024), which is also reflected in the interviews. This is crucial in the wider energy transition, where public resistance to REPs can significantly slow down development. If LEIs can continue to expand their reach and address their structural limitations, they can serve as anchors for a democratic and publicly supported energy future.

The Multi-Level Perspective

Strategic Niche Management

LEIs operate at the niche level of the MLP. To successfully develop, the Strategic Niche Management (SNM) theory identifies three key processes: managing expectations, building social networks, and facilitating learning (Kemp et al., 1998). Cooperatives in Groningen show active engagement in all three, but with varying degrees of maturity and challenge.

Managing Expectations is about communicating clear and credible promises to attract stakeholders and justify continued support (Kemp et al., 1998). It is clear from the interviews that the cooperatives are aware of this dynamic. They have ongoing communication with their members through newsletters, information sessions, and detailed project updates. They communicate the benefits of their projects, such as reinvestments of profits in the community or access to locally generated electricity. However, cooperatives also acknowledge structural challenges that may undermine these benefits, such as grid congestion or limited funding. If expectations are raised too high, trust may decline in the community if these promises are not met. Facing these challenges, most cooperatives aim to maintain transparency in their communication, with several interviewees indicating the importance of providing concrete updates rather than overpromising.

Building Social Networks is essential for niche development as it brings stakeholders together who can contribute resources, legitimacy, and advocacy (Seyfang & Haxeltine, 2012). The cooperatives have strong collaboration with other institutions. Through umbrella organisations such as GrEK and the regiotafel organised by GrunnegerPower, cooperatives maintain active communication with each other. These networks facilitate the exchange of knowledge, joint advocacy, and collaborative problem solving, which enhances the resilience of smaller cooperatives. Additionally, many cooperatives indicated to have good relationships with their municipalities. Many interviewees described the municipality as a key partner, especially when they have a dedicated energy coordinator who facilitates effective communication, as is the case in Groningen. Some indicated that the municipality supports public outreach and visibility of cooperatives or helps facilitate contacts with stakeholders. Contacts with grid operators and energy suppliers are less frequent, but important, as these contacts are needed for project requirements like providing the necessary infrastructure.

Facilitating Learning is also crucial for niche development, both first- (technical and organisational) and second-order (questioning the assumptions and constraints of the dominant regime) (Schot & Geels, 2008). The cooperatives are engaged in both. Cooperatives frequently experiment with technical adaptations, such as shared car initiatives, energy storage, or different configurations of grid connections, showing first-order learning. Second-order learning is reflected by the way cooperatives see the role of citizens in energy governance. For example, multiple cooperatives indicated that active participation in the energy transition increases residents' awareness of their energy consumption and sustainability. However, cooperatives do not just learn and take up knowledge themselves; they also actively try to educate and inform their members, for example through frequent information sessions. Cooperatives thus actively contribute to a broader learning environment that goes further than just their organisation, but engages other cooperatives, municipalities, and the wider community as well.

Overall, the cooperatives showed that they are developing well in the niche space according to SNM theory. They put significant efforts into managing expectations, building networks, and first- and second-order learning, showing a maturing innovation environment. However, cooperatives must maintain support and adaptability to keep developing. Cooperatives still face significant challenges: internal, such as a heavy reliance on volunteers, and external, such as technical barriers like grid congestion. Challenges like these need to be addressed for LEIs to scale and influence the broader

regime. Nevertheless, the evidence suggests that these cooperatives are growing and developing well in their niche space.

Regime Interactions

The regime level represents the dominant socio-technical system, with entrenched infrastructures, regulatory frameworks, cultural norms, and incumbent actors (Geels, 2002). For LEIs, interacting with the regime is necessary for scaling, but they face a lot of institutional barriers in doing so. The cooperatives are navigating this relationship, but face structural barriers.

A central theme of the interviews was limited access to the grid. Grid congestion was a frustration that was often raised, complicating, delaying, or blocking some projects. One cooperative mentioned a ready-to-go project that was stalled due to infrastructure limitations. This is a reflection of a key point raised by the MLP, suggesting regimes resist change not only ideologically, but also through entrenched infrastructures that favour large, centralised parties (Geels, 2014). This is exemplified by the limited grid capacity and the sometimes slow response from grid operators. Another challenge is navigating the existing regulatory systems. Cooperatives indicated that policies, while supportive of sustainable initiatives on paper, remain administratively challenging for small-scale actors. Planning restrictions, like those on wind turbines in open spaces, or complex subsidy procedures, are significant challenges that can hinder the development of initiatives. This also aligns with existing research, which notes that even green policy regimes often favour large-scale solutions and actors, hindering the development of grassroots initiatives like LEIs (Hoppe et al., 2015; Kooij et al., 2017).

However, cooperatives are not passive actors. The cooperatives described structural collaboration with their municipalities, describing them as a valuable partner providing support, including funding, providing energy coaches, or assisting with public outreach. The relationship is described as especially functional when the municipality has an energy coordinator as a designated contact point. Municipalities reflect the role of so-called hybrid actors in sustainable transitions, who link niches with regime institutions (Bünger & Schiller, 2022). Some cooperatives also described their interactions with system actors, such as grid operators (Enexis) and energy suppliers (e.g., Equans). Communication with these actors is necessary during project development and implementation, because those actors influence grid connections and infrastructure. Cooperatives described contacts as limited but mostly positive, or at least not obstructive. However, several cooperatives noted a lack of structural engagement, and that initiative for contacts needed to come from the cooperatives themselves. This lack of coordination between cooperatives and system actors can limit LEIs' ability to influence local energy planning and delay the implementation of projects. While the interviews generally suggest that cooperation is possible, at the same time, a more proactive relationship would better support the integration of LEIs into the broader energy regime. The limited capacity of cooperatives also shapes these interactions; many rely heavily on volunteers and lack the time or expertise to navigate the complex bureaucratic challenges or maintain continuous contact with incumbent actors. The absence of professional support, such as dedicated legal or technical assistance, limits the capacity of many LEIs to negotiate their position in the regime.

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Despite these challenges, LEIs try to find strategic adaptation efforts. Cooperatives try to increase their voice and impact capacity through coordination platforms like GrEK, sharing knowledge and experience between cooperatives. These collaboration efforts empower individual cooperatives and contribute to shifting perceptions of what actors can look like in a decentralised energy system.

Scaling and System Integration

A crucial thing to consider for LEIs is if and how they can scale and embed themselves into the regime. As discussed in the theoretical framework, many landscape dynamics form windows of opportunity for grassroots innovations like LEIs to scale and influence the regime (Geels, 2002). Such dynamics include new policies like the EU Green Deal (European Commission, 2019) and the Klimaatakkoord (Rijksoverheid Nederland, 2019) that promote the reduction of GHG emissions and decentralised energy systems, or technological innovations that reduce the costs of REPs (IRENA, 2024). The cooperatives indicated a clear ambition to scale, with many already taking efforts to increase their impact. However, they also voiced some concerns.

One means of scaling is through efforts to increase energy autonomy. Many rely mainly on solar, and to better secure a steady supply of energy, many cooperatives are looking to scale their wind capacity with small EAZ wind turbines being especially suited. Another opportunity is forming energy communities where cooperatives coordinate energy production and consumption in the region, with initiatives like the Local4local project already underway. Through inter-organisational cooperation and infrastructural coordination, LEIs can build a more decentralised and resilient energy system. Professionalisation is another way of scaling. As many cooperatives rely on volunteers, their ability to manage complex projects or scale operations is limited. Cooperatives indicated a need for paid positions, such as a project manager, or developing partnerships with commercial organisations that can bring resources and technical expertise. This way, they can increase internal capacity and take on more ambitious projects. Third, cooperatives emphasised the need to improve their public reach to increase their member base and local legitimacy. Ways through which they attempt this are by using inclusive communication channels or recruiting members directly through projects.

However, scaling is accompanied by significant challenges. Professionalisation, while seen as necessary, has risks to the democratic and grassroots nature of cooperatives. Some cooperatives indicated concerns that hiring a professional staff or working with commercial actors could create distance between the members and the "top", decrease transparency, or skew democratic influence towards socially more dominant or resourceful members. Examples such as Rabobank or Friesland Campina were given to illustrate this. Additionally, structural limitations and challenges get in the way of scaling. Grid congestion is seen as a big issue, preventing new grid connections, which could obstruct taking on new or larger projects. Moreover, planning restrictions limit the development of wind projects in particular, due to the restriction on wind turbines in the open landscape in Groningen. Economic uncertainties could also constrain the feasibility of scaling, through rising costs of renewable energy technologies, declining subsidies, or complexities for insuring new facilities. Grid congestion is another issue, as cooperatives need to pay for excess energy that is delivered back into the grid, which could harm the feasibility of new or larger projects. Another barrier is public engagement, especially a lack of

public interest in renewable energy among people who simply view energy as a commodity and do not perceive clean energy as a personal benefit. Without sufficient public engagement, scaling the member base and building local legitimacy becomes increasingly difficult.

LEIs have many ways to scale and embed themselves in the dominant regime: increasing energy autonomy through scaling local wind capacity and energy communities, increasing capacity through professionalisation of the internal structure and cooperation with commercial actors, and building local legitimacy through expanding their member base. However, this scaling is not about disrupting and replacing the regime, but rather about gradual integration by embedding themselves into existing structures. They are pursuing a strategy of gradual embedding and hybridisation, expanding their influence while remaining grounded in local, participatory values (Geels, 2002). Whether LEIs succeed will depend on their ability to balance growth with identity, and on whether institutions make space for them to scale on their terms.

Reflection

The interviewed cooperatives are showing structural development in the niche, according to SNM. They actively try to manage expectations by being transparent and communicating, they build strong networks with other cooperatives and municipalities, and they facilitate first- and second-order learning. This is a clear indication that LEIs in Groningen are no isolated experiments, but are becoming more mature and interconnected institutions within the energy system.

At the regime level, cooperatives are engaging with incumbent actors. They often have constructive and supportive relationships with the municipalities, which can act as important hybrid actors (Bünger, A., Schiller). At the same time, contacts with system actors such as grid operators and large energy suppliers remain limited and uneven. While interactions are usually constructive, initiative for contact needs to come from the cooperatives, which limits their ability to influence local energy planning and can delay the implementation of projects. In terms of scaling and system integration, the cooperatives show ambition and hesitation. They identify multiple ways to increase their impact: professionalising their internal structure, improving outreach to broaden their member base, and enhancing energy autonomy through wind projects and inter-cooperative collaboration. However, technical limitations impair their development, and they express concerns about losing their democratic grassroots character. This is why scaling is attempted through gradual embedding, a process of hybridisation where cooperatives adapt to regime structure but try to maintain their participatory characteristics. If and how LEIs can embed in the dominant regime depends on how they can balance that. Their potential is not in replacing the regime, but reforming it from within.

Conclusion

This study has demonstrated that LEIs in Groningen have the potential to significantly contribute to a more just and inclusive energy transition. They enhance procedural and distributive justice through democratic governance structures and local-benefit sharing, and have a clear intent to promote recognitional justice through efforts to be inclusive to the wider community. However, structural challenges like their reliance on volunteers or limited financial capacity impose limitations on their implementation of the principles of energy justice. Despite this, LEIs are actively engaged in improving the inclusivity and fairness of the energy transition. Their locally embedded character and participatory approach help foster trust and local legitimacy, which can reduce social resistance to REPs and enhance the energy transition (Hazrati, 2024). As grassroots innovations, LEIs are developing strongly. However, their ability to scale and embed themselves in the dominant socio-technical regime is constrained by institutional, infrastructural, and financial barriers. Their growth and future role in the energy transition depend on supportive policies and their ability to scale and professionalise while keeping their participatory character.

While interpreting these results, several limitations should be acknowledged. The small and relatively homogenous sample of primarily board members limits the scope of perspectives. Especially the perspectives of residents or marginalised community members exclude the "lived experience" from this research. Additionally, the reliance on interviews without triangulation with other data sources could limit the depth of this analysis. Despite these limitations, this thesis still offers valuable insights into the role of LEIs as justice-enhancing actors and niche innovations. Future research could build on these findings by examining LEIs over time to assess if they can maintain their participatory character when scaling up. Additionally, comparing LEIs across different regional or national contexts could deepen the understanding of how different institutional conditions impact LEI development.

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Appendices

Appendix A: Interview Guide

Introduction and Background Questions

Thank you for taking the time to talk to me. A quick introduction: I am Wessel, 24 years old, and I come from Groningen. I study Global Responsibility and Leadership, which is a long name for sustainability. For my bachelor's thesis, I am researching the role of local energy initiatives in the energy transition of the RES region Groningen. This interview is intended to gain insight into how energy cooperatives, like yours, see their role in the energy transition. I will ask questions about your position in the current energy system and about your contribution to a more just energy system. During the interview, I will not ask personal questions to ensure anonymity, but of course, I am curious about who I am talking to. So, do you want to introduce yourself before we start?

To recap: participation is completely voluntary; you may stop at any time and refuse to answer any questions without any consequences. This interview is expected to last 45 to 60 minutes. Before we go any further, do you have any questions for me?

Check that the informed consent form has been signed

Do I have your permission to record the conversation? This is only for later transcription purposes. To ensure anonymity, I will not ask you for any personal information. The recording is completely confidential, will not be shared with others, and will be deleted after transcription.

Then I'll start recording now.

Thank you again for your time and participation in this research. To begin,

- 1. Can you explain your role in *cooperative x*?
- 2. Can you describe what your cooperative does, and what its main mission and goals are?

Energy Justice

DistributiveJjustice

- 3. What do you consider to be the (main) benefits of your local energy-initiatives?
- 4. How does your cooperative ensure that these benefits (such as profits, energy savings, and environmental benefits) remain within the local community?
- 5. Are there people or groups who may be unintentionally excluded from these benefits?

Procedural Justice

6. How are community members involved in the decision-making process within the cooperative?

7. How do you ensure accessible and meaningful participation for a wide range of residents?

Recognitional Justice

- 8. How does your cooperative take into account the different needs, values , or situations of diverse members of the wider community?
- 9. Are there groups or community members that are harder to reach or engage?

The Multi-Level Perspective

Niche-Regime Interactions

- 10. What are the main challenges your cooperative faces within the current energy system (such as financing, grid access, regulations)?
- 11. How would you describe the relationship between your cooperative and the local/regional government?
- 12. What is your relationship with other energy cooperatives in Groningen?
- 13. What is your experience with larger parties in the energy system, such as energy companies, grid operators, or policy makers? Do you experience mainly cooperation or friction?

Scaling and Institutional Embedding

- 14. What role do you think local energy-initiatives can and perhaps should play in the energy transition of Groningen and the Netherlands?
- 15. What do you think is needed to make that happen? What is needed for cooperatives like yours to scale and have more impact?

Closing

16. Is there anything else you would like to add about the role of local energy-initiatives in achieving a just and sustainable energy system?

Those were my questions! I'll stop the recording. I want to thank you very much for your time and openness. As discussed, the recording will only be used for transcription of the interview and will be deleted immediately afterwards.

Appendix B: Interview Guide (Dutch)

Kennismaking en Achtergrondvragen

Bedankt dat u de tijd heeft genomen om met mij in gesprek te gaan. Even een korte introductie: ik ben Wessel, 24 jaar en kom uit Groningen. Ik studeer Global Responsibility and Leadership aan de rug, wat een lange naam is voor duurzaamheid. Voor mijn bachelorscriptie doe ik onderzoek naar de rol van lokale energie-initiatieven in de energietransitie van res-regio Groningen. Dit interview is bedoeld om inzicht te krijgen in hoe energiecoöperaties, zoals die van u, hun rol zien binnen de energietransitie. Ik zal vragen stellen over jullie positie in het huidige energiesysteem, en over jullie bijdrage aan een rechtvaardiger energiesysteem. Zometeen zal ik geen persoonlijke vragen stellen om anonimiteit te waarborgen, maar ik ben natuurlijk wel benieuwd wie ik tegenover me heb. Dus zou u uzelf nog willen voorstellen voor we beginnen?

Nog even samenvattend: deelname is geheel vrijwillig, u mag op elk moment stoppen en weigeren vragen te beantwoorden, zonder enkele gevolgen. Dit interview zal naar verwachting 45 tot 60 minuten duren. Voordat we verder gaan, heeft u nog vragen voor mij?

Controleer of het geinformeerd toestemmingsformulier is ondertekend

Geeft u toestemming dat ik het gesprek opneem? Dit is uitsluitend om het later te kunnen uitwerken. Om anonimiteit te waarborgen zal ik u niet vragen om persoonlijke gegevens. De opname wordt vertrouwelijk behandeld, niet gedeeld met anderen, en verwijderd na transcriptie.

Dan start ik nu de opname.

Nogmaals bedankt voor uw tijd en deelname aan dit onderzoek. Om te beginnen,

- 1. Kunt u uw rol binnen coöperatie x toelichten?
- 2. Kunt u beschrijven wat uw coöperatie doet, en wat de belangrijkste missie en doelen zijn?

Energie-Rechtvaardigheid

Distributieve Rechtvaardigheid

- 3. Wat beschouwt u als de (belangrijkste) voordelen van uw lokale energie-initiatieven?
- 4. Hoe zorgt uw coöperatie ervoor dat deze voordelen (zoals winst, energiebesparing, milieuwinst) binnen de lokale gemeenschap blijven?
- 5. Zijn er mensen of groepen die mogelijk onbedoeld worden uitgesloten van deze voordelen?

Procedurele Rechtvaardigheid

6. Hoe worden leden van de gemeenschap betrokken bij het besluitvormingsproces binnen de coöperatie?

7. Hoe zorgt u voor toegankelijke en betekenisvolle participatie voor een breed scala aan bewoners?

Erkennings Rechtvaardigheid

- 8. Hoe houdt uw coöperatie rekening met de verschillende behoeften, waarden of situaties van diverse leden van de bredere gemeenschap?
- 9. Zijn er groepen of leden van de gemeenschap die moeilijker te bereiken of te betrekken zijn?

Het Multi-Level Perspectief

Niche-Regime Interacties

- 10. Wat zijn de belangrijkste uitdagingen waar uw coöperatie binnen het huidige energiesysteem mee te maken heeft (zoals financiering, toegang tot het net, regelgeving)?
- 11. Hoe zou u de relatie tussen uw coöperatie en het lokale/regiobestuur omschrijven?
- 12. Hoe is uw relatie met andere energiecoöperaties in Groningen?
- 13. Wat is uw ervaring met grotere partijen in het energiesysteem, zoals energiebedrijven, netbeheerders of beleidsmakers? Ervaart u vooral samenwerking of juist frictie?

Opschaling en Institutionele Verankering

- 14. Welke rol denkt u dat lokale energie-initiatieven kunnen en misschien zouden moeten spelen in de energietransitie van Groningen en Nederland?
- 15. Wat is er volgens u nodig om dat te realiseren? Wat is er nodig voor coöperaties zoals de uwe om op te schalen en meer impact te hebben?

Afsluiting

16. Is er nog iets dat u zou willen toevoegen over de rol van lokale energie-initiatieven in het realiseren van een rechtvaardig en duurzaam energiesysteem?

Dat waren mijn vragen! Dan stop ik nu de opname. Ik wil u hartelijk bedanken voor uw tijd en openheid. Zoals besproken, zal de opname enkel worden gebruikt voor transcriptie van het interview, en daarna direct worden verwijderd.

Appendix C: Code Book

(Sub)theme	Frequency:
Strenghts	
Member Participation	
Project Participation	13
Democratic Participation	10
Member Education and Information Sharing	10
Collaboration	
Collaboration with Cooperatives	11
Collaboration with Municipalities	9
Collaboration with Energy Utilities and System Actors	3
Local Redistribution	
Community Reinvestments of Profits	7
Access to Locally Generated Energy	4
Inclusive Local Participation	4
Inclusiveness	
Service Diversity for Broad Inclusion	7
Affordable Participation Models	3
Local Mindset and Support	
Local Support for Renewable Energy Projects	3
Energy Awareness through Ownership	3
Public Outreach	
Persistent Engagement with Hard-to-Reach Groups	3

Weaknesses

Public Outreach	
Difficulty Reaching the Public	10
Communication Barriers	3
Low Turnout at General Assemblies	2
Capacity Limitations	
Reliance on Volunteers	8
Limited Financial Capacity	4
Energy Supply	
Grid Congestion	6
Demand-Supply Mismatches	5
Financial	
Dependency on Loans or Investments	3
High Costs of Batteries	2
Lack of Structural Engagement with Grid Operators	3
Wind Projects	
Price	2
Location	1
Opportunities	
Secure Energy Supply	
Scaling Local Wind Capacity	7
Energy Communities	5
Professionalisation	
Professionalisation of the Cooperatives	6
Partnerships with Commercial Actors	3

Improving Public Outreach

4
2
2
7
2
5
3
4
3