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The transformative power of self-organization: Towards a conceptual framework for understanding local energy initiatives in The Netherlands

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ABSTRACT

Self-organization has been previously coined as a concept that describes the shifting relationships between citizen groups and institutional stakeholders in various fields, including sustainability and energy transitions. Yet, little has been known about what exactly the transformative power of self-organization is. The present article discusses processes of self-organization associated with small-scale, decentralized energy projects, such as local energy initiatives. By building on prior literature on energy initiatives, self-organization, and niche-regime interaction, attention is given to the mutually reinforcing relationship between local initiatives and the institutional context in which this relationship is situated. In analyzing the relationship between the internal aspects of the initiatives and their institutional arrangements, this article suggests that the processes of self-organization facilitate socio-institutional practices that are observable not only within the initiatives but also traceable in wider institutional contexts. These socio-institutional practices are essential for a better understanding of the interface between the citizen-driven energy projects and local governance. The analysis further supports the idea that processes of self-organization, along with market-led and state-led mechanism, underpin innovative and pragmatic pathways which could enhance the energy transition towards a carbon neutral future.

1. Introduction

An increasing amount of research in recent years has considered the role of small-scale, decentralized energy projects such as local energy initiatives (LEIs) and their transformative potential in the face of energy transition [1–4]. Local energy initiatives are often considered through the lens of local involvement and community ownership [1,5], grassroots innovations [2,6], citizen participation [7,8], individual motivations [9–11], consumer demand [12,13], and financial or legislative support mechanisms [7,14]. Despite its breadth and depth, however, limited clarity exists on the manner in which LEIs might assist energy transition. One point of entry to improve clarity is to highlight the processes of self-organization as essential to the understanding of the dynamic micro-level interactions between LEIs and the operational environment in which these are situated. Self-organization is often used to describe and analyze issues such as dynamic urban governance, the build-up of grassroots initiatives, and semi-informal or informal do-it-yourself initiatives [15–17]. In addition, self-organization plays a role in the institutional interplay between various local initiatives and local governance structures, which is also explicitly the case in debates on energy transitions [3,16]. Nevertheless, the exact nature of this interplay remains partly unclear.

This study argues that self-organization can provide an understanding of how socio-institutional changes occur both within the internal environment of the initiatives and the external institutional context (IC). For that reason, attention is focused on socio-institutional practices associated with LEIs. In this regard, socio-institutional practices refer to how "initiatives work" and more specifically to the "positions, roles, norms, and values lodged in particular types of social structures" [18]. While LEIs often have a strong local focus, the socio-institutional practices with which they are associated transcend the boundaries of their geographical scope. Following this train of thought, this article supports the view that self-organization is an ongoing process that takes place in reshaping the institutional framework of energy transition.

This article places processes of self-organization centrally to assess socio-institutional practices related to LEIs. The notion of transformative power associated with LEIs is, therefore, of critical importance. Hence, the central question in this research is as follows: while considering LEIs, what is self-organizing with reference to socio-institutional practices? Instead of assuming that only practices are self-organizing within the context of LEIs, this article pursues an inquiry on whether such self-organization should not also be placed at least partly outside of LEIs. If so, this could urge for a reconsideration of how we

view LEIs in relation to the institutional transformation of the energy system, where LEIs are especially pertinent as triggers and engines of change. The aim is to generate a conceptual understanding of the role of self-organization in LEIs based on extensive field research covering 15 different community-driven energy initiatives. The results provide thought-provoking insights into the role of self-organization in LEIs and their IC placed within the broader discussion of energy transition.

This study contributes to a growing body of literature paying attention to the development and evolution of Dutch grassroots initiatives in the energy sector [19,20]. The empirical verdict presented here − input from local community energy initiatives found in the region of Groningen − are not representative of all Dutch subnational, but the findings serve as conceptual vignettes concerning how community-led developments initiate low carbon energy transition. This article, therefore, attempts to encapsulate the wider socio-institutional practices and suggest that these findings could have a broader context beyond the Netherlands.

The structure of the paper is as follows. The next section outlines the theoretical foundation of this research. Section 3 provides and an account of the methods used in this investigation. Section 4 outlines the results of the field research. Section 5 discusses, compares and contrasts the main findings to earlier claims observed in the literature. Concluding remarks and suggestions for further research are presented in the final section.

2. Conceptual framework

2.1. Local energy initiatives

While this article discusses the relevance of socio-institutional practices associated with local energy initiatives, it has to be noted that a local energy initiative (*lokaal energie initiatief*) is a term used to describe any early-stage development of citizen-led decentralized energy projects in the Netherlands. The literature lists similar terms in various national contexts related to this topic such as "community renewable energy" or "community-owned means of energy production" in the United Kingdom [2,21]; "citizen energy" in Germany and Austria [8,22]; "citizen participation in the energy sector" in Germany [7,13]; and "renewable energy communities" in a larger European context [14,23]. The terms mentioned above are semantically and conceptually related. They all refer to the potential of grassroots initiatives that have a strong and conscious focus on energy related issues to practically change energy systems. In general terms, LEIs are a compilation of various types of societal actors in different institutional settings, united by multiple sets of objectives, which are not always related to energy [2,5].

LEIs are associated with small local level practices that are locally rooted but often struggle to achieve wider institutional and organization impact in regional or local planning and development issues [5]. The emergence of LEIs is widely attributed to several factors. A majority of the relevant research connects LEIs with issues of community activism and grassroots mobilization [2,16,22,24]. Studies suggest [25–28] that LEIs rely on community action and are used as a tool for engaging in local collective action. The rising numbers of LEIs are associated with relatively high levels of social acceptance, support, and positive value linked to renewable energy amongst citizens at large [10,21,29,30]. It has been suggested that behind LEIs, there are often motivated individuals who have a shared vision and concrete goals that create opportunities to establish extensive networks [5,31,32]. Some authors [9,11] argue that partaking in local renewable initiatives often takes stock in gain- and norm-based incentives that motivate individuals. Others [13,33] underline that the effects of trust and multiple social relationships sponsoring individual and collective actions in facilitating LEIs cannot be ignored.

Understanding LEIs involve aspects that are external to the local community, such as the dependence or dissatisfaction with energy suppliers [11,12]. Access to technological advances and the social value of such technological innovations provides [3,34,35] is also being considered. Another important external aspect refers to the quality offered by big service providers and the greater consumer demand for green energy [13]. Some authors [3,35] note that there is an alignment of interests between different societal and institutional stakeholders, which results in favorable preconditions regarding LEIs. The deployment of various legal opportunities, subsidies, loans, and other techno-economic modeling schemes for supporting LEI infrastructures are not to be ignored [7,14,34,36].

Sufficient attention should be paid to both the internal and the external aspects of LEIs to grasp the unfolding processes behind their various roles. LEIs face pressure not only in the context of local governance arrangements or the internal dynamics of the initiative but also in the interaction between these two aspects. Some authors suggest that LEIs highlight the role of networking, expectation management, and learning through social interactions between various societal actors [34]. Satterthwaite [37] and Dewulf et al. [38] suggest that the formation of LEIs also influences the institutional rearrangement that occurs between the involved organizational actors and the role of local communities. This line of argumentation suggests that attention should be focused on the interaction between the internal and external aspects, and how these aspects interrelate and influence each other.

2.2. Aspects of self-organization

Self-organization in planning is defined primarily through the lens of complexity theory and refers to the spontaneous and unpredictable changes mainly in an urban environment [15,39]. In practical terms, self-organization is associated with informal or semi-formal practices that concern different forms of collective action, social activism related to proactive civic engagement and eventually, build coalitions with local institutions [16,17,40]. Some studies [41,42] suggest that self-organization cannot be discussed without reference to the presence of an IC, which often strives to steer or even dominate such initiatives. To better understand self-organization, this article proposes that one needs to reimagine the internal and external aspects that influence processes of self-organization, how these aspects interact with one other, and what is the result of the output of such an interaction. It has been suggested [43,44] that processes of self-organization can intersect and challenge well-established planning practices and this could lead to different narratives, irrespective of whether these narratives are internal or external to the initiative's context.

If we seek to find out why self-organization is crucial for planning practice and how it contributes to our understanding of emerging local energy initiatives, we need to broaden our focus outside the aspects of self-organization, experienced at the scale of the local community. It seems that although self-organization is closely tied with the notion of local initiatives, what exactly *is* self-organizing is not stated outright. The remainder of this section provides a framework inspired by transition-thinking which aims to reduce some of the ambiguity surrounding the processes of self-organizing.

2.3. Self-organization in transition

In this study, transitions are defined as a process of change within a society or culture (including its physical and material artifacts) that is a result of the co-evolution of various processes and developments in different domains, resulting in multi-scale structuration [45]. Such structuration requires constantly reinforcing the interaction between nested hierarchies that consist of niches, regimes, and landscapes [46,47]. Throughout this article, LEIs refer to niche practices that reflect the surrounding sociocultural and material systems. The underlying assumption here is that niche practices can get upscaled and become new regimes or get incorporated into existing regimes. It might, however, be the case that dominant regime level practices can also

influence niche practices. Niche-regime interaction can lead to a series of adaptive changes, facilitated by individuals and organizations, rather than framing niche-regime compatibility as an evolutionary hierarchical approach [48]. From a grassroots perspective, niches generate useful insights into how socio-institutional practices grow and diffuse into society [4]. Niche-regime interaction is being gradually investigated, but an explanation of how niche practices interrelate with regimes is still lacking [49]. We, therefore, support the idea that greater attention should be given to the processes of self-organization in understanding the niche-regime interaction.

Self-organization serves as a useful intermediary to understand the reflective processes and value-led features that niches facilitate and carry over to the level of the regime. Processes of self-organization account for the innovation opportunities that occur between niche and regime level practices by facilitating various socio-institutional practices [50,51]. The processes of self-organization are, therefore, essential for understanding the interface between niche and regime practices; however, what exactly is self-organizing remains unclear. The processes of self-organization, which relate to socio-institutional practices, shape what is happening in the niches, but are also influenced by and influence the development at the regime level. What self-organizes, therefore, are not the niches *per se* or the practices within the niches, but the socio-institutional practices that are generated by the niche-regime interaction. Socio-institutional practices can influence the regime and are, simultaneously, tangible vehicles for innovation docked purposely at the niche level.

Traditionally self-organization has been brought up in transition literature to explain multiscale dynamics, although it is often taken for granted [51]. In the recent years, self-organization is widely discussed in relation to its importance in urban planning and governance practices [16,17,52]. However, understanding how local communities make sense of self-organization is newly emerging and underdeveloped field of research [52–54]. This article considers the implications of self-organization as a process of local collective construction that is located within and outside the wider context of changing socio-institutional practices. For analytical purposes, we accept that self-organization arises simultaneously both at the niche and the regime level by consolidating and embedding processes of internalization and externalization. Guided by earlier research on the processes of internalization and externalization [55], this paper provides an overview that dictates that both internalization and externalization are essential to the understanding of relationships occurring between local collective action and the surrounding world. It is important to acknowledge that the line drawn between the self-organizing processes occurring at the niche and the regime levels tend to be arbitrary as each of them constantly conditions and positions each other. It is, therefore, less relevant to discuss where the boundary is located and more pertinent to consider the existence of such a boundary and what it means. Knowing that such invisible lines exist, help us to identify and better comprehend the conditional forces linked to self-organization. More interestingly, this raises questions about the socio-institutional practices associated with the processes of self-organization and their societal relevance.

3. Research context & methods

3.1. Case selection

This article brings together evidence from LEIs located in the city and province of Groningen. This research area is particularly relevant for several reasons. Groningen, located in the north of the Netherlands is one of the first cities in the country and even a pioneer of committing to national and European objectives in the field studying of climate and energy [56]. The region promotes itself as the "energy valley" of the country and Groningen is considered an "energy city." In the meantime, Groningen is subject to frequent earthquakes due to natural gas extraction from Europe's largest natural gas field [57]. These earthquakes

created widespread property damage and triggered a societal and political urgency to shift towards alternative energy sources [58]. Combined with disappointments in traditional energy companies, this urgency has created a regional momentum of people taking matters in their own hand. The institutional re-configurations and policy arrangements supporting local energy initiatives distinguish Groningen as a trendsetter or a frontrunner regarding the adoption of energy efficiency, climate change adaptation and mitigation programs addressing the role of local communities to take action on their own [32].

3.2. Data collection

Some words on the initiatives. The initiatives included in this study were selected from an initial scoping of more than 30 such initiatives that could be identified from web research, umbrella organizations and snowball sampling. An important aspect guiding the sampling referred to the expression of localized and community-led response to environmental challenges and energy transition on a neighborhood scale. We targeted recent initiatives that were still in the middle of the dynamic and possibly self-organizing processes of collective construction and changing socio-institutional practices.

The initial scoping showed initiatives primarily addressing short-term visible solutions, such as house insulation and collective PV purchase. Given this fact, the choice of the cases was designed to deepen the understanding the dimensions of community-led energy transformation and touch upon the peculiarities of each initiative. The data we draw on here included 25 semi-structured interviews with representatives of 15 LEIs (see Table 1). Interviews covered topics such as mobilization and motivation for setting up an initiative, ways of organizing, reproduction and development, collaborating with other initiatives or institutions, key challenges, hurdles, and lessons. The aim was to gain insights into the daily operation of the initiatives, their institutional surroundings and the experiences and challenges of organizing the initiatives. Neither initiatives nor interviewees were treated as representative or exemplary cases. They were chosen based on their ability to provide useful insights into the operation of the initiatives. Hence, we chose respondents with a more coordinating role such as those taking initiatives, part of boards or whom were leading volunteers. If during interviews we noticed a lack of overview by respondents, we always ensured also other respondents of the specific LEI would be interviewed.

Each interview was digitally recorded, transcribed, rendered anonymous and analyzed through coding using qualitative analysis software − ATLAS.ti, v 7.5.18. The research made use of two sets of codes, following Hay [59] who suggests the implementation of basic coding in combination with more specific and interpretative coding. The first emerged from the literature review and included conceptual elements such as upscaling, institutionalizing, professionalizing and self-organizing. The second set of codes emerged from the empirical data and offered new information, different than the pre-set codes. Those covered aspects of enjoyment and fun, local pride and making transitions accessible for the masses by what respondents often called 'lowering the hurdles' for setting up energy initiatives. Additionally, the leading author regularly attended events organized by the LEI or significant institutional partners, such as sitting in organizational meetings, visiting energy and sustainability open days, attending networking and engagement events organized by local government and tertiary sector organizations. The employment of such ethnographic techniques was crucial for acquiring new evidence that informed the identification of new codes. In addition, these ethnographic techniques also proved valuable in verifying insights and allowing a critical reflection on the dynamic interactions between the initiatives and wider socio-institutional decision-making context.

The table discloses that while the LEIs included in this study were rather homogeneous regarding their community-driven origin and locally oriented output, there were some differences as well. In essence,

Table 1
List of interviews included in this study[a].

No	Relation to the initiative	Initiative	Technological means	Members	Date
LEI 1	Initiator	Duurzaam Reitiep	PV	80–90	Apr-15
LEI 2	Initiator	Duurzaam Reitiep	PV	80–90	Jun-15
LEI 3	Initiator	Tuinwijk in het Zonnetje	PV, geothermal heating	20–30	May-16
LEI 4	Initiative member/ participant	Tuinwijk in het Zonnetje	PV, geothermal heating	20–30	Jun-16
LEI 5	Initiator	Tuinwijk in het Zonnetje	PV, geothermal heating	20–30	Jun-16
LEI 6	Initiative member/ participant	Tuinwijk in het Zonnetje	PV, geothermal heating	20–30	Jun-16
LEI 7	Initiator	Paddepoel Energiek	PV, insulation, windmill	n/a	Sep-16
LEI 8	Initiative member/ participant	Paddepoel Energiek	PV, insulation, windmill	n/a	Sep-16
LEI 9	Initiator	Paddepoel Energiek	PV, insulation, windmill	n/a	Sep-16
LEI 10	Initiative member/ participant	Buurkracht Hoornsemeer	PV, floor isolation	10–20	Oct-16
LEI 11	Initiator	Meerkracht	Heat pumps, PV, windmill	30–40	Nov-16
LEI 12	Initiator	Buurkracht Hoornsemeer	more PV in the area, floor isolation	10–20	Nov-16
LEI 13	Initiator	Cooperative Association Energie Coöperatie Noordseveld	PV, heat scans, solar panels, solar park	100 +	Nov-16
LEI 14	Initiator	3e Schilderskwartier	PV, insulation	20–30	Nov-16
LEI 15	Initiator	Meerkracht	Heat pumps, PV, windmill	30 – 4-	Nov-16
LEI 16	Initiator	De Kern	PV, house insulation	10–20	Dec-16
LEI 17	Initiator	De Kern	PV, house insulation	10–20	Dec-16
LEI 18	Initiative member/ participant	Cooperative Association "Grunneger Power"	grants, support to small initiatives	1000 +	Mar-17
LEI 19	Initiator	Zuides-West, Zuidlaren	PV, Energy consumption meters	30–40	Mar-17
LEI 20	Initiative member/ participant	Duurzaam Nieuwolda	PV, insulation, experimental living (renovated neutral living show case house)	n/a	Mar-17
LEI 21	Initiative member/ participant	Cooperative Association Groenste Buurt Noorderplantsoen	PV, insulation, green rooftops, waterproof gardens, urban green space	100 +	Mar-17
LEI 22	Initiator	Cooperative Association Pekela Duurzaam	energy scans, PV, insulation	80–90	Mar-17
LEI 23	Initiator	Marsdijk	collective central heating boiler purchase	10–20	Mar-17
LEI 24	Initiator	Kortland	solar water heating, PV, floor and rooftop insolation	50–60	Jun-17
LEI 25	Initiator	Kortland	solar water heating, PV, floor and rooftop insolation	50–60	Jun-17

[a] Legend: Initiators − have been taking part in core group activities. Initiative members − regular or occasional participation in events or meetings. Information on the membership size is an estimate and subject to fluctuations since not all the initiatives keep track of their members.

the differences reflected the situations that arise at each locality and the ecological metaphors the initiative used. Hence, the empirical verdicts presented here do not account for representatives or comprehensive generalization, nor highlight significant outliers. Each initiative, in its way, can be identified as typical, reflecting the unique and specific local community-led activities. Nevertheless, while thus in need of carefully interpreting generalizations upon LEI, choosing a variety of 15 initiatives in a similar institutional context was instrumental to our intentions: to provide deeper insights into the complexities surrounding LEIs and serve as valuable vignettes of the conceptual issues addressed by this article.

4. Results

In this section, an account of the interviews and a summary of the data collection is provided. The results are discussed in the following section.

4.1. Regional and local dynamics

What makes researching local energy initiatives in the north of the Netherlands relevant for exploring energy transitions? The city of Groningen is located in the northern part of the Netherlands, which can be historically described as the natural gas powerhouse of the country, due to the exploitation of Groningen's natural gas fields. However, fossil fuel is not the only source providing energy to the northern part of the Netherlands. The region profiles itself as the "energy valley" of the country, which makes it an attractive point of interest for this research, as it reflects the various challenges and opportunities related to energy transition and societal transformation. Recently, the local and the regional government introduced development strategies addressing issues

of energy and transitioning to a low-carbon economy at large [58]. Local modes of governing facilitate and encourage a broad range of community initiatives that address energy efficiency and sustainable energy production at the local level. It has to be noted that the influence of regional and nationwide support programs and regulative frameworks has a prominent role in influencing the development of not only specific cases concerned in this research but also the overall socio-institutional context.

4.2. Emerging themes from the interviews

For this study, we conducted interviews with 25 participants from 15 initiatives to identify the dynamics of self-organization within LEIs. The main findings are summarized, and illustrative quotes are presented below (see Table 2)

The results of the interviews showed that there were various interactions between the initiatives and the IC in the different stages of development. While it was hard to determine what such stages of development are, it became apparent that the origin of the initiatives had the same starting point: the desire to develop a local response to ongoing societal and environmental challenges. In most cases, this would lead to a small action group mobilizing residents. In other cases, it would result in professional or semi-professional organizational structure. The results also suggested that the first impulse of the initiatives did not entirely rely on existing social networks but also benefited from people that remotely know each other. The development of the initiatives, except the final realization stage when the external and support organization has to be included, relied exclusively on the residents involved with the initiative and not on the local government or outside institutions. As a general rule, the initiatives were reserved support from external to the locality organizations, such as tertiary sector

Table 2
Quotes from interviews, illustrating typical responses.

Mobilization & Motivation	"I feel a part of this neighborhood, and because it was a neighborhood project, it got me. If it was a company doing it, I could be more critical about it. When it is, a project from the neighborhood then I listen. It brings people together." (LEI 4)
	"I started the initiative for two main reasons; the first is because I'd like to do something about climate change with other people. The second one is more on the social aspect. I like to have something done within the area" (LEI 14)
	"…to make it easy, simple, attractive and to make people aware that however small the action they take, every small step is valuable, because a million small steps is a giant leap" (LEI 12)
	"All of us need to take part of the transformation on the traditional ways to the new ways in electricity. Doing it with neighbors is my way of anticipating, being part of it." (LEI 16)
	I think a local initiative also, to some extent, sort of community building. I think of it through… something like togetherness" (LEI 15)
Ways of organizing and reproduction	"We call those people solar ambassadors of the project; those people are helping out, and some maybe just talk with two neighbors and others organized other stuff. It didn't matter, as far as the information comes from someone you trust." (LEI 5)
	"We have special evenings, most of the time we have evenings with experts on specific topics, like insulation or what is the difference between double or triple glass. Also stimulate people to have green roofs, so the water does not go directly to the sewage system" (LEI 21)
	"In the winter, we organized a warm sweater day outside, we had a nice fire and wanted to tell people that they set the thermostat 1° lower and stay nice and cozy with the sweater also inside their houses." (LEI 24)
Degrees of interaction	"They [tertiary sector organizations] also had experience with community projects, and they had contact with the [housing] corporations…and they were the connection for us initially." (LEI 3)
	"It is nice to have the municipality, and [the support organization] but they are not the driving energy. It is about the people who make it happen. Well, people place solar panels with or without them." (LEI 2)
	"What we see in the policy now, as we grow we see our name more often on the surface. When the aldermen are mentioning our name, that makes it important and gives us a position" (LEI 14)
	"Because if we can, as a local initiative, together, with the [local] government and with the other movement leap to energy transition, then we have a strong case." (LEI 6)

support organizations. However, in some cases, the support services were crucial to the existence of the initiatives. Regarding socio-economic composition, some of the initiatives reflected different socio-economic features, such as mixed home ownership, the presence of big landlords and lower to middle-income households. Other originated from relatively homogeneous areas, characterized by high percentage of home ownership and relatively high-income levels. Regarding the technological dimensions of the initiatives, the majority of the participants mentioned that their initiative mainly focuses on house insulation and collective purchase of photovoltaics (PV). However, those two examples were mostly seen as an upgrade to dwelling units instead of being the focal points of the initiatives. Nevertheless, there was a consensus that technological innovation makes LEIs more tangible and attracts more participants.

4.2.1. Mobilization & motivation

The main purpose of LEIs (as described by the respondents) in terms of motivation was to inspire and mobilize the residents around issues of energy consumption and energy saving. However, in almost all cases a recurrent theme was to develop a shared local project, which would contribute to the creation of a both more sustainable and livable area. The social capital and community building character of the initiative was supported by the fact that it was important that everyone who lived in the area should feel welcome to join. The interviewees highlighted the importance of being a local or neighborhood project, which did not necessarily transcend the boundaries of its locality. However, it was considered worthwhile to inspire and motivate other localities to do the same. Regarding technical parameters and technology in use, LEIs focused primarily on the use of alternative energy sources, especially grid-tied solar photovoltaic (PV), house insulation, energy efficient heating and cooling systems. The majority of the interviewees had been seriously contemplating adopting PV or insulating their houses while at the same time pursue a collective realization of such goal.

The respondents did not express that there had been any worrying aspects concerning external influences over the development of the initiatives. In some cases, this resulted in the identification of clearly defined starting points, such as being local and inclusive and relaying complex technical and organizational aspects of setting up initiatives to lay people without hassle and in simple language. However, in some cases, LEIs relied primarily on guidelines developed by third parties in assisting or setting up the initiatives. Overall, respondents were concerned with the struggle to recruit more residents partaking in activities

organized by LEIs. This view was echoed by another informant, who shared that is hard to raise someone's awareness when one is not interested or does not agree that joining an initiative would lead to any personal benefits. It was suggested that due to the subjective matter of increasing residents' awareness, an aim shared by most initiatives, occasionally there were difficulties in reaching a wider audience.

4.2.2. Ways of organizing & reproduction

When asked about the various manners of organizing, participants were unanimous in the view that group building activities were necessary for 'keeping the show on the road.' However, the answers varied regarding various ways of organizing. Some felt that it was sufficient for the initiative to not have strict organizational nor a legal structure and relied on the enthusiasm of a core group volunteers. Others considered that it often takes a combination of personalities and qualities to get the initiative running. In one case, a participant thought that the initiative succeeded in getting more members and attention due to the implementation of an innovative ambassador scheme. The so-called "solar ambassadors" were a group of volunteers who went door-to-door to talk to their neighbors and discuss the opportunities the initiative provided. Usually, they were members of the community who were helping to popularize the initiative across the area and share knowledge about their opinions of what the initiative would provide to the locality. Such schemes not only led to the increased levels of trust, respect, and reciprocity among existing and potential new members but also helped to build a sense of togetherness and to create the foundation to inspire justifiable pride in the local community.

The participants, on the whole, demonstrated that organizing small-scale events enhanced the visibility of the LEIs and that these events contributed to the formation of a more cohesive local group. Some events, such as coffee table meetings or 'warm sweater days,' were informal and highlighted the fun aspects of doing things together. Other activities had a more formal and representative character − info markets, local debates and representation of the initiative at local neighborhood association or related energy-related events. Almost all of the interviewees reported that the initiative they represent is not registered as a legal entity and highlighted the importance of voluntary activities. Only a small number of respondents indicated that they would like to see their initiative evolving into a legal entity with a clear organizational structure and members. Every LEI had a daily board, or a "core team" of volunteers, responsible for communication, organizing and coordinating events. However, some of the LEIs included in this

research were registered as cooperative associations with limited liability, which also operated on a voluntary basis.

4.2.3. Working with other groups and organizations

In their accounts of working together with other groups or institutions, participants discussed the various pathways of cooperating with other initiatives, public agencies or private service providers. These discussions strengthen our observations that initiatives widely benefited from a plethora of opportunities of major and minor importance. However, since each LEI reflected a particular locality working with others meant developing place-specific interventions. As a rule of thumb, areas with high percentage of an individual property ownership relied primarily on a close collaboration with tertiary sector support organizations, while areas with mixed house ownership and public-sector housing also benefitted from the different opportunities that the housing associations provide. When asked about the role of the municipality in developing the LEIs, one of the initiators mentioned that a civil servant for the district suggested making contact with a tertiary-sector support organization. Another respondent revealed that the municipality was more of a facilitator than an initiator. While this proved that the local authorities did not completely ignore the initiative, an important element in setting up the initiative was attributed to building a close relationship with support organizations.

Working with support groups had three primary functions. First, it provided expert knowledge on the fundaments and technicalities of creating an energy initiative, as many of the interviewees had limited to no knowledge on energy related matters. Second, it made available professional services in public awareness campaign, communicate, and facilitate information meetings between the interested residents and retailers. Third, it brought expertise and knowledge from similar initiatives and accelerated the pace of development of the initiatives. Some of the participants indicated that next to the close ties developed with tertiary sector support organization and housing corporations, they also turned to financial incentives provided by the New Local Agreement (NLA). The NLA was a settlement between the municipality and local housing organizations focused on improving the quality of life in residential areas. The availability of NLA funds provided opportunities for housing associations to operationalize the collective demand rooted in some communities and enhance the implementation of rooftop PV installations. Some interviewees described that in socially mixed areas semi-public institutions such as housing corporations were able to accommodate the momentum accumulated by residents' activities and move the initiative further.

4.3. Socio-institutional practices

Together these results provide valuable insights into three unique sets of socio-institutional practices found in the interaction between the initiative and the surrounding institutional and physical context. The first set of practices relates to building a sense of place and issues of togetherness. The results reveal that it was crucial to establish a local, community-driven project with which residents could identify themselves and feel proud of their neighborhood. Local collective action, relating to issues of togetherness, signified the importance of sharing knowledge, supporting each other, comparing situations, and circulating social capital in general. It was believed that local collective action would motivate more people to join and lead to a higher impact rate of the initiative and recognition from outside. The second compilation of practices was developed around matters such as facilitating, informing, advising, and raising awareness. For the informants of this study, LEIs were seen primarily as local projects and therefore relied on extensive information and facilitation strategies performed either by the initiators or ambassadors of the initiatives. The importance of these practices was not only raising awareness of the possibilities for sustainable energy consumption and production but also "lowering the bar," considering simplicity and low threshold paramount. Ultimately,

this related to making LEIs available and accessible to as many households as possible. The third set of practices underlined the importance of facilitation between the different stakeholders. The interviews suggested that the narratives of the LEIs would not be complete without considering the role of the various stakeholders who supported and developed simultaneously with the initiatives. Support organizations often provided strategic advice or acted as institutional brokers between the initiative and interested public or private sector entities. Besides the technical and juridical aspects of launching an initiative, support groups also provided a list of trusted services, suppliers and technicians. Furthermore, the interaction between the initiatives and their institutional context indicated that it was not always the local initiatives that had to react to circumstances, but on occasion, it was the institutional partners that needed to alter their code of conduct. Based on our observations, we must note that while LEIs were growing since the first coffee-table meeting or informal talks yet rarely crossed the geographical limitations of their areas. The socio-institutional practices that were settled and maintained in the development of the initiative, however, transcended the boundaries of the local area and inspired institutional actors and other local communities to experiment with similar practices in different localities.

One of the most significant findings was that LEIs emerged as a local response to ongoing societal and environmental challenges with a global character. Each initiative encompassed different socio-institutional practices, and while we identified the leading practices within each initiative earlier, we remain skeptic toward the extent in which they were inherent or developed in the internal or external aspects of the initiatives. For example, some initiatives relied on technical assistance and support from tertiary-sector organizations more than others. Nevertheless, in almost all cases the primary aim was to establish common ground for setting up an initiative through connecting various stakeholders, namely, residents, local authorities, housing, and tertiary-sector support organizations. Next to the different approaches employed in getting things done, initiatives also differed in procedural aspects, the type of project they ran, the number of members and actors involved, and the degrees of interaction between those actors. Results suggest that the socio-institutional practices linked to the initiatives were constantly questioned and reformulated in the delicate relationship between the initiatives and their contexts.

The case-specific internal and external aspects and the manner in which these aspects interact with each other highlights the importance of having a nuanced view on self-organization, which takes into account the context-specific internal and external dynamics of the initiatives. These findings suggest that both the inner world of the initiatives and the wider operational and contextual environment are subject to processes of self-organization.

5. Discussion

The current study found that local community energy initiatives were initiated by community members and aimed to serve their communities to a certain extent. The results of this study are in line with earlier research on local energy practices, which suggest that LEIs often follow community development logic and rely on norm-driven motivations [2,5,10,33]. In this particular situation, it can be argued that from the perspective of the initiators one of the most important aspects of establishing local collective action was to raise awareness of the possibilities LEIs provide for communities. The results also indicate that LEIs focused on the development of shared visions and activities that lead to the strengthening of the local character of each initiative, which is similar to previous suggestions [5,31,49].

However, by standing alone, local initiatives would not be able to develop further without the assistance of the tertiary sector or semi-public organizations. In fact, the actors took the peculiar role of intermediaries (as suggested by Hargreaves [6]) in exploring how social relations and new forms of cooperation shape the future of energy. By

doing so, this research reconfirmed that LEIs provide a middle ground for cooperation that is considered both personal and professional [29]. There was no sufficient evidence supporting the claim that the development of LEIs emerged out of dissatisfaction with major energy suppliers and an intention to be independent of big energy companies, as some have suggested [11,12]. What drives LEIs to move forward, however, are the swift reactions to local initiatives and the societal partners that mutually constitute and adapt to the new conditions. In this respect, the findings are similar to results reported earlier [10].

The results of this study suggest to some degree that processes of self-organizing could explain different socio-institutional practices observed in LEIs. Hence, there is a need for a careful investigation into the internal and external aspects of different ways of organizing. A significant deal of self-organizing processes takes place within the inner world of the initiative in the form of community organizing [52]. One striking example of this traces back to the ambassador scheme which was developed and circulated by some of the initiatives. This scheme can be seen as a self-organizing process in itself, because it was not deliberately planned and yet by relying on collective action expanded the scope of the initiatives. This corroborates the earlier claims that self-organization happens in a distributed manner where all group members contribute to the project, while none of them are in control [39]. While the internal dynamics of each initiative could be substantially different from one another, they provide insights into the reasoning behind why certain actions are desirable, and others are not. What remains unclear at this point is how the internal aspects of the local initiatives and their external aspects interact and shape each other.

The results of this study highlight that processes of self-organization could be observed not only in the initiative itself, but also in the IC, and more importantly, in the interaction between the two, reinforcing the emergence of new governance practices [16,17,40]. One might ask whether support groups or semi-public institutions, such as housing corporations, which provide support to local initiatives, operate in response to the decentralization and liberalization of the energy market. While the answer to this question is outside the scope of this research, our findings confirm earlier claims that if a given initiative needs to develop, it needs to develop itself within the IC where it interacts with external parties. Such observations are also reported by earlier research [10,42]. The establishment of tertiary-sector support organizations might be a response to previous developments in the field, and their existence is a confirmation that self-organization can be channeled via various arrangements. To what extent such support organizations are relevant for fulfilling the objectives of local initiatives remain unclear, but their presence can be seen as a sign of self-organization in the wider institutional environment. These findings raise questions regarding the nature and extent of self-organization and self-governance in relation to the role of civic initiatives discussed earlier [16]. There are, however, other possible explanations. These results provide further support for the hypothesis that it is likely that support organizations evolved as a result of their interaction with LEIs and the IC. One unanticipated finding is that informants remain divided in their opinion on how to professionalize and whether to be professionalized in general. However, a note of caution is due, while professionalization of grassroots initiatives in the field of energy is documented [19,31], future studies should focus on whether such professionalization contributes lead to upscaling energy related innovations.

Embracing processes of self-organization in decision-making calls for appreciating the different pathways in which local collective action could lead to active and inclusive partnerships between citizens, policymakers, academics, businesses, and the society as a whole. While recognizing the importance of the diversity of pathways in any setting, self-organization might occur internally, externally or in a mix of the two. One should consider that there is not a single recipe for the appropriate combination of the socio-institutional practices that are suitable to start an initiative. These results suggest that self-organization is traceable in how these two essentially different sides interact with each other. These findings are contributing to the practical understanding of self-organization not only in the public sector but also about the role of private and tertiary sector organizations.

Small scale LEIs are perhaps not the most challenging example of self-organization, but the composition of these initiatives gives us useful insights into how change occurs in socio-institutional systems. By the time of completion of this manuscript, it was brought to the authors' attention that a major housing association involved with one of the LEIs included in this study was applying the same scheme of rooftop PV installation in other neighborhoods. This illustrates the ability of external actors to learn from LEIs and facilitate socio-institutional changes elsewhere; this phenomenon can also be seen as an aspect of self-organization in the wider IC. This finding is in line with earlier studies which suggest that self-organization is often used to legitimize a retreat from the government in the policy sector [42]. That being said, the similarities and differences between the initiatives suggest that the intensity and amplitude of self-organization varies as a result of the different internal mechanisms the initiatives convey and the contextual factors that they encounter.

6. Conclusion

This article revealed that processes of self-organization are native to both local initiatives and the surrounding IC. Processes of self-organization can help us understand how the internal and external aspects of an initiative shape and mutually reinforce each other and thereby reveal new pathways for capacity improvement. As this study shows, there is a relationship between processes of self-organization that happen within the local community and the processes that occur in the operational network where such initiatives take place. This article suggests that the socio-institutional practices related to these specific initiatives are self-organizing. For example, some practices might upscale and interact with the IC, serve as an inspiration to other local communities and by crossing boundaries lead to mutual adaptation and learning.

However, it is not only the practices of local communities or local institutional partners that count; as the case studies illustrate, local niche activities are not always aiming to upscale. It might be the case that the socio-institutional practices that are related to a particular niche might influence other localities or niches; alternately, the practices established in the external IC can affect developments in other local communities. The transformative power of self-organization in LEIs lies in the ability to trigger, facilitate, and maintain various socio-institutional practices that influence the development of an initiative. However, it remains doubtful how these practices supplement energy transition. Small community-based LEIs tend to meet local needs. At this point, LEIs rarely transcend their local boundaries, which seems irrelevant to the overall picture of energy transition. Nevertheless, the ideological and moral principles related to the socio-institutional practices associated with LEIs, and the manner in which such initiatives slowly change the energy system, serve as a source of innovation that has transformative power in transitioning to a low-carbon economy.

When it comes to LEIs, socio-institutional arrangements are starting to be organized in a different way, which is a clear sign that society, values, and intentions associated with local initiatives are also starting to be reshaped. In the future, practitioners and researchers should not develop blueprints of what is to be self-organized or portfolios based on successful examples but engage in activities that will illuminate different perspectives on self-organizing, as well as invest in the transformative powers of self-organization. This illumination will not only facilitate the interface between public, private, and societal spheres at a larger scale. It will also assist in the development of skills on how to overcome barriers through meaningful collaborations, create the conditions for capacity improvement, and initiate place-based socio-institutional practices.

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