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Assessment of Social Innovation Cooperation in the Dutch Energy Transition

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Summary

The Netherlands has been repeatedly presented in research as fascinating for studying renewable energy initiatives not only because of its vibrant 30 plus year history of local cooperative actors in the growing energy decentralization space, but also because of how tightly it continues to clutch its centralized fossil fuel-heavy energy system, ranking second to last in renewables as a share (6.6% as of 2017) of gross final energy consumption among European Union member states. Against this backdrop, the social innovations that local renewable energy cooperatives represent are no less relevant today than they were in the 1980s. The performance and effectiveness of this latest wave of urban cooperatives in spurring the Dutch energy transition by specializing in small collective solar production projects on rooftops is positive on the one hand. However, in their pursuit to make their projects highly replicable under a less-than-favourable public policy environment, it is curious to consider the extent to which this movement continues to be a radical innovation. This research uses recently developed theoretical frameworks to explain the transformative journey of these latest energy cooperatives, reconciling their project initiatives with a suitable business model for sustainability transitions. These concepts suggest such niche initiatives identify and partner with a like-minded regime actor to help them realize their transformative goals. Greenchoice, a Rotterdam-based energy supplier among the country's largest, markets itself as providing 100% green energy to over 450,000 customers and is an ardent supporter and power purchasing client of local energy cooperatives.

The purpose of this study is to generate more insight into the nature and level of the cooperation between cooperatives and Greenchoice to determine the extent to which the needed resources sought after by cooperatives have enabled them to continue their grassroots movement as social innovators by realizing new projects. The research methods include secondary historical data on the projects developed and in-depth interviews of urban cooperatives and third-party knowledge-exchange organizations for the local renewable energy movement. The study finds that, while the regulations concerning the government project support scheme used by cooperatives makes cooperation with an energy supplier like Greenchoice a necessity, the cooperation is positive by most indicators in helping cooperatives realize their projects successfully. However, there are other challenges to project development that cooperatives do not yet actively discuss with Greenchoice, largely due to limits it places on its perceptions of it as an energy supplier. For its part, Greenchoice's positive reputation with cooperatives is well-earned, but must continue to weigh its motivations as a sustainable enterprise with its commercial identity and more actively bring itself and cooperatives closer as true project collaborators who can together effectively strategize for a national transformational change in the energy value chain to sustainable and local production.

Keywords

The Netherlands, energy transition, renewable energy cooperatives, business model, niche-regime dynamics

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Abbreviations

CRM	Customer Relations Management
GC	Greenchoice
GI	Grassroots Innovation
IHS	Institute for Housing and Urban Development
IPCC	Intergovernmental Panel on Climate Change
LREC	Local Renewable Energy Cooperative
MLP	Multilevel Perspective
NMP	National Environmental Policy Plan
ODE	Organization for Sustainable Energy (*Organisatie voor Duurzame Energie)*
OECD	Organisation for Economic Cooperation and Development
PBL	Netherlands Environmental Assessment Agency *(Planbureau voor de Leefomgeving)*
PCR	Postal Code Scheme *(postcoderoos regeling)*
PPA	Power Purchase Agreement
PV	Photovoltaic
SDE+	Stimulation of Sustainable Energy Production *(Stimulering Duurzame Energieproductie)*
SE	Social Entrepreneurship
SI	Social Innovation
SNM	Strategic Niche Management
TBM	Transformative Business Model
TSI	Transformative Social Innovation
UK	United Kingdom
VvE	Association of Owners *(Vereniging van Eigenaren)*
WISE	World Information Service on Energy

Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction

This study focuses on exploring the nature and level of coordination and cooperation between local renewable energy cooperatives in the Netherlands and their institutional partner, Greenchoice, an established renewable energy supplier. This chapter briefly covers the Dutch energy system and the emergence of renewable energy cooperatives as motivations for the conceptualization of the problem statement and main research objective. Following this, the main research question is stated along with supporting sub-questions. This chapter then concludes with a statement on the significance of the study as well as its scope and limitations.

1.1 Background

According to the Organization for Economic Cooperation and Development (OECD), over 90% of the energy supply in the Netherlands was comprised of carbon intensive fossil fuels in 2015, the fifth highest among the organization's member states (OECD 2019). The report also indicates that renewable energy only accounted for 4.2% of the Dutch energy supply in 2013, and only having risen to 6.6% in 2017 (Eurostat 2019a). The discovery of underground gas reserves in the northeast region of the country in the late 1950s made the Netherlands a net exporter of natural gas (Kooij et al. 2018), and ensured its energy security for decades to come. As of 2016, natural gas accounts for 36% of the country's energy consumption method (Eurostat 2019b). And despite a number of serious earthquakes in the vicinity of these gas fields having caused extraction to slow down in recent years, the regime configuration with regards to Dutch energy continues to be geared towards natural gas. The national government's role was significant: supporting the creation of a centralized national gas grid. And the large energy producing conglomerates enjoyed relative lack of interference from the government (Kooij et al. 2018).

It can be observed from history that the energy system in the Netherlands is rather locked-in to carbon heavy technologies and therefore lacking motivation to transition to renewable energy. Due to the centralized nature of the energy sector, actors in this regime are resilient to any change that may affect the economic benefits they gain from this arrangement. Challenges to this centralization are considered necessary to give way to greener alternatives. Threats of climate change and continued energy security in the national discourse have driven research into renewable technologies (Seyfang et al. 2014). However, because the current energy system is set in its ways, renewable energy projects are first realized outside of this system as grassroots movements.

Realizing an energy transition led from the grassroots level in four waves

Collective concern at the grassroots level for the implications of the Dutch energy system on the environment and sustainability is traceable back to the 1973 Oil Crisis, which encouraged the Dutch government to consider renewable energy for the first time, but in the context of the government's diversification effort of its energy sector away from an overreliance on fossil fuels (Kooij et al. 2018). The first community projects appeared as wind turbines in the late 1970s under the umbrella of ODE (Organization for Renewable Energy), which continues to be a key actor today. The earliest cooperatives formed in the late 1980s when it was realized that doing so would lower considerably the barrier to private ownership of wind turbines (Kooij et al. 2018; Oteman et al. 2017; Hufen and Koppenjan 2015).

The Dutch government created a marketplace and an institutional fit for decentrally produced electricity with the 1989 Electricity Act, which obligated energy suppliers to purchase wind

energy for a set price and to guarantee access to the electrical grid (Oteman et al. 2017). While this first marriage between renewable energy cooperatives and energy suppliers was enabled through public policy, the regional energy monopolies the policy was intended to break by introducing cooperatives as competition proved to be ineffective at overcoming the system lock-in reinforced by the strong fossil fuel energy lobby (Oteman et al. 2017). The significant influence of fossil resources in the Netherlands during the late 20th century is theorized to be one reason why the country fell behind its North Sea neighbour, Denmark, in developing wind turbine technology (Morris and Jungjohann 2016), a seemingly new occurrence of the 'Dutch disease' coined by *The Economist* in 1977 (C.W. 2014). However, the social innovations achieved here should not be understated, as they were both foundational and pioneering for future cooperatives to emerge. The ability to garner localized support, not only in the form of paid shareholders, but also from local farmers whose agreement to lease their land for the construction of the turbines (Oteman et al. 2017) are 'local-first' qualities that set cooperatives seeking energy independence (an innovative ambition in its own right) apart from the energy regime, and thus an interesting subject of study.

The Friesland village turbine success story marks the second wave (1991-1997) of local renewable energy cooperatives. While national level support for grassroots energy innovations waned, nine new village wind cooperatives emerged in this northern coastal region of the Netherlands. However, they were founded less for wanting to challenge fossil fuels, but more for generating local profits that would be fully realized by the communities themselves. Not only was the revenue invested back into church restorations, village fairs, etc., the cooperatives were also able to expand their renewable energy generating capacity with the purchase of solar photovoltaic (PV) panels installed on the rooftops of local schools. The municipality, faced with depopulation and a declining tax base, was very amenable to these projects and the prospect of revenues being invested in collective goods from which all village residents could benefit. This local acceptance expanded into shared learning, where a successful turbine in one village would inspire the nearby village to make plans for one of their own (Kooij et al. 2018; Oteman et al. 2017).

In parallel to this second wave, the international landscape with regards to environmental discourse was changing as a reaction to the 1986 Chernobyl nuclear disaster and the 1987 Brundtland report, leading to the formation of the United Nations Intergovernmental Panel on Climate Change (IPCC) in 1988. The following year, the Netherlands produced its National Environmental Policy Plan (NMP) encouraging, among other sustainable actions, energy efficiency and also set wind power targets that were largely not met. The Dutch government as well as provincial governments continued to be closely tied politically and financially with the fossil fuel lobby. Furthermore, the national government continued to be protective of its industrial development ambitions. However, the environmental sustainability discourse still prevailed to a degree, resulting in the government setting a 10% renewable energy target by 2020. The way in which to reach this target would be made more complicated by the European Union's move to decentralize and liberalize the energy market (Kooij et al. 2018; Oteman et al. 2017).

Dutch energy liberalization for consumers, taking place in 2004, was a transformative shift in the energy system. Most importantly, it introduced new energy supply actors, both large multinational corporations as well as smaller suppliers interested to forge a new path into the renewable energy market which was believed to have potential for growth. Greenchoice, one of the key subjects of this study, was one of the first 'green' entrants into the energy supplier market. As for the renewable energy cooperatives, the liberalization was significant as they now had options for partners whose interests overlapped with their own, in contrast to the large

multinational fossil fuel corporations. But this did not necessarily translate immediate financial benefit for them. In fact, because wind turbine projects at the time meant long waits for return on investment, cheaper green energy credits from Nordic hydropower crowded out the space that local wind cooperatives would have expected to grow into. As a result, they suffered in the initial years after market liberalization. But the social innovations of cooperatives remained attractive for other communities to also experiment with energy self-governance, and innovating further by selecting new and more easily attainable technologies (Kooij et al. 2018; Oteman et al. 2017).

Market liberalization also meant that the consumers acquired more influence, now having more freedom of choice to select renewable energy from suppliers like Greenchoice (Kooij et al. 2018). And a third wave of grassroots renewable energy projects emerged as the discourse continued about needing to make a transition to more sustainable living. Oteman et al. (2017) refers to the 2006 project "Farmer Seeks Neighbour" as the first collective solar roof project, where community members issued small loans to a local farmer to purchase solar PV panels, and were repaid with interest from the profits made by the sale of the energy produced. A cooperative in Breda called Kroetenwind was established in order to designate a newly built neighbourhood as a sustainable living zone. It was able to do so by convincing all incoming plot owners to become paid members so that it could more easily initiate renewable energy projects in their neighbourhood zone (Oteman et al. 2017). By 2009, several new cooperatives across the country were founded with broad sustainability agendas, pursuing lower risk and lower complexity projects for shorter term results (e.g., resale of green electricity, collective solar panel purchases, and knowledge sharing about energy savings). For instance, a Rotterdam grassroots initiative called Urgenda organized the collective purchase and sale of 50,000 solar PV panels between 2006 and 2010 to households, a strategy replicated by other new cooperatives owing thanks to the declining price of solar PV panels. Regarding the resale of green electricity, Greenchoice as a green energy supplier with an established customer base emerged as a key partner of cooperatives, as it had the proper supplier permit to sell electricity produced by solar panel projects realized by these new cooperatives, and could market the electricity to its customers as being produced locally in the Netherlands by a grassroots renewable energy cooperative (Oteman et al. 2017).

The fourth wave of renewable energy grassroots initiatives has grown considerably from 40 initiatives in 2009 (Oteman et al. 2017) to 484 in 2018 (HIER Opgewekt 2018a). The majority of the new cooperatives in this wave have been founded in urban areas, as market confidence in the success of the collective solar PV projects in the previous wave meant that member growth could be accelerated if situated in densely populated areas where grid connectivity is good. While there is still an environmental motivation to join a cooperative, economic motivations are emergent as well. Some passive members are seeing the new renewable energy projects as sound investments with good returns. Social acceptance of the collective solar PV projects are considered to be high, and thus are frequently visible in the built urban environment (Oteman et al. 2017).

Defining the Local Renewable Energy Cooperatives (LRECs)

The emergence of grassroots initiatives to demonstrate the advantages of alternatives to the locked-in energy system in the Netherlands (e.g., decentralization, collective ownership, self-governance, clean renewable energy, action on climate change, economic benefits, and the like) has been a form of social empowerment for those who understand that not enough is being done at the national policy level. The government's discourse continues to be focused on economics, and therefore dissonant with the discourse of energy independence and making an

energy transition that these grassroots initiatives value (Kooij et al. 2018). Proka et al. (2018) further details this dynamic by describing sustainable energy innovations as being key for the national government to meet its national and international climate commitments, the government has yet to show any meaningful reduction in support for its natural gas industry.

Not waiting for a top-down transition to combat the clear and present threat of climate change, motivations to 'do it ourselves' (Proka, Loorbach, et al. 2018) from the bottom-up has given way for like-minded communities to act collectively in the cooperative form. This study will use the following definition for local renewable energy cooperatives (LRECs) from Boon and Dieperink (2014): "…organizations, initiated and managed by actors from civil society, that aim to educate or facilitate people on efficient energy use, enable the collective procurement of renewable energy or technologies or actually provide (i.e. generate, treat or distribute), energy derived from renewable sources for consumption by inhabitants, participants or members. The latter live in the vicinity of the place where the renewable energy is generated."

Proka et al. (2018) summarizes the multiple perspectives from other scholars on the nature and role of Dutch LRECs with respect to the sustainable energy transition. In the economic sphere, an LREC's membership is generally comprised in the community in which it was founded, and its energy generation projects tend to be situated locally as well. The profits are shared equally amongst members and therefore the community directly benefits. Socially, LRECs enhance social cohesion, championing democratic decision-making (e.g., one member/shareholder equals one vote) and resource pooling. Environmentally, LRECs are effective in brokering public acceptance of renewable energy projects, which can suffer from a 'NIMBY' effect (Wolsink 2000), and also equip local residents with knowledge on energy conservation practices.

LREC activities demonstrate motivations that are intentional and authentic and aimed to improve the well-being of individuals in the communities in which they serve, which make them distinctively actors of social innovation (Dees et al. 2004). This is in contrast to the locked-in energy regime they seek to transform, which is comprised of maximum-profit-focused conventional enterprises (Mair and Martí 2006). However, without more significant policy and financial support from the national government, LRECs must continue to be innovative with actors and resources more readily available around them in order to 'survive and keep going' (Ornetzeder and Rohracher 2013; Seyfang and Smith 2007). Arguably, the actor most critical in this survival effort is the commercial energy supplier who purchases the energy generated by LRECs.

This notion of producing, supplying, and reselling renewable energy calls attention to several key concepts that will frame the problem statement in the next section. First, the emergence of LRECs as niche grassroots innovations attempting to affect a transformative change of a structural problem in society (McGowan and Westley 2015) makes them social innovation (SI) actors with ambitions of sustainability. Secondly, as SI actors, academic theory frames them as bottom-up experiments operating in a protected space (Seyfang and Haxeltine 2012; Schot and Geels 2008) outside of the locked-in system and therefore without clear and predictable means in which to acquire more resources to grow beyond the experimental phase. Thirdly, academic theory explains that, in the lens of public-private partnerships, LRECs are social value creators (Caldwell et al. 2017). This affords the opportunity to study LRECs' ability to cooperate effectively with their energy supply partner in the framing of a sustainable business model (Proka, Beers, et al. 2018).

1.2 Problem Statement

Given the 30 plus years of history of the LREC phenomenon both in the Netherlands and much of Northern Europe, the body of academic literature is rich with research about their scaling potential as well as their realistic potential to affect transformative change in the way of the much needed energy transition (Proka, Loorbach, et al. 2018; Kooij et al. 2018; Oteman et al. 2017; Hufen and Koppenjan 2015; Boon and Dieperink 2014), there appears to not be much information on this fourth and current wave of LRECs who have exploded in numbers and motivated to follow on the successful energy generation and resale projects of the third wave before them.

While there are energy suppliers that have entered the marketplace since the 2004 liberalization, including Greenchoice, whose commercial business aims (e.g., supplying only domestic renewable energy) are aligned with those of the LRECs, these suppliers are still profit-seeking enterprises. The nature of their relationship is not well studied. On its face, the interaction between LREC and energy supplier could be interpreted as uneven, and therefore conflictual. Academic theory in the next chapter will be used to address this dilemma not necessarily as a conflict, but a necessary interaction in order for the LREC to continue with its work of advancing the energy transition.

What is known about this relationship is that it is, in legal terms, a business agreement for the supplier to purchase energy generated from the LREC. However, for suppliers like Greenchoice who are in the business of supplying only renewable energy, they have a vested interest in seeing the cooperative movement continue to grow. Greenchoice works actively to deploy its resources as a professional enterprise to assist new LRECs starting up as well as more established ones with the philosophy of 'a rising tide lifts all boats.'

This business relationship, while convenient for both parties, is not necessarily equal. As the number of LRECs continue to grow, so does the competition amongst them to realize new solar and wind projects because of the seemingly static supply of appropriate rooftops and other surfaces (Proka, Loorbach, et al. 2018). It is expected that the challenge of LRECs to strategize together effectively will grow as more LRECs are founded. This presents the possibility for energy suppliers to be able to dictate terms favourable to them as the renewable energy capacity market expands.

Much research on the Dutch LRECs has been with the objective of how to professionalize them so that they can be equipped to scale up their operations (e.g., more projects and more members). However, the institutional landscape in which they have been operating in since market liberalization has not really evolved. LRECs still lack meaningful policy and financial support, and therefore must continue to rely on other actors. The ability to realize new projects comes down to financial resources, which come in two forms – membership and revenue from power purchase agreements with suppliers like Greenchoice.

This research will explore, using a multiple case study strategy, whether new projects and member growth are being realized to the satisfaction of LRECs which are in partnerships with Greenchoice. Areas of challenge and opportunity to improve the cooperation between these two parties will be identified through the use of sustainable business model indicators, and to compare these indicators to determine which are relevant and convey an optimal coordination to the benefit of the Dutch energy transition.

1.3 Research Objective

The primary objective of this study is to generate more insight into the nature and level of the cooperation between local renewable energy cooperatives (LRECs) and Greenchoice to determine the extent to which the needed resources sought after by LRECs have enabled them to continue their grassroots movement as social innovators by realizing new projects. It is expected that empirical data gathered will be able to identify opportunities and constraints to improving this cooperation, which is of fundamental importance to the business models of both actors.

1.4 Research Question

To support the objective, the main research question is formulated as follows:

> **To what extent has the cooperation between renewable energy cooperatives as social innovations and Greenchoice a mission-driven renewable energy supplier contributed to the Dutch energy transition?**

The following provisional sub-questions will also facilitate the response to the main question:

- **Sub-Q1**: What is the nature and level of cooperation between cooperatives and Greenchoice?
- **Sub-Q2**: What contextual factors enabled cooperation between cooperatives and Greenchoice?
- **Sub-Q3**: What have been the contributions to the Dutch energy transition in the past five years by cooperatives who have cooperated with Greenchoice?

1.5 Significance of the Study

The Dutch energy transition, in the context of current European Union renewable energy targets (Rijksoverheid 2019) is far off pace (Eurostat 2019a; Eurostat 2019b). Support from the national government for LRECs, even according to its own Energy Agenda (Ministry of Economic Affairs 2017), appears to only be symbolic and not appreciative of their potential (Oteman et al. 2017): "locally produced renewable energy is more expensive and less cost efficient than large scale renewable energy production. Despite this, the Cabinet still supports the development of local renewable energy, because of its contribution to the societal awareness and public support for the energy transition" (Ministry of Economic Affairs 2017). While LRECs are not to be impeded, there are no governmental plans to stimulate LRECs either.

It could be considered then that LRECs (and grassroots movements on sustainability and climate change action broadly) still have more work to do before the national government takes notice of their potential. However, these waves of LRECs over the last 30 years characterizes the movement as growing exponentially on the one hand (HIER Opgewekt 2018a), but also standardizing their projects and processes, and therefore not innovating as much anymore (Oteman et al. 2017). Without more support from 'the top down' and more effectively strategizing with each other (Proka, Loorbach, et al. 2018), LRECs have begun to act more like private developers having to be active and competitive players in the renewable energy market. They do so at the risk of potentially eroding their identities as local community energy initiatives (Kooij et al. 2018) and their 'radical' ethos (Smith 2007).

This adjustment is explained with academic theory and literature. What is significant, however, is the necessary interface between community-led social initiatives and a commercial entity like Greenchoice. They both create social value, working in parallel to make it possible for everyone in the Netherlands to produce their own renewable energy or to be a part of a renewable energy project in their local community. While LRECs have available to them shared learning opportunities from their broader network of other LRECs, they interact most likely in an in-kind manner. However, to interact with actors in their broader context, such as Greenchoice, this constitutes a more substantial relationship with real monetary (and non-monetary) impact on the LREC's business model. In fact, this study has an a priori expectation that Greenchoice in some cases have probably co-created with an LREC on its initial business model during its start-up phase. Available literature on renewable energy cooperatives in the Netherlands do not seem to explore this in great detail, thus presenting an opportunity for this study to do so.

1.6 Scope and Limitation of the Study

This study is focused on the nature of the relationship between LRECs in the Netherlands and one of the commercial energy suppliers with which they have a business partnership, Greenchoice, and to what extent their ability to cooperate influences the LRECs capacities to contribute to the Dutch transition away from fossil fuels to renewable sources for the country's energy needs. The meaning of the contribution to the energy transition is somewhat amorphous and can be interpreted differently by different people. It would be in some ways preferable if the dependent variable in this study could be assessed as a calculation of the renewable energy production as a percentage of the energy demand in the community from which each LREC originates as Hufen and Koppenjan (2015) suggest. However, considering that the share of renewable energy production in national terms is quite small, this study believes it is more useful if this is understood more from the perspective of LRECs, namely how much their memberships have grown, how many more projects were they able to realize, and to a lesser extent the additional energy production capacity realized as a result of good cooperation with Greenchoice where their business needs were being met. This simpler framing of the dependent variable is supported by Proka, Loorbach, et al (2018) who imply that the mainstreaming of new technologies (and practices and structures) indicates an actual transition taking place.

This is not to say that good cooperation with their energy supplier is the only influential factor determining the extent LRECs are advancing the energy transition. On the contrary, other research has identified for instance a lack of strategic capacity or strategic will amongst each other in the Netherlands (Proka, Hisschemöller, et al. 2018) or in the UK (Seyfang et al. 2014). Because of the uncertainty of meaningful support from national government, LRECs are described as acting in a risk- and conflict-aversion posture, which may very well impact their ability to collaborate and strategize with each other, and thus negatively impact the transition effort. In fact, Proka, Loorbach, et al (2018) discuss the emergence of regime selection pressure of niche innovations as the landscape and regime grow more open to mainstream alternatives, which implies competition.

This study also has an a priori expectation that some LRECs do not necessarily have ambitions to affect national transformative change in the energy system, perhaps having more community-oriented motivations. While this study envisions to collect 'motivation' as a data point, the suggestion is not being made that having lower level motivations constitutes a lower contribution to the energy transition based on this study's dependent variable indicators. Motivation is important to this study as it believes this could be a descriptor of the attitude or perception that an LREC has for its partnership with Greenchoice.

Chapter 2: Literature Review / Theory

2.1 Introduction

This chapter presents a literature review which will make use of available academic theory to explain the journey in which an LREC realizes its social innovation identity and explores actors in its broader context from which it can obtain resources to realize its business plan. From the perspective of an LREC, this interaction with a dominant institution is a significant turning point in their narrative, which can be explained in part according to two theoretical propositions (two of twelve) about the interrelations of processes understood by researchers participating in the recent effort to build a new theory – Transformative Social Innovation (TSI) (Haxeltine et al. 2017).

The 'newness' of TSI, however, presents a potential weakness to this research overall were it to be completely unprecedented. On its own, TSI has not enjoyed sufficient opportunity to be tested beyond 'anecdotal and fragmented empirical evidence' (Haxeltine et al. 2017; McGowan and Westley 2015). However, TSI is firmly built on the shoulders of more well-established theories (Haxeltine et al. 2017) in social entrepreneurship (SE) and grassroots innovation (GI), as well as strategic niche management (SNM) and the multilevel perspective (MLP). Together, these theories will be used to explain the journey of Dutch LRECs to emerge, according to TSI, as social innovation (SI) initiatives contributing to 'transformative change' (Haxeltine et al. 2017; McGowan and Westley 2015).

Dutch LRECs are not unlike other sustainability innovations that have been studied using these other more well-established theoretical lenses. This literature review will demonstrate that a study of LRECs can be made with robust theoretical backing while also making use of TSI as perhaps the most applicable theory yet to understand the processes they undergo as SI initiatives working to address emergent 'persistent problems' (Rotmans and Loorbach 2009), namely, one, the depletion of natural resources and the degrading of ecosystems to achieve and ensure energy security, and two, climate change as a consequence of the Anthropocene era (Avelino et al. 2017; Olsson et al. 2017).

The following sections in this chapter will review a selection of academic literature from each of the earlier theories: SNM/MLP, GI and SE, to describe LRECs as operating in the niche level, and then framed in the energy transition as a kind of societal transition borne out of grassroots activism; their work considered as an enterprise for the greater social good. These characteristics suggest that they operate from outside the prevailing system, or regime (Seyfang et al. 2014; Schot and Geels 2008), and need certain resources in order to sustain their activities. In the case of LRECs, it is imagined that these resource needs are different and specific to each LREC, but that financial resources are believed to be universally sought. After a period of experimentation in protected niche spaces (Seyfang and Haxeltine 2012; Schot and Geels 2008), LRECs need to form reliable relationships with institutions serving as intermediary agents to the regime.

In practical terms, this research considers Dutch green energy suppliers (specifically, Greenchoice) as the effective intermediary in which LRECs make entry with when seeking resources. To that end, there is also academic literature available that effectively describes the historical context of renewable energy as a sustainability innovation in the Netherlands, with LRECs and green energy suppliers as actors interacting with each other. This research will make use of this literature as well. By the end of this chapter, a conceptual framework will be constructed in order to guide the empirical phase – a case study effort informed heavily on primary data collected through in-person interviews of key informants.

2.1 Strategic Niche Management and the Multilevel Perspective

The persistent problems referred in the previous section that society suffers from are complex and concern the very structure of society. They emerged as a result of system failures that are comprised of flaws of a locked-in nature, meaning that bias, institutional barriers, the dominance of certain technologies over others all have created harmful path dependencies (Rotmans and Loorbach 2009).

Overcoming these persistent problems require a societal transition that is structural and therefore radical (Rotmans and Loorbach 2009). This transition to a more sustainable society requires changes in the system, including all of its actors and their individual priorities. The multilevel perspective describes three heuristic levels (Geels and Schot 2007; Rip and Kemp 1998) that exist where transitions are meant to happen, and theorized that transition journeys are possible from one level to another.

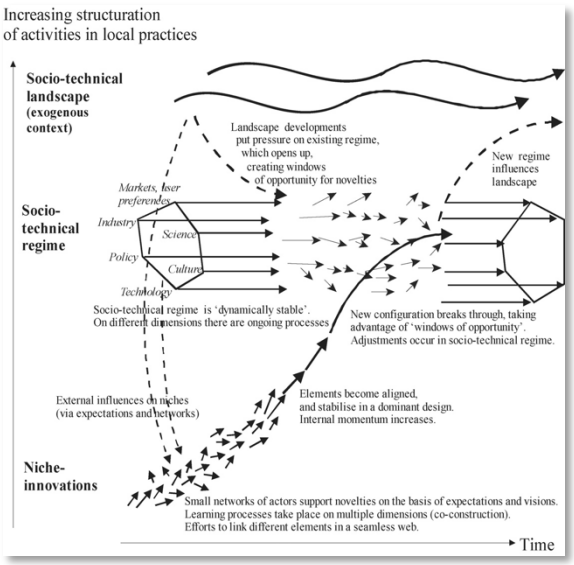

Figure 1: The multilevel perspective from Geels and Schot 2007.

This deep structure where a transition is needed to occur is at the 'socio-technical regime' level (Geels and Schot 2007). The other two levels above and below it, respectively are the 'socio-technical landscape' and the 'niche-innovations'. (Schot and Geels 2008; Geels and Schot 2007). The landscape level can be understood as the global context in which the other two levels operate. While changes at this level are slow, they can put pressure on the regime level to create modest windows of opportunity for niche innovations to be elevated from its protected space of free experimentation to make use of outside resources to scale up their innovations.

Strategic niche management was conceptualized as the experience of innovative technologies that were free to experiment and fail freely, undergo some internal processes of setting expectations, learning, and making networks, (Seyfang et al. 2014) until they were considered successful and ready to bring up into the regime when windows of opportunity would open (Schot and Geels 2008). This upward journey suggests a pathway for sustainable innovations like renewable energy to be experimented at the household level, learning networks built with other like-minded households, until a cooperative organizational structure emerged as a means to realize small scale renewable energy projects. This emergence would demonstrate an energy transition was not only possible technologically, but that it was desirable, at least among the few believing in energy democracy and combatting energy poverty (Seyfang et al. 2014) through a rather radical aspiration for a decentralized energy system. These internal conditions from SNM prevail in TSI theory as well (Haxeltine et al. 2017).

Repeated experimentation through, according to Geels and Raven (2006) and later Schot and Geels (2008), local projects implemented by local networks that would fail or succeed but nonetheless learn and formulate shared rules are described in this literature as a technical trajectory. This emergence raises their profile within local society, and they begin to interact with intermediary agents (e.g. branch organizations, professional societies) (Schot and Geels 2008), or can be otherwise understood as a constituency (Seyfang and Longhurst 2016) who

also seek to help document and facilitate continued learning. While not yet actively seeking outside resources, LRECs at least in their early years of existence in the Netherlands were being noticed as part of a local energy community phenomenon ripe for study.

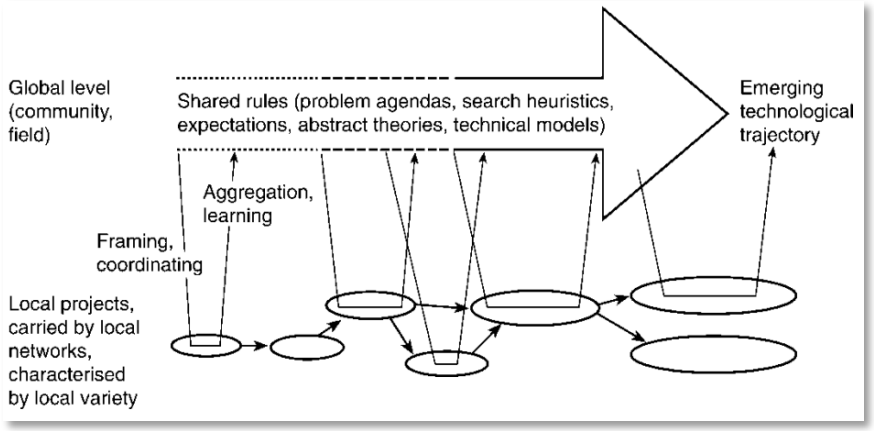

Figure 2: Emerging technical trajectory carried by local projects. From Geels and Raven 2006.

Kooij et al. (2018) observes this technical trajectory in the Dutch context, originating with the formation of the Organization for Renewable Energy (ODE) in 1979, a citizen-owned and operated network of wind turbines, with the first operating turbine completed in 1987 in the city of Delft. Cooperative ownership, according to Kooij et al. (2018) was inspired by resistance to the nuclear energy movement elsewhere in Europe. Two years later, these early cooperatives were granted access to the electrical grid and a guaranteed price for the energy they generated through the Electricity Act of 1989 (Kooij et al. 2018). Environmental awareness and local action were growing topics in social discourse, and the number of cooperatives grew to 25 by the early 1990s. Collectively, they felt their ambitions were fulfilled insofar as getting the government and industry to take notice.

Building on the success of these local projects, the technical trajectory continued in the north of the Netherlands in the province of Friesland. More wind cooperatives were formed not so much for any grand political or environmental agenda, but more so as a means of generating profit for the local community (Kooij et al. 2018). Seyfang (2014) together with Smith (Seyfang and Smith 2007) acknowledge that not all projects automatically have ambitions to be scaled up, and can be more self-serving to solve their local problems. Because the socio-technical regime is a multi-dimensional conglomerate of structure, culture, and practices (Rotmans and Loorbach 2009), these early LRECs were experimenting with socio-technical regime change in challenging the system locked-in to centralized carbon intensive energy generation and distribution.

It is worth reflecting at this point in the Dutch LREC timeline their achievements as bottom-up niche projects even before the defining window of opportunity in the socio-technical regime opened, the 2004 liberalization of the Dutch energy market (Kooij et al. 2018; Proka, Loorbach, et al. 2018). SNM encapsulates the experience of LRECs experimenting, networking to form the ODE and shared experiences to scale their efforts, and thus formed a technical trajectory where the cooperative model was proven to work according to the modest expectations they set for themselves (Schot and Geels 2008).

The next section will discuss LRECs as grassroots innovations which take advantage of the energy liberalization as an external circumstance – emerging as equally important to internal circumstances in later SNM research works (Schot and Geels 2008) – to grow their business model to the institutions (energy suppliers) that became available to them. They achieve this

in, according to SNM, in a co-evolutionary manner where the LRECs, the energy suppliers (and public policy governing both of them) were simultaneously shaped to allow for more diffusion of local renewable energy as an innovation (Kooij et al. 2018; Geels 2005).

2.2 Grassroots Innovations

According to Seyfang and Longhurst (2016), SNM has been typically used to explain niche-innovations in technological systems, largely leaving open how other radical, albeit less technical, innovations from civil society could affect a system transition. The concept of grassroots innovations emerges in literature to fill this space, and more directly addresses constraints to growth such as a lack of institutional fit (an inability to effectively network with the regime in SNM/MLP parlance) and therefore challenged to obtain the resources necessary to survive long-term (Ornetzeder and Rohracher 2013; Seyfang and Smith 2007).

An often cited definition of grassroots innovation comes from Seyfang and Smith (2007):

> "innovative networks of activists and organisations that lead bottom-up solutions for sustainable development; solutions that respond to the local situation and the interests and values of the communities involved. In contrast to the greening of mainstream business, grassroots initiatives tend to operate in civil society arenas and involve committed activists who experiment with social innovations as well as using greener technologies and techniques."

Due to their unwavering focus on all things local from their membership to ensuring the benefits of their projects are enjoyed by the communities from which they are founded, LRECs can easily be understood as GIs according to the definition above. They are civil society actors innovating at the niche level.

While there are a number of articles by leading researchers in GI, namely from Seyfang and Smith, on sustainability initiatives as grassroots innovations, Oteman et al. (2017) wrote a key article about a study performed on the performance of Dutch LRECs to 'fit' within existing institutions and what that meant insofar as their ability (and ambition) to pursue other more sophisticated activities once the technical trajectory was realized. Oteman offers that GIs are a 'movement' which forms networks among a variety of other actors who also share their goal – in this case, local renewable energy provision – and in turn, working together to gain greater legitimacy from even more embedded actors in the system (or regime) (Oteman et al. 2017).

The liberalization of the Dutch energy market for household consumers in 2004 is the defining external circumstance which triggered the era of LRECs as they are known today (Oteman et al. 2017), setting off a wave of not only more LRECs but now new energy supply entrants who were marketing themselves as supplying green energy. While the uptake for LRECs to view these energy suppliers as honest partners was slow (several years after the liberalization according to Oteman), their shared ambition to make renewable energy accessible make them sensible partners for each other, working together as members of 'community energy' much in the same way as Seyfang et al. (2014) observed them in the United Kingdom.

Oteman et al. observes this mutual interest between Dutch LRECs and green suppliers in real terms, where some suppliers actively sought collaboration with LRECs. Their research (and echoed in an informal discussion this researcher has had with one LREC) observed a referral scheme whereby the green supplier pays a fee for every LREC member who purchases electricity from that supplier. Formal affiliations between LRECs and suppliers have emerged where a "Electricity Supplied by…" label is shown on the tax statements of cooperative members, indicating that their LREC is affiliated with a particular green energy supplier. In

exchange, the supplier might provide any of a variety of services to the LREC. Of course, this will be researched in the upcoming empirical phase of this research.

Turning attention back to Oteman's assertion that GIs have had varying degrees of institutional fit, the emergence of the 'LREC-green supplier' relationship is described as a consequence of a sub-optimal fit between LRECs and national policy, which is still locked-in to prioritize the long-established energy conglomerates when setting energy policy. As has been the case in the UK (Ornetzeder and Rohracher 2013), while national policy in the Netherlands was creating more small windows of opportunity in the sociotechnical regime with subsidy programs to incentivize renewable energy technologies and local projects – namely SDE+ (*Incentive Renewable Energy*) and the Post Code Rose (Kooij et al. 2018; Oteman et al. 2017) – of which LRECs do their best to make most use, this has been observed in the Oteman research to be a low discursive fit due to the dissonance between LRECs' needs for more significant financial resources and the Dutch Government's "Energy Agenda", which mentions the role of LRECs as symbolic actors in the effort to make the energy transition (Oteman et al. 2017).

Viewing LRECs as grassroots innovations, it can be appreciated now the challenges of 'fit' they face to realize success beyond their first niche activities (Oteman et al. 2017). The will to survive and keep going (Ornetzeder and Rohracher 2013; Seyfang and Smith 2007) is a very real concern shared by GIs of all kinds. This challenge, along with the motivation to make better partnerships with more influential institutions can also be observed in academic literature on social entrepreneurship as well.

2.3 Social Entrepreneurship

With the increase of climate change and sustainability in the global discourse at the landscape level, interest in advancing scientific research into social innovations and social entrepreneurship have also increased, particularly when their role is described in literature as sorely missed in transition studies (Seyfang and Haxeltine 2012) (Kemp et al. 2007). Viewing LRECs as social innovation actors or entrepreneurs allows us to discuss them in contemporary terms. And while the main research question (and sub-questions) posed in this research tries to make best use of academic literature to place LRECs in a social lens, we see that the need to network effectively for the resources and opportunities to scale their innovations forward and upward are questions not unlike what are typically asked in scientific circles studying businesses and organizations. Social entrepreneurship research studies, at the most basic level, various endeavours that integrate both economic and social value creation (Mair and Martí 2006).

It should be cautioned that social entrepreneurship can have varied meanings, whether focusing on the founding principles of the organization or the tangible outcomes of an organization, better known as social enterprises (Mair and Martí 2006). While there is much to be said about the debate to properly delineate the scope of what is meant by 'social', it can be expressed again in perhaps simplistic terms to be different from conventional entrepreneurship in its lack of profit-maximization ambitions (Mair and Martí 2006). Rather, they are motivated by making authentic impact to improve the well-being of individuals in the communities in which they serve (Dees et al. 2004).

Describing social enterprise activity in terms of 'impact' has given way to much research on scale (Dees et al. 2004), scaling up (Seyfang and Haxeltine 2012), and scaling out (Olsson et al. 2017) (Westley et al. 2014). Westley's (2014) research on scaling up social enterprises is interesting to the discussion on LRECs because it bridges the intent of enhancing societal well-being with innovative methods – social innovation. Innovations need to move across scales and

transform regimes, much in a similar way imagined in SNM, and identify ways into the system that created the social problem in the first place (Westley et al. 2014). The study of scaling LRECs is indeed relevant and needed so long as the energy transition has yet to be realized.

This research, however, is concerned with the practical condition in which LRECs, like other social innovations (Seyfang and Longhurst 2016; Seyfang et al. 2014; Mair and Martí 2006; Dees et al. 2004) find themselves – being without sufficient resources to get the job done. This places them in a vulnerable posture, and therefore take decisions with an aversion to risk that limits their potential social impact.

Westley (2014) extends the concept of social entrepreneurs to also consider organizations who both introduce the innovation and manage the broader context so that the innovation has a chance to catch on and thrive – 'institutional entrepreneurs'. Among other skills (social, political, cultural, etc.), institutional entrepreneurs should also have 'resource mobilization' skills to enable them to leverage and expand networks to obtain needed resources (Westley et al. 2014; Moore and Westley 2011).

The literature reviewed on this point of resource mobilization is often still framed with the intent of servicing the scaling up/scaling out question to the point where the social enterprise can have more of an influence in policy discussions. Moore and Westley (2011)'s research offers the concept of a 'knowledge and resource broker' with the express role of finding opportunities to upscale their innovation within policy-making circles. However, this research attempts to remain in a more practical realm about the experience of procuring resources through institutions whose goals are already aligned with those of the LRECs. There remains considerable potential for projects like community solar to be replicated within the Netherlands (and considerable potential for society to be convinced that renewable energy is accessible and sensible). These projects can and ought to be realized as further demonstrations of social innovation in action that works.

Furthermore, on the point of convincing society (or making a value proposition to a community about the advantages of community solar projects), having this social buy-in is necessary for LRECs to have the 'moral capital' to be accepted by the community it intends to serve. As observed with LRECs in the UK, trust is seen as a competitive advantage so that LRECs can build the partnerships necessary to realize the first project (van der Horst 2008). It can be theorized that the green supplier(s) to be studied in this research, Greenchoice, would take into consideration the amount of moral capital an LREC it is interested in partnering with has as an indication of how reliable it is expected to be as a partner.

The next section will introduce transformative social innovation (TSI) theory, unique in its depiction of a social innovation journey as more process-oriented rather than variance-oriented (Haxeltine et al. 2016). It is intended that TSI will permit this research to be able to be more flexible with the concept of SI's finding institutional partnerships, namely that they need not be seeking those partnerships in order to seek greater policy influence necessarily. The success and replications of their own projects, and growing membership, are evidence in their own right for policymakers to take notice.

2.4 Transformative Social Innovation

Transformative Social Innovation (TSI) Theory has emerged over the last six years from a European Union research grant, capturing the increased discourse on social innovation (SI) broadly as well as on sustainable development as a defining social issue of our time. It observes in its view an incomplete research field of social innovation, claiming conceptual ambiguity

and the problematic dissonance relative to the high expectations placed on SIs to contribute to resolving structural problems in society. It differentiates itself as a practical-oriented theory focused on the processes SIs undertake to make *transformative* change (McGowan and Westley 2015; Murray et al. 2010).

Furthermore, TSI challenges a number of normative assumptions about the agency of SI actors, namely that they have conventionally been presented as agents who use creative approaches to solve a particular social problem. However, this 'single-variable' (Olsson et al. 2017) framing is rather limiting as the SI tends to be evaluated on whether it achieved the particular result it set out to address. Additionally, SI research has a tendency to make a value judgement on the SI actor as being inherently good, which raises a concern of the objectivity of the SI research field in this respect. TSI suggests that 'the ends should not be confused with the means', and thereby liberates SIs from these normative labels (Haxeltine et al. 2016). What this means for this research on LRECs, particularly in the upcoming empirical phase, is that their business-minded orientation does not make them any less social. It is their very business model – the cooperative structure – that is the social innovation challenging the locked-in, profit-seeking energy regime.

Where TSI does assign value, or study focus, is again in the processes that SI actors, whether they be people or an agglomeration of networks or initiatives, experience to make persistent adjustments to social values and behaviours that are of sufficient 'width and depth' according to Haxeltine et al. (2016) to constitute transformative change. This is a departure from the variance orientation of earlier SI research which seeks to explain observed outcomes with variables, and instead capitalizing on process-oriented theories of transition such as the multilevel perspective (Haxeltine et al. 2016). Thus, the practical and experiential foci of TSI theory make it a particularly useful and appropriate frame to study the SI agency of local renewable energy cooperatives, namely the process in which they manage their relations with institutions in the wider socio-material context to meet their resourcing needs (Haxeltine et al. 2017; Weaver 2017).

The various interactions that LRECs experience are conveyed, according to TSI, in four layered clusters comprising its conceptual framework: a.) relations amongst SI initiatives, b.) relations in network formation, c.) relations to institutional change, and d.) relations to the socio-material context (Haxeltine et al. 2017). The final output of the initial TSI theory-building effort was a working paper detailing twelve theoretical propositions across these four clusters. The scope of this research is focuses, in particular, on two propositions under Cluster "C" (Figure 3):

> 'Proposition 7: SI initiatives need to find an institutional home in order to access vital resources; this often entails a balancing against the desire for independence from (critiqued) dominant institutions,'

and

> 'Proposition 9: One way in which SI initiatives engage with dominant institutions is by reconsidering the broader institutional logics in which those institutions are embedded; they do this by 'travelling' across different institutional logics, and by reinventing, recombining and transposing specific elements.'

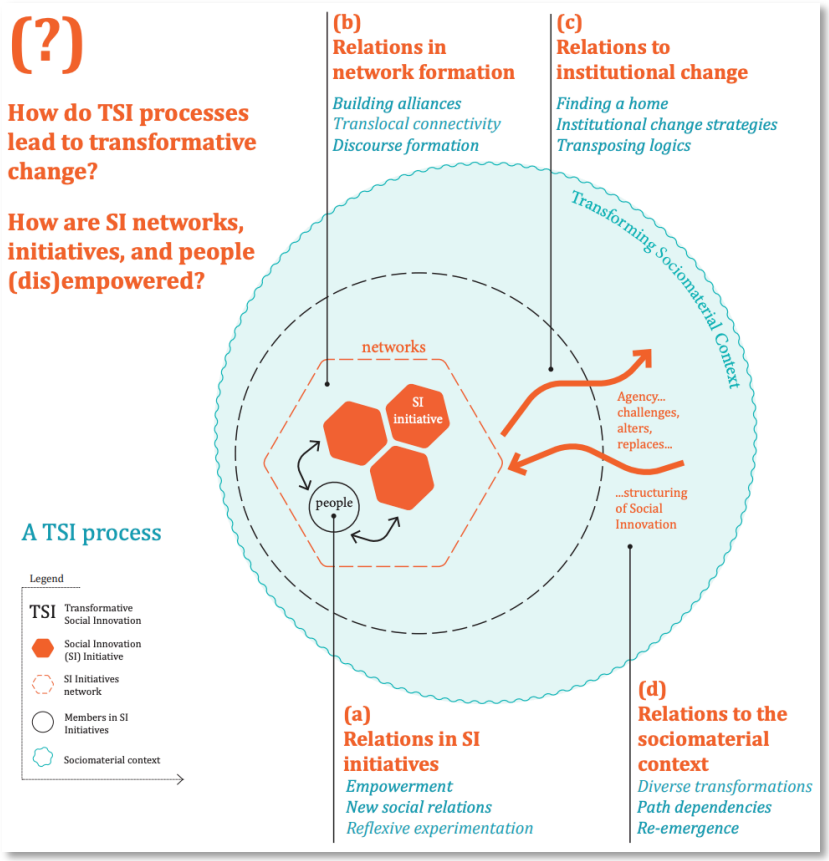

Figure 3: Infographic of a transformative social innovation process. From Haxeltine et al. 2017

Because SI initiatives lack many of the assets that dominant institutions enjoy, such as recognition and legitimacy, financial resources, and influence to a degree, SI initiatives need to find an institutional home, understood as "an institutional existence in relation to established institutions, as an intermediate stage between a non-institutional and institutionalized existence" (Haxeltine et al. 2017). The credit cooperative movement in Europe was studied by the TSI theory-building research team and found that in their ambition to formalize themselves as officially recognized banks, the credit cooperatives needed to first negotiate their way into the dominant banking regime (Haxeltine et al. 2017).

An inherent dilemma emerges where SI initiatives must actively be on guard to ensure their aims are not being compromised during this institutionalization process. SI initiatives manage this risk by being creative with institutional bricolage (Olsson et al. 2017) that it finds available. Taken a different way, there are perhaps actors who operate in the field of dominant institutions at its fringe who are perhaps open-minded to the social innovation. These actors, because of the nature of their business, are not SI actors themselves (perhaps because they maintain a profit-maximizing mentality), but they see the SI innovation as a business opportunity. If the SI initiative is able to make an institutional home with this kind of fringe actor, TSI explains that the SI initiative has a partner to co-create on the innovation and co-evolve their operations to work together more efficiently (Haxeltine et al. 2016). This process is complex and involves trade-offs (Strasser et al. 2019; Haxeltine et al. 2016) especially when the resource being sought is financial (Weaver 2017).

LRECs in the Netherlands have been observed in what can probably be categorized into two interaction configurations with the Dutch energy supply actor network: a conventional interaction with a commercial (green) supplier and a more radical configuration where LRECs

have formed their own energy supply companies in the cooperative format – a collective of cooperatives (Proka, Hisschemöller, et al. 2018). While the scope of the empirical research to follow will only be studying the first type of interaction, briefly discussing the more extreme type in this literature review might do well to better illustrate what is meant by Proposition 9.

A collection of LRECs have formed two 'cooperative-only' energy companies in an effort to avoid what they believed was a dependence their network has on commercial energy suppliers – OM and Our Energy. LREC members bring their own membership into these collective companies. Their collective effort allows them to supply their energy to each other's members and to municipalities for prices competitive with the broader energy market (Proka, Hisschemöller, et al. 2018). Considering the high legal, administrative, and capital barriers to entry to form a new energy supply company in the Netherlands, the OM and Our Energy cases are compelling to demonstrate SI initiatives acting creatively and flexibly in their interactions with their broader context. On the other hand, these two cooperative energy companies were formed relatively recently and it remains to be seen how these two cooperative energy companies will fare. Proka, Hisschemöller, et al. (2018) observed that, among other opinions from other LRECs, these two initiatives may be challenged to convince other LRECs to join them due to their relative limited experience as the role of energy supplier.

The more conventional interaction – LREC with commercial supplier – should not be discounted, as this is the reality for most other LRECs that want to realize their missions. In either configuration, LRECs acting alone in their niche environments are no less lacking in legitimacy, financial resources, and influence when they are faced with needing to interact with their broader context. Especially with this fourth and current wave of LRECs that benefit from the lessons learned from preceding waves, this realization (of needing to identify an institutional partner) comes relatively early during their start-up phase.

Now having established through the use of four fields of study that an LREC is an SI actor seeking transformative change, another framing device is needed to observe the 'niche-regime' interaction this research is interested in. It is intended that cooperation will be viewed through the lens of a business model, whereby the more of an LREC's needs from an external partner (Greenchoice) are being met vis-à-vis their business model is indicative of positive cooperation. This research will make use of a recently proposed business model conceptual framework specifically for SI actors.

2.5 Transformative Business Model

In order to obtain the recognition and legitimacy they often lack from their inception phase, SI actors must take their product or service to the marketplace. For LRECs, this is quite evident in order for them to realize the value they offer, which is the ability for anyone to generate their own renewable energy (or to participate in some capacity in a renewable energy project in their neighbourhood). Under the current energy system in the Netherlands, energy can only be purchased and consumed through authorized energy suppliers. Realizing a local renewable energy production project is only half the picture. The energy needs to be sold to a supplier in order to realize any financial returns on investment the LREC has made on the project. This interaction, whether considered as 'niche-regime' or 'product-market' in academic parlance, is where 'the rubber meets the road' (to borrow a distinctly non-academic Western expression). SI actors address social issues within their communities through transacting with commercial actors in the marketplace on a price basis (Slimane and Lamine 2017). It is then appropriate to begin observing this interaction in a business orientation with a sustainable business model in mind.

There has been extensive study and research into the field of business models for sustainability initiatives. However, this research uses the following definition from Schaltegger et al (2016):

> "A business model for sustainability helps describing, analysing, managing, and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries."

Proka, Beers, et al (2018) extends these dimensions further by linking them to the SI actor experience of navigating the transformative social innovation process (Figure 3), and arguing that sustainability business models can become transformative in changing locked-in conditions in the regime. To do so, they need to have a degree of reflexivity, meaning to have an awareness of changes in the market and to be adept in handling any opportunities or threats that may arise from those changes (Proka, Beers, et al. 2018; Beers and van Mierlo 2017). This conceptual framework for a special business model for SI actors wishing to shape their context is called the 'Transformative Business Model' (TBM) (Proka, Beers, et al. 2018). It follows in the steps of other innovative business models that are founded on the belief that innovation entrepreneurs can influence or shape markets and society, perhaps more so than policymakers (Proka, Beers, et al. 2018; Geels and Schot 2007).

TBM combines a conventional for-profit business model with the concept of 'niche' and then observes the dynamics between the two concepts in terms of the SI actor's reflexivity. It assesses an SI actor's ability to institutionalize niche dimensions into its business model, and thereby assesses the SI actor's transformative potential (Proka, Beers, et al. 2018). The business model component of TBM is expressed using four dimensions (Proka, Beers, et al. 2018; Boons and Lüdeke-Freund 2013; Doganova and Eyquem-Renault 2009):

1.	**Value Proposition**	What value or benefit is embedded in the offerings of the organization towards all the stakeholders involved.
2.	**Product or Service**	Fulfils the value proposition and generates the promised benefit, which is directly offered to the organization's customers and indirectly to other stakeholders.
3.	**Architecture of Value**	Lists the partners and channels through which value creation and delivery is accomplished.
4.	**Valuation Method**	Encompasses the cost and revenue flows that define the value captured by the organization and its viability.

Table 1: Four Dimensions of the Business Model Component of the Transformative Business Model Framework. From Proka, Beers, et al. 2018.

When SI actors seek to move outside of its niche network to enter the market, a business model can be considered a market device (Boons and Lüdeke-Freund 2013; Muniesa et al. 2007) between different market actors, such as LRECs and energy suppliers. A business model can be used as a common language for actors to explain the details of their innovative ventures and to determine areas within their venture where coordination and collaboration are possible in order to realize fulfilment of the venture (Boons and Lüdeke-Freund 2013). These dimensions are rather powerful devices for LRECs to describe their business model, and to locate the touchpoints for an energy supply partner like Greenchoice.

The niche dimensions that TBM incorporates are what make this business model unique in its assessment of the transformative potential of a business or SI actor. It understands that all

niches, regardless of size and influence can be considered as "embryonic regimes" (Fuenfschilling and Truffer 2014), meaning they possess a low degree of institutionalization but have the potential to grow and possibly replace the regime (Proka, Beers, et al. 2018; Proka, Hisschemöller, et al. 2018). The niche dimensions of TBM are as follows:

1.	**Technologies and Infrastructures**	The material dimension required for the societal function including all the technologies and physical infrastructures.
2.	**User Practices**	The application domain of the concept or technology, and the associated new routines and norms of the actors
3.	**Cultural Symbolic Meanings**	The symbolic representation of the functioning including the associated values and guiding principles.
4.	**Knowledge Base**	Involving scientific as well as tacit, practical knowledge associated with the societal function.
5.	**Organizational Logic and Structure**	The specific logic of how an organization generates value, including organizational decision-making processes, routines and activities directed towards the achievement of organizational aims, as well as issues regarding ownership and the relationships between investors, producers, and users.
6.	**Sector Structure**	The organizational networks, the particular sector capabilities, as well as the specific interaction platforms for coordination and negotiation within the sector
7.	**Policies and Political Power**	The regulations and political power exercised to influence or maintain them.

Table 2: Seven Dimensions of the Niche Component of the Transformative Business Model Framework. From Proka, Beers, et al. 2018.

2.6 Contributions to the Dutch Energy Transition

The case in favour of a system-wide transition of energy production in the Netherlands from fossil fuels to renewable technologies as a social imperative in the face of global climate change was made in great detail in Chapter 1. The previous sections in Chapter 2 characterize the energy system as a regime, where disruptions to it through bottom-up initiatives (Smith and Raven 2012) indicate moments of potential transition (Bosman et al. 2014). However, these disruptions are not exclusive to a technological nature. In fact, taking this limited position is precisely what literature has been observing the Dutch energy regime to be doing to preserve itself, namely 'greening' its fossil-based centralized system by adopting lower carbon natural gas and not giving way to new local actors wanting a more radical change to a decentralized system built on genuine zero-carbon renewable technologies (Bosman et al. 2014). The energy system also includes its actors and 'artefacts' that produce energy as a vital resource of society (Bosman et al. 2014; Loorbach and Verbong 2012).

With this in mind, contributions to the energy transition consider not just the aggregate percentage share of energy production to renewables, but also the new actors (LRECs) and its stakeholders (local resident investors and general members) which together represent an alternative decentralized model for the energy system of the future and thereby posing a disruption of the prevailing centralized model controlled by a small group of large energy companies. Transition occurs in practice through the mainstreaming of new technologies, structures, and practices (Proka, Loorbach, et al. 2018). The Dutch non-profit knowledge platform for the local renewable energy community, HIER Opgewekt, evaluates the contributions this community makes to the energy transition through its annual Local Energy

Monitor report (HIER Opgewekt 2018a). It regularly uses the metrics of the number of cooperatives formed and their total membership, number of projects realized, and the amount of energy produced. In the absence of a definition in literature regarding a 'tipping point' or 'critical mass' for when the transition is truly succeeding, this study uses these commonly accepted metrics.

2.7 Conceptual Framework

This conceptual framework (Figure 4) adapts the TSI process diagram (Figure 3) (Haxeltine et al. 2017) to illustrate the process in which an LREC as a social innovation actor ventures out of its protected niche network to seek resources according to its business model from Greenchoice, a mission-driven energy supplier and fringe regime actor. The coordination between these two actors serves as the independent variable of this study. It will be investigated through empirical research the nature and level of this cooperation, utilizing four business model dimensions as sub-variables, as well as the contextual factors that have enabled this cooperation. It is believed that this interaction is necessary and that it is more active relative to the phase of development of the LREC. The study will take care to differentiate cooperation during the LREC's start-up phase versus its operational phase after having realized its first project. Achievements of the LREC in terms of growth of membership, projects and energy generating capacity are considered in this study to be contributions to the energy transition and represent the dependent variable. This conceptual framework models this relationship and will guide the empirical research process from data collection to analysis.

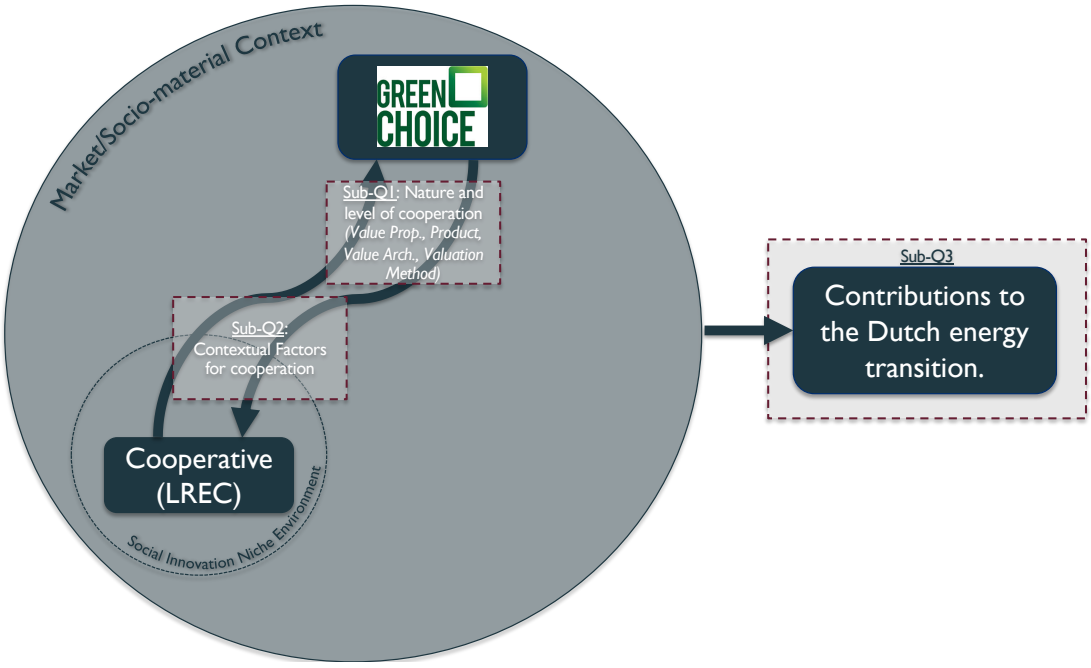

Figure 4: A conceptual framework for assessing social innovation cooperation between LRECs and energy supplier. Author created with influence from transformative social innovation theory model.

Chapter 3: Research Design and Methods

3.1 Introduction

The main objective of this research was to gain more insight into the nature and level of cooperation between local renewable energy cooperatives (LRECs) and Greenchoice in order to determine to what extent LRECs' resource needs are being met in order for them to realize new projects and further the Dutch energy transition. This chapter describes the design and methods of the empirical research to be undertaken in order to respond to each of the sub-questions. As a reminder, they are as follows:

- **Sub-Q1:** What is the nature and level of cooperation between cooperatives and Greenchoice?
- **Sub-Q2**: What contextual factors enabled cooperation between cooperatives and Greenchoice?
- **Sub-Q3**: What have been the contributions to the Dutch energy transition in the past five years by cooperatives who have cooperated with Greenchoice?

3.2 Operationalization

As mentioned in Chapter 2, a framework is needed to outline the specifics of resources that an LREC desires as well as resources that it might not realize it is lacking. This research utilized a conceptual framework recently proposed by thought-leaders in transition studies which conceptualizes a Transformative Business Model (TBM) (Proka, Beers, et al. 2018). Indicators were sourced from this model and adapted for a slightly different use than was originally intended. The TBM indicators were used in the primary data collection phase (interviews) to assess LRECs vis-à-vis their transformative potential. However, it went further and were used to identify entry points where Greenchoice cooperates with an LREC and contribute to their business model. This understanding is critical for the TBM to guide the empirical research process correctly. Variables, indicators, and questions framed by the research question and supported by the literature review are presented in the table below.

Variable (Independent)	Sub-Variable	Definition	Indicators	Questions
Cooperation	Value Proposition	Using a theoretical framework for Transformative Business Models (TBM), indicators are derived in order to express the elements LRECs as transformative social innovations need in order to contribute to a sustainability transition (i.e., the dependent variable). Cooperation is defined as the extent to which an LREC's needs, according to the TBM framework are being met (where possible) by Greenchoice. Sub-Variable definitions can be found in	-Organizational Logic and Structure -Cultural Symbolic Meanings	-How did your cooperative begin? -What is the background of its emergence? -At what point did Greenchoice (GC) become involved with your cooperative? -Could you describe in your opinion what you feel your cooperative's best selling point is? -Do you feel that your partnership with GC helps or hurts your best selling point? Or are they not a factor? -How do you feel about the current state of your cooperative? Are you satisfied with your size or would you like to grow? -Do you discuss your future ambitions with GC? If so, how often? How would you describe those conversations? Are they open and supportive? -What do your members say your cooperative means to them? -Do you think your organization's partnership with GC helps or hurts your organization's image? -Do you think GC could do anything to help promote your image?
	Product or Service		-Technology and Infrastructure	-What was your cooperative's inspirations or models in developing your own product? -Was GC involved in assisting you to brainstorm your product? If you want to expand your product/service, do you see a role for GC to help you with this? -Do you feel that the technology your cooperative is now using for energy generation the best fit for your organization? -Would you like to expand into other technologies? -Does GC influence you in any way on your interests to pursue other technologies? Would you like for GC to play a more active role in this kind of technical advice?

Value Architecture	Table 1 (Chapter 2).	-User Practice (Members) -Governance -Sector Structure (Value Chain) -Policies and Political Power	-Could you explain how membership works in your cooperative? -How many members do you have? -What has been the greatest challenge you've faced in obtaining new members? -What does GC do now to help you obtain new members? What do you think it can do for you in the future? -I understand that Greenchoice offers to help your cooperative with marketing for new members. How do you think this could be improved? Would you be willing to pay GC for a more personalized marketing campaign? -Does your cooperative promote sustainable energy consumption within your membership? -Does GC help you with this in any way? -Are there ways in which you think GC could help you? -How does governance work in your organization? -What did GC do to help shape your governance structure? And does it work to your satisfaction? -At the time you made your power purchase agreement (PPA) with GC, were you satisfied with the rate they offered for your energy? -Do you feel the PPA is fair today? If not, does this affect the way you interact with GC in the course of normal business? -What is your organizational culture like? Do you feel that GC is a good fit for your culture? Do you feel that other energy suppliers could be a better cultural fit? -Could you describe the other networks and partnerships your cooperative has developed? -Do you have interest to make more industry contacts? -Do you think GC could help connect your cooperative to new industry contacts? -To what extent does current government policy influence your relationship with GC?
Valuation Method		-Knowledge Base	-How confident is your cooperative's knowledge on technical and social matters? -Do you have ambitions to have more knowledge in a particular area? -Did GC contribute to building your cooperative's knowledge base? -Would you consider GC to be willing and able to provide you with new knowledge about, perhaps, how to add a new technology to your portfolio?

Table 3: Independent variables, indicators and questions for data collection and analysis. Author created utilizing sub-variables and indicators from Proka, Beers, et al. 2018.

Variable (Dependent)	Sub-Variable	Definition	Indicators	Data Collection
Contributions to the Dutch energy transition	-	Factual numerical data to demonstrate the elements of growth for any particular LREC, e.g. new projects, new members, and additional production capacity since they first entered into a business relationship with Greenchoice.	- Number of Members - Number of Projects - Production Capacity	Primary Data -- Interviews Secondary Data -- LREC Annual Reports; HIER Opgewekt *Lokale Energie Monitor*

Table 4: Dependent variables, indicators and data collection method for analysis. Author created.

3.3 Research Strategy

To explain how good coordination with respect to the extent which Greenchoice is meeting an LREC's business needs required an in-depth study. While the TBM is a framework in which a systematic analysis can be performed to review niche-regime dynamics in a social innovation (e.g., sustainability) setting (Proka, Beers, et al. 2018), it is expected that these business needs are context-specific. The LRECs to be studied do not all belong to one city or locality. They are diverse with respect to location, size, and technology portfolio (e.g., solar, wind, biogas, or any combination thereof). Therefore, a multiple case study strategy was employed for this research.

Furthermore, the use of TBM (or any conventional business model for that matter) suggests the use of quantitative elements. In this research, an indicator from TBM called 'valuation method' was used. However, there was concern over the use of this indicator to gauge level of coordination as it could have been conflictual by discursively making the suggestion that relations are automatically good from the perspective of an LREC (and all of its other needs are being met) so long as finances are not a concern. Rather, this study used the niche dimension 'knowledge base' as the chief indicator for this sub-variable, opting for a non-monetary asset to inform valuation.

This research however recognized that good cooperation occurs due to a wider set of circumstances beyond financial ones, and it was interested to study the opinions, perceptions, processes, and the behaviours and relations of actors. Considering this interest in mind, the use of semi-structured interviews for primary data collection was considered to be the most appropriate strategy for such qualitative research interests (Thiel 2014). This is elaborated further in the next section on data collection methods.

Case studies are best used when studying similar subjects in a real-life setting (Thiel 2014). The number of these subjects is generally fewer than that of other research strategies such as the survey. The trade-off is that these fewer subjects will be studied in great depth and include the wider context in which the subjects operate. The decision to employ a multiple-case study strategy for this research was so that each case (i.e., each LREC) could be studied in its own

context and across the contexts of the other cases (Baxter and Jack 2008). Identifying the similarities and differences between cases in a real-life setting was useful for this research when determining from a multitude of indicators, which ones were most relevant depending on, for example, which phase of business operation is the case in (e.g., start-up or mid-stream).

Furthermore, the indicators derived from the independent variable for this research perhaps were not exhaustive. This researcher had some knowledge about Dutch LRECs, but required more new knowledge to fully answer the Sub-Qs programmed for the empirical phase of this research. The case study strategy is most equipped to address the possibility that other factors completely unknown to the researcher emerge from the semi-structured interview process. This added to the narrative to be built for each case to sufficiently answer Sub-Q1 in particular, which is phrased in such a way to inquire about the nature of a relationship between two actors based on the perceptions or opinions of key informants.

3.4 Data Collection Methods

This research was informed by prior document review and then employed an interview approach, triangulated with a brief post-interview online questionnaire in order to compile robust empirical data sufficient to prepare detailed narrative case studies and overcoming common validity and reliability weaknesses.

3.4.1 Primary Data

The source for primary data was from in-depth interviews conducted by the researcher. The non-probability sampling method employed was purposive to select LRECs which, of course, have a demonstrated business relationship with Greenchoice. The study units were selected on whether they were situated in urban environments with the purpose of standardizing their conditions to allow them to be compared. Namely what is meant by this is that urban-situated LRECs of recent and rapid emergence have advantages over their rural predecessors. The potential member base is considerably greater in urban environments and the project sites are likely to be situated on land or structures with an existing connection the electrical grid. ‘Urban’ is to be defined according to a PBL Netherlands Environment Assessment Agency report on Dutch cities and urban areas (Nabielek et al. 2016). This report sources its urban definition from the OECD as “an identified functional urban area with more than 50,000 people” (OECD 2012).

LRECs are characterized as having small but professional staff (Hufen and Koppenjan 2015). Key informant selection prioritized the most senior member or most tenured employee of the LREC so as to obtain as deep institutional knowledge as possible to create the case study narrative. Greenchoice key informants came from the organization’s department dedicated to its relations with LRECs. Furthermore, the research benefitted from triangulation using interviews of third parties, HIER Opgewekt and 02025, Dutch renewable energy knowledge-sharing and thought leadership networks. While the semi-structured interview approach ensured all indicators were covered in any given interview with the primary actors (LRECs and Greenchoice), it was not an interaction where all relevant data was guaranteed to come to light whether purposively or due to time constraints. However, interviews of secondary actors (knowledge-sharing networks and independent experts) helped to capture any additional relevant data missed in primary actor interviews. Note the interview protocol in Annex 1, which is modified from the interview protocol found in Proka, Hisschemöller, et al. (2018).

This research also employed brief electronic questionnaires as a follow-up and feedback mechanism to capture interviewee perceptions of certain indicators using a Likert scale. This approach had two advantages, first to focus the interview itself on discussing qualitative

opinions and perceptions which are of high value to answering the sub-questions, and second to clarify (and thereby triangulate) claims made during the interview session. While the questionnaires themselves were not distributed to a large enough sample for statistical analysis, they were a useful extra dimension of data when analysing the interview data. The questionnaire is found in Annex 2.

3.4.2 Secondary Data

The researcher requested project information documents and press releases, from the LRECs. These corroborated and triangulated claims made during the interview session regarding dependent variable factual data (e.g., number of projects, number of members, energy generation capacity, etc.) and was further cross-referenced with the same data as reported in HIER Opgewekt's Local Energy Monitor report. Together with academic literature, these secondary data were relevant to the researcher gain a higher understanding about the contexts surrounding each LREC.

3.4.3 Triangulation of Data

According to Baxter and Jack (2008), triangulation "…is a primary strategy that can be used and would support the principle in case study research that the phenomena be viewed and explored from multiple perspectives" and have the benefit of ensuring the research has high 'truth value.' The mixed methods approach enables the researcher to rely on more than one type of data to comprise a multi-dimensional view of any one given indicator, and thereby also enables the researcher to establish any similarities or trends. To improve 'truth value,' triangulation was employed by interviewing independent experts as secondary actors to validate opinions and perceptions expressed with a possible natural bias in interviews of primary actors. Secondary actor interviews provided the opportunity for any unanticipated information to emerge that was relevant for answering, in particular, Sub-Q2.

As stated in the previous sub-section, secondary data was used to triangulate claims made during interview sessions. They were also useful to prepare the researcher ahead of time to prepare focused interview questions that avoided him from having to cover factual information that was already available on the websites of the organizations interviewed.

Most importantly, triangulation via mixed methods minimized the risk of natural bias and the risk of missing important data if the researcher was relying only on one data collection strategy. Validity and reliability for a multiple case study approach are better ensured if coupled with mixed methods for data collection.

3.5 Data Analysis Methods

The interviews of primary and secondary actors were all conducted face-to-face as the researcher and study units were all located within the Netherlands. All interviews were recorded and transcribed in their entirety. Transcriptions were sent as a post-interview deliverable to the interviewee for 'interviewee validation' (McGrath et al. 2018). Atlas.ti was the software tool used for qualitative and mixed-method data organizing and processing. It was used to code the interviews to indicators as well as a navigation tool to search for keywords and topics. The ability to search was crucial for the researcher to be able to perform a narrative data analysis for data interpretation. Analysis of the data involved studying any patterns in responses to indicator-based questions, and formulated narratives and perspectives from them that was used to determine their relevance to answering the research questions.

3.5.1 Reliability and Validity

According to Thiel (2014), "the small number of units of study in case studies can endanger the reliability and validity of case study research." Triangulation using mixed-methods was the primary strategy to overcome both reliability and validity weaknesses of this research. Secondly, the use of the Atlas.ti software tool as a searchable database for all qualitative interview data collected also improved reliability and promoted transparency in the research experience. As for validation, the 'interviewee validation' post-interview package was another strategy to be used to improve validity.

Further on the point of validity, this research had a high internal validity and low external validity due to the context-specific nature of the study units. This severely limited the ability for the research to be generalized to a higher extent like other research strategies (such as a questionnaire with a large enough sample to make a statistical analysis). Case studies are limited to making analytic generalizations only (Yin 2012). However, this type of generalization is quite useful when analysing phenomenon (such as social innovations) out 'in the field.' A purposeful sampling of cases actually increases generalizability if the researcher considers selecting only cases he expects to be favourable for proving the thesis. But, if one of the researcher's selections actually disproves the thesis, then there is an opportunity to make many analytical learnings that were not previously considered (Flyvbjerg 2006).

In any event, recommendations are made at the end of this research to encourage that the research be repeated in other location or situational contexts. Therefore, making all efforts to document and make transparent the research experience is vital to ensure repeatability by other researchers.

3.6 Profile of the Respondents

Key informant interviews were conducted with representatives of LRECs with long tenure, who in some cases serve on the board of their LREC, in a management position, or is otherwise knowledgeable about their projects. Interviews were also conducted with program managers of two third-party non-profit organizations serving as knowledge platforms (one national and one municipal) for parties involved with the Dutch local renewable energy movement. One final interview was conducted with two representatives from the cooperative energy team of the energy supplier, Greenchoice. A total of ten (10) interviews with eleven (11) individuals were conducted in-person over an approximately five-week period between July and August 2019. A summary table of the respondents with their affiliations and positions can be found below. Items 1-7 are LRECs. Items 8 & 9 are the third-party organizations.

	Name	Affiliated Organization	Municipality	Position
1.	Raymond van der Stelt	Drechtse Energie	Dordrecht	Treasurer, Board Member
2.	Michiel Roemer	deA (Duurzaame Energiecoöperatie Apeldoorn)	Apeldoorn	Project Leader
3.	Friso Waagmeester	Blijstroom	Rotterdam	Board Member
4.	John Kwaks	Energiefabriek013	Tilburg	Technical Specialist
5.	Arthur Hilgersom	Deelstroom Delft	Delft	Board Member
6.	Bico Fokke	Ecostroom	Amsterdam	Project Manager
7.	Frank Boon	Zuiderlicht	Amsterdam	Director

8.	Thijs Haverkamp	02025	Amsterdam	Program Director
9.	Merian Koekkoek	HIER Opgewekt	nationwide	Program Manager
10.	Ben Olierook Bastiaan de Boer	Greenchoice	nationwide	Account Manager Project Manager

Table 5: List of Interview Participants

3.7 Research Ethics

The research process was conducted with limited assistance from representatives of Greenchoice. They participated in a number of informational interviews in order for the researcher to better understand the local renewable energy landscape and how it functions, and Greenchoice's role in the renewable energy value chain. They further assisted in helping to establish contact with the researcher's chosen study objects.

While this research was conducted independently, it served as a form of market analysis as well. Greenchoice may choose to use or not use the findings of this study at its own discretion However, their limited involvement posed possible consequences during data collection.

During each interview, the researcher made abundantly clear his limited contact with Greenchoice. Upon obtaining respondent permission, the interviews were recorded and the researcher-prepared transcripts were sent to the study objects for review for accuracy. To this end, informed consent was obtained. The researcher has no reason to believe information shared in the interviews were in any way altered due to this limited involvement from Greenchoice.

Chapter 4: Research Findings and Analysis

4.1 Introduction

This chapter presents the results of this research. It is organized in accordance with the operationalization table featured in sub-section 3.2. Presenting the findings in this way also further emphasizes the researcher's intention to integrate the niche dimensions with the four major dimensions of the Transformative Business Model (TBM) in order to assess the transformative potential of the LRECs vis-à-vis their cooperation with Greenchoice. This chapter begins with a description of the case study, and more specifically, to describe commonalities among the LRECs researched with respect to the contextual factors in their cooperation with Greenchoice that they all share. In the main findings, a business model for production-focused cooperatives – including various touchpoints with Greenchoice – takes shape and is described according to the research indicators. These findings are then analysed against the dependent variable: the real-term project contributions to the energy transition, and in which phases of project development are areas of opportunity for cooperation with Greenchoice to potentially expand.

Prior to the commencement of the field data collection, it was initially intended that annual reports from the LREC would be available for use to establish, among other things, dependent variable factual data (e.g., number of projects, number of members, energy generation capacity, etc.). Upon initiating the research, it became apparent that such reports were not available. In fact, the researcher discovered that this data is being collected and reported upon by the third-party knowledge network, HIER Opgewekt which was already identified by the researcher as a desired secondary interviewee. Upon further research, HIER Opgewekt's annual Local Energy Monitor not only provides statistical data vital to this research, its reputation as the number one knowledge network for local renewable energy activities in the Netherlands means that it has become a significant source used by this researcher to describe the contextual factors in play between LRECs and Greenchoice, as well as other actors (e.g., municipalities, homeowners' associations, private roof owners, etc.). The extensive information available from HIER Opgewekt discovered by the researcher after the primary data collection had brought a richness to the qualitative data analysis process. The first-hand observations made by the researcher were in many ways clarified or confirmed by HIER Opgewekt's Local Energy Monitor. To that end, it is referred extensively in this chapter, and the next section in particular.

4.2 Description of the Case Study

The local renewable energy cooperative sector in the Netherlands, according to the most recent measurement, is quantified at 484 active initiatives, of which 200 are project-specific cooperative initiatives, the vast majority of which are collective solar projects (Lokale Energie Monitor 2018). This means that each time a project site was identified and a project realized for that site, including the formation of a cooperative as a legal entity for that site, it is counted as a project-specific cooperative initiative. However, there are LRECs which have more than one active project in its portfolio which manage them directly rather than formulate a project-specific cooperative entity. These two configurations can generally be understood as a centralized versus decentralized organizational structure. While not critical to the research question per se, it is a useful clarification. More detail on this distinction can be found in Section 4.4.3.2: Governance.

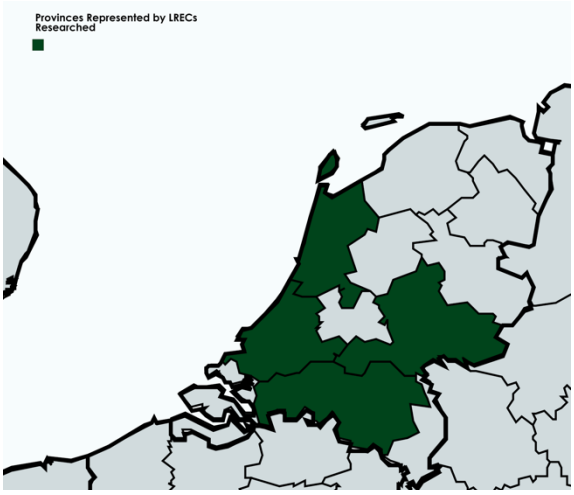

Figure 5: Provinces Represented by LRECs Researched in the Study (clockwise: North Holland, Gelderland, North Brabant, South Holland)

Although seven (7) LRECs were interviewed for this research, they have domain over 32 unique collective solar project sites throughout the Netherlands. For context, there are 314 collective solar projects that have been realized by local energy cooperatives since 2008 (Lokale Energie Monitor 2018). This type of production project is experiencing tremendous growth in popularity, where more than 50% of the energy production capacity of these collective solar projects since 2008 have been realized through projects developed only in the last year. The energy produced from collective solar projects is enough to supply the consumption of 19,000 Dutch households. However, only accounting for 2% of the total solar energy capacity in the Netherlands, such collective projects have room in the market to expand (Lokale Energie Monitor 2018).

	Newly Realized in 2018		Total Realized Since 2008	
	# of Projects	MWp	# of Projects	MWp
Local Cooperative (cooperative property)	+140	30.3	314	58.4
Another initiator with a project cooperative (cooperative property)	+26	2.2	75	6.2
Other initiator: crowdfunding (participation, no property)	+7	4.8	61	9.9
TOTAL	**+173**	**37.4 MWp**	**450**	**74.5 MWp**

Table 6: Collective Solar Projects and Production Realized in 2018 and Cumulatively Since 2008 (Lokale Energie Monitor 2018)

As mentioned in section 3.4.1, LRECs for this research were selected on the basis of: 1.) having a demonstrated business relationship with Greenchoice, and 2.) being situated in an urban area, with the purpose of facilitating a comparison. However, a third unintended commonality emerged as a result of the selection. All LRECs researched make use of an increasingly popular

financial incentive regulation from the national government called the Postal Code Scheme ('postcoderoos regeling' or 'PCR'). In fact, the vast majority (if not all) collective solar projects make use of one of the two financial support schemes made available by the Dutch national government: SDE+ and PCR. HIER Opgewekt's Local Energy Monitor for 2018 counts 247 postal code projects, more than double the amount of the previous year and more than three times as much power (Lokale Energie Monitor 2018). The majority of these projects have power purchase agreements (PPAs) with Greenchoice versus any other energy supplier. Postal code projects account for approximately 80% of Greenchoice's PPA portfolio for collective solar projects. This support scheme has been significant in encouraging the formation of LRECs and collective solar projects as they are known today.

4.2.1 Partnership Model Between LREC and Energy Supplier

Upon initiating this study, the researcher was aware of two partnership configurations between LRECs and energy suppliers. The first model, and the one which forms the intended scope of the study, is where the cooperative designs and implements projects through collective action to purchase solar panels and install them on a rooftop situated within the community. The second model is one where a cooperative overcomes the high requirements to obtain an energy supplier's license and itself becomes an energy supplier, purchasing energy from production-focused cooperatives. However, the researcher learned of a third model not at all related to production, where the cooperative acts as a reseller of energy purchased from an energy supplier, which actually was the foundational partnership model before its decline in popularity in recent years in favour of the first model.

HIER Opgewekt's Local Energy Monitor (Lokale Energie Monitor 2018) explains three methods that solar production-focused cooperatives use:

1. Return Delivery – Solar installations make use of the building's existing grid connection to supply energy both to the building roof's owner and into the electrical grid. The cooperative has no choice in selecting an energy supplier and must work with the one that the roof owner uses.
2. 'Direct Connection' – In 2017, it became administratively possible for cooperatives to make its own connection to the electrical grid and thereby enabling it to select the energy supplier it wishes to sell to. Terms of sale are agreed in a power purchase agreement (PPA).
3. Large Projects – A cooperative is likely to be one of several parties to own a share of one or more solar/wind equipment items of a larger park. Due to the size of the park, only one connection to the electrical grid is possible, and therefore a single cooperative does not have as much decision-making ability on the energy supplier.

Since 2017, the emergence of a model where a cooperative holds its own PPA with the energy supplier of its choice grew to approximately 55% of all solar projects, or more than 75% of the total solar energy capacity produced for sale (Lokale Energie Monitor 2018). This is a brief overview of how the partnership possibilities between LRECs and energy suppliers have optimized from the perspective of LRECs over time. Contact between the two entities increases as the number of project initiatives increase. This project growth is owed in part due to the postal code scheme (PCR), a national government financial support mechanism.

4.2.2 Postal Code Scheme

First introduced in 2014 by the Ministry of Economic Affairs and Climate Policy, and updated most recently in late 2017, it observed the spatial constraints citizens faced in participating in supporting local renewable energy projects, namely that they themselves often did not have suitable conditions on their own property to install solar panels (HIER Opgewekt 2017). The

PCR made it possible for citizens to participate in projects situated on someone else's roof and enjoy the energy tax refund offered to incentivize participation in such projects. Participating investors must reside in one of a cluster of adjacent postal code zones around the project site in order to be eligible for the energy tax refund. This scheme is particularly unique in that it enables citizens with a sense of choice on whether to passively pay a tax or whether to actively spend that same money in a local renewable project (Proka, Hisschemöller, et al. 2018).

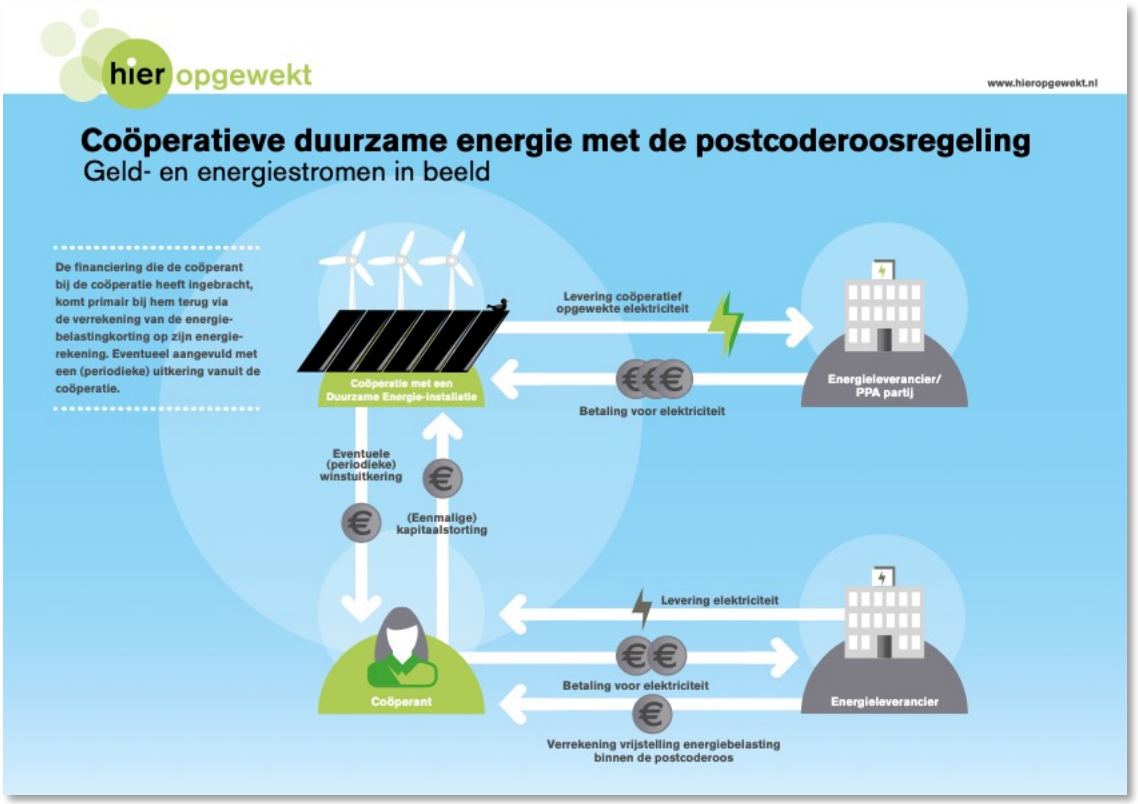

Figure 6: Asset Flow Diagram of a Typical PCR Project (HIER Opgewekt 2017b)

Above is a representation of the asset flows involved in a typical PCR project. The top portion of the diagram illustrates the partnership that was discussed in the previous section: solar energy produced is sold to an energy supplier by way of a PPA. Dividends from this periodic sale to energy supplier is paid toward participant shareholders first towards repaying their up-front investment into the project. Once full return on investment is achieved, any further dividends are enjoyed by the participant as profit. The participant also benefits with their energy supplier as well. If their energy supplier supports the PCR, they are eligible for a refund on the energy tax assessed to them by their energy supplier based on the kilowatt hours generated by their share of the project. Calculations of this settlement require a large administrative effort and coordination between the cooperative who must provide the production data per individual participant and the energy supplier who calculates and effects the settlement on the customer invoice. This scheme is guaranteed by the government for 15 years from the moment the government approves the project.

4.2.3 Phases of Postal Code Scheme Project Development

While a more detailed description of findings from the research is expressed in the upcoming section, key contextual information emerged which shaped the researcher's understanding of the common phases cooperatives experience in the development of a PCR project.

Figure 7: Phases of Postal Code Project Development. Author created from data collection.

Phase 1: Knowledge, Attitude, and Reputation

Cooperatives, especially those which are in a start-up phase, are founded in a neighbourhood context by fellow neighbours where technical or policy knowledge about energy is held by one or two motivated residents. They become aware of PCR typically through word of mouth from other similar cooperatives and begin to acquire knowledge about the details of creating and implementing a project from a combination of word of mouth from other cooperatives and freely accessible knowledge platforms for community energy initiatives such as HIER Opgewekt. While their attitude is pro-active, can-do, and idealistic, their reputation still needs to be built. For cooperatives which already have one or two realized projects in their portfolio already, their ability to acquire another project site is never assumed and thus their focus on building and maintaining their reputation is not underestimated.

Phase 2: Project Site Acquisition

Acquiring project sites is a challenge for start-up cooperatives and established cooperatives alike. With the knowledge and past experiences they have collected through shared learning from each other, cooperatives consider many aspects when identifying a potential site. Two aspects of high consideration are location and spatial dimension. These determine whether the site has sufficient solar exposure, the number of panels it can accommodate, whether the structure underneath (in the case of a rooftop) can support the installation, all of which factor into the potential production yield and therefore inform the cooperative's business case. Of near equal importance is obtaining cooperation from the land or building owner. Because the project installation is under the ownership of the cooperative (and not the land or building owner), these parties must come to agreement. As the policy landscape and financial case stands today, property owners are not easily motivated to cooperate with cooperatives.

Phase 3: Participant Acquisition and Project Operations

With the project site acquired, the cooperative begins a fundraising campaign to acquire participants who are motivated and have the financial means to purchase shares of the project. Unique to PCR projects (as opposed to SDE+ projects) is the requirement that project participants reside within the approved postal code zone cluster. While this does, on the one hand, maintain the local nature and societal embeddedness of the project, it also excludes potential participants on the basis of location. Furthermore, it is not possible at this time to participate in multiple projects that may have overlapping postal code zones, thereby posing a constraint both for expansion of such projects in a locality, and for the ability of that locality to transition more of its energy consumption to cleaner methods in closer proximity to it. As participants are acquired, the cooperative builds an administrative apparatus to manage all of the participant data required both by the PCR and the cooperative's own rules.

Phase 4: Project Realized

When the fundraising campaign is complete, the cooperative now has the financial means to realize the project in practical terms. Activities here include but are not limited to the

purchasing and installation of the solar panels, making the connection to the electrical grid, and activities related to having the project adequately insured. A PPA is established between the cooperative and their chosen energy supplier. The project site is activated, and the production of energy begins. This phase also represents events occurring after project activation, most notably the annual settlement of the energy tax credit for project participants and the administration required by both the cooperative and its participants' energy suppliers.

4.3 Research Findings

Each of the above organizations were interviewed using the independent and dependent variables stated in Chapter 3. The subsequent sections describe the findings collected and organized according to these variables and the associated indicators nested under each (sub-) variable appropriately. These independent sub-variables are used to describe the LRECs as the primary research unit and how their cooperation with Greenchoice manifests within each sub-variable.

Kindly note that the terms 'LREC', 'cooperative', and 'initiative' are used frequently and interchangeably. They should be considered to refer to any or all of the cooperative organizations listed in Items 1-7 in section 3.6 above.

4.3.1 Value Proposition

Of the Dutch LRECs interviewed for this research, it was evident that their motivations for founding their initiatives largely confirmed the motivations derived from the literature review. Apart from Deelstroom Delft, they all observed a lack of genuine action from government at all levels from national down to municipal with regard to supporting renewable energy projects. When asked what the motivation was for forming their cooperative, the board member from Blijstroom characterized the role it plays in occupying the vacant space left open by the Municipality of Rotterdam:

> *It was mostly maybe 10 people getting together in a place in Rotterdam Blijdorp. And they were just not satisfied by the way that Rotterdam [government] was not picking up the sustainable development goals with respect to energy. And they said, "If the gemeente doesn't do it, then we have to do it ourselves. And we take control. We organize ourselves and we will be in charge of our own energy source, energy consumption, et cetera." And that was a big idea. And then they were looking for ways to do it. (Respondent)*

While this sentiment is shared by deA in Apeldoorn, credit for the formation of that cooperative is due to its founder having previously worked in the municipality and experienced first-hand how much was being done on paper, yet how little was being done in practice to advance the energy transition. More interestingly is in the case of Deelstroom Delft, where the municipality there appeared to take a considerably more proactive attitude toward its climate and sustainability goals. The municipality solicited for a study in 2016 to determine the

Figure 8: Solar Panel Project 'Stadskantoor' by cooperative Deelstroom Delft containing 300 solar panels producing energy for over 70 households from the rooftop of the municipal office of Delft. (Source: https://deelstroomdelft.nl/we-produceren-lokale-zonne-energie/)

possibility of an energy cooperative being formed there, which motivated Deelstroom's co-founder to respond and work collaboratively with the municipality to form Deelstroom one year later in 2017. In all LREC cases – and confirmed by the respondents from the third-party organizations – what was meant by taking actions as citizens was to form a cooperative legal entity with the express purpose of generating their own electricity locally through collective solar panel projects.

Figure 9: Greenchoice headquarters in Rotterdam. Author's own photography.

Greenchoice demonstrates its alignment with the value propositions of these cooperatives through its motto, '*duurzaam dichtbij'* translated roughly as 'sustainably close by'. One of the respondents from the team within Greenchoice focused on LREC relations, the only team of its kind among the largest energy suppliers in the Netherlands, describes their motto in more detail:

> *It's more or less that the big picture is that solar panels are a no-brainer. But if you can do it on your own roof on your own home, that's best. But there are a lot of people who don't have the possibility. So, let's at least make it as close as possible – on the corner of the street or wherever. And if you can't do it on your own, do it together. And doing it together is more or less our team. (Respondent)*

Considering the Dutch energy supply market is open and competitive, this alignment of value proposition is a top consideration for LRECs to select Greenchoice as its energy supply customer. This is explored further in the data analysis section with regard to *sector structure*.

4.3.1.1 Organizational Logic and Structure

The organizational logic for all LRECs interviewed is generally the same. It is formed by a small group of between 1 and 10 residents living in proximity to each other. Typically among the founders is someone with a technical background in engineering. A cooperative legal entity is formulated with all requisite statutes (e.g. articles of association) and other legal agreements, along with a board comprised of an odd number of the founders (to prevent ties when matters are brought up to a vote) on a volunteer basis. Membership to the cooperative is gained through either one of two channels: passive or active.

For a nominal fee ranging from approximately 1 to 25 Euros per year, one can become a general member, which gives access to all of the cooperative's events, namely the periodic 'member nights', as well as to receive regular electronic or paper mail communications from the cooperative. This is a low-cost means for anyone in the Netherlands interested to support the

cooperative financially who may otherwise not have the means to support it in a more significant way.

The more impactful means for membership is by becoming a participant or investor through the purchase of 'shares' of one or more of the cooperative's collective solar generating projects. Shares is a general term to describe the purchasable units made available by cooperatives. For instance, Blijstroom sells 'panel parts'. As nearly all 37 collective solar project sites under the domain of the cooperatives interviewed for this research are postal code projects, participation is restricted to residents in the postal code zones in proximity to the project.

In the case of some cooperatives, there is a third way to gain membership. Cooperatives such as deA and Blijstroom act as sales channels for Greenchoice. Anyone in the Netherlands who is interested to change their energy supplier to Greenchoice can do so through a cooperative's unique sales portal (which can be often found on the website of the cooperative). For each customer gained through the cooperative's sales portal, Greenchoice pays the cooperative a referral fee. According to the Greenchoice respondents, this is a rather valuable revenue stream for newer cooperatives in their start-up phase who have not yet realized their first project yet. While none of the cooperatives interviewed for this research indicated whether this was useful during their start-up phase, they all, to a limited extent, make use of this revenue stream now. Most cooperative respondents stated that while they feature affiliate links to Greenchoice on their own website, they do not actively promote this with their current and potential members. It has been theorized by Greenchoice, and echoed to an extent by HIER Opgewekt, that cooperatives value more the desire to do as much as they can on their own. This focus comes at the cost of Greenchoice's role as a cooperating partner being minimized in the public sphere.

All LRECs interviewed were asked to reflect on their challenges, to try to prioritize them, and to brainstorm on whether they had ever considered Greenchoice to be in a position to assist them on addressing their challenges. The responses were almost exclusively related to the operations and new business aspects of their organizations. The second most common niche dimension where LRECs cite challenges is *sector structure*. And challenges covered under *policies and political power* are less so and believed to be addressed as a consequence of mitigating the more priority organizational challenges. These challenges will be elaborated below in their appropriate sub-sections.

Operational Challenges

From his experience working closely with Amsterdam-based LRECs both in individual and group settings, the respondent from third-party organization, 02025, describes the strong and weak suits of the typical founder of an LREC as being very good in determining the best solution and designing a project for it. However, they are typically not inclined to work on the legal and administrative aspects of their organizations. Formulating statutes is a legal requirement for a cooperative entity and is an operational task that is often outsourced to someone more knowledgeable. While Greenchoice offers this knowledge, cooperatives tend to seek assistance from within – either from another more established cooperative or to the public resources available by third-party knowledge platforms (e.g., HIER Opgewekt, 02025, etc.)

When asked whether cooperatives think the postal code scheme is effective, the respondent from HIER Opgewekt responded that the regulation requires a significant administrative effort between cooperatives and energy suppliers. Respondents from all interviewed LRECs detailed the high level of effort required of them to report the requisite production data and investor share allocation data to the investor's energy supplier, who then uses this information to settle the energy tax credit earned via the customer's invoice. In all LREC cases (except for

Zuiderlicht where its project participants and consumers are separate and consumers are required to be Greenchoice customers), a project participant can also be a customer of any energy supplier allowed by the PCR. This means that a cooperative must report this data to a multitude of energy suppliers, all of which have rather distinct procedures; and thus making for a significantly time consuming and error prone task. Of the approximately more than 45 energy suppliers in the Netherlands (Kuijper 2019), 21 of them are known to currently support their customers participating in postal code projects (HIER Opgewekt 2018b).

One LREC interviewed reflected on a time where he was informed by Greenchoice that it performs all the administration for cooperative postal code projects. However, in practice, the respondent felt that the level of effort to report to Greenchoice was no less than that required in reporting to any other energy supplier.

> *When we started to discuss with [Greenchoice] about a postcoderoos project, they said something like 'We do all the administration' … 'I just send you the format and with the data and you just send the bill'. If that's it, then I don't see much benefit to us. I thought I just picked the key numbers and they do everything. But I do 90% in my view. (Respondent)*

When asked whether Greenchoice administers the postal code scheme to its project participants, one cooperative replied:

> *No, we do that on our own…Every company has its own way of feeding the information. Some will have paper. Another will have an Excel sheet. And maybe somebody else would like to upload something on their portal or something like that. So, we do the administration on our own. (Respondent)*

Respondents from Greenchoice believe that, because of their experience gained through the significant share of postal code projects to which they are party, they are the energy supplier with the most efficient procedure for postal code project administration. However, the majority of LRECs interviewed describe or confirm some level of fragmentation in the procedures required by each energy supplier.

While postal code project administration is the administrative task where coordination with Greenchoice is most significant, there are other administrative tasks assumed by cooperatives, namely having to do with managing a new project. These tasks include, but are not limited to coordinating with the owner of the roof (along with any other parties with any other legal interests to the building or ground underneath the building), the solar panel installation vendor, the electrical grid operator, and the insurance company. Additionally, customer relationship management is a major administrative task which is, according to one respondent's personal experience, a time requirement of approximately 50%.

"We are looking for the next roof. And we are always searching for a new roof."
-Drechtse Energie

"The main challenges are, first, getting a roof. That is really hard. Getting a roof owner who wants to give the roof for 15 years."
-Blijstroom

"But also trying to convince the owners to participate… to make [the roofs] available. You don't get a lot of money for it… But, what other arguments do you have to convince someone that he has to let us use his roof? There's not much to gain for him."
-Energiefabriek013

"I think roofs is the biggest thing that they are looking for."
-02025

Customer relationship management (CRM) includes the facilitation of member agreements for new members, account management with shareholding participants inquiring about the performance of their solar panel investments, and to document customer contact moments wherever possible. Some cooperatives utilize the popular American CRM software, Salesforce. And in

recent years, two major domestic CRM solutions tailored to local energy cooperatives have entered into the market: Voorstroom and Econobis. The majority of LRECs interviewed are current clients of one of these two applications. Greenchoice has an affiliation with Voorstroom (Lochem Energie 2017). The respondent from the cooperative, Ecostroom, spoke about Voorstroom at length and mentioning that Greenchoice had invited it to Voorstroom's beta testing program. While Greenchoice is not in the business of building solutions for cooperative administrative tasks per se, it was interesting to learn of its affiliation with Voorstroom.

New Business Challenges

Once success in a cooperative's first project is realized, there is much enthusiasm to apply the knowledge learned from that experience into subsequent projects. However, there are several limitations that cooperatives face that are largely outside of their control. When asked to prioritize their challenges, the number one challenge cited most frequently is securing the project site. Depending on the cooperative's desired model, a rooftop needs to be sufficiently large to accommodate enough solar panels (and strong enough to support the weight) in order for the project to achieve large enough income to sufficiently recover the upfront costs.

Studying the project sites of the cooperatives interviewed for this research, the most common building types used were schools, industrial buildings, and municipal-owned buildings. Increasingly, project sites are being realized on residential blocks managed by housing associations (VvE). While schools have proven to be ideal sites because they bring a captive group of parents who are not only supportive of their children's school serving as an example for sustainability, but are also eager to join the cooperative as either members or investors, convincing the owners of these other building types has been more challenging. It was often cited by the cooperatives that negotiations with roof owners of industrial buildings required significant time commitment without any guarantee that the roof owner would stay committed to the discussion. The respondent from Zuiderlicht details his experience:

> *But, getting rooftops is still the main obstacle. Getting in touch with people who have a roof is OK. But, within the process of meeting someone – a roof owner – and getting to the point where he agrees to put solar panels on his or her roof for 15-20 years. That process – there are a lot of intermediate steps where the owners fall out. It's too long. (Respondent)*

The Zuiderlicht respondent further mentions that such roof owners raise concern for other maintenance needed on their roofs (e.g. replacement of water sealing) as reason to not cooperate in the moment. Other owners stated that their roof would increase in value the longer they waited to cooperate. And as mentioned by the respondent from Energiefabriek013 in the quotation box above, cooperatives feel that they lack sufficient tools to make a proposition to roof owners that are worthwhile. And as for housing associations, the homeowners need to reach majority consensus internally on the matter of solar panels on their rooftops. Cooperatives are faced not only with singular obstinate owners of industrial rooftops but also with certain homeowners who can prevent a vote from passing.

Greenchoice is apprised of this challenge. It estimates that there is nearly 900 km^2 of suitable roof surface for solar panels in the Netherlands, of which only 4% are used for this purpose. Earlier this Spring 2019, it launched a national awareness campaign 'Cracking Roofs' *('Daken Kraken')*, highlighting to Dutch residents the high potential for rooftop solar energy and encouraging them to use an interactive online map to indicate rooftops where they would like to see a solar project. The rooftops with the most votes earn 500 Euros towards a solar project being realized there (Greenchoice 2019).

Respondents from cooperatives were asked to reflect on the Cracking Roofs campaign. Many were aware of it. Though, they seemed unclear as to its purpose, owing to the fact that they did not receive any prior notice from Greenchoice about the campaign and its intended purpose. Greenchoice stated in its interview that one of the intended purposes of the campaign was to connect citizens to the local cooperatives operating in their locality, it was easily misunderstood by some cooperatives as an effort which gave the appearance of competing with cooperatives' own outreach efforts.

> *So, I don't know if we are involved in this campaign. And, I don't think that's a good thing. I think they should contact us. [Greenchoice] should call me and say, 'Hey, we are going to do this campaign. And, of course, we want to work with you.' (Respondent)*

The realm of marketing (which can also be referred to as outreach or recruitment) is where both Greenchoice and cooperatives feel a strong cooperation can take place. It is believed by all respondents that Greenchoice has a significant customer base whose ideals align with that of cooperatives and could be recruited as general members or investors in postal code projects in their pipelines. Greenchoice actively makes efforts to inform its customers residing in postal code zones where new projects are in the works. Recruiting new participants for upcoming projects was frequently cited by cooperative respondents as their second priority. However, some cooperative respondents mentioned that their public communications activities are typically performed by member volunteers who may receive modest stipends for their time contributions to the cooperative. Also, the respondent from Blijstroom cautioned that there is a difference between an energy consumer with ideals that align with a cooperative, and a consumer who has the financial means to participate in a project.

> *And then the second challenge is to find members who want to pay from 200 to 4,000 Euros for the panels. And then they get the money every year, of course. But they have to pay up front and get it back in fifteen years. (Respondent)*

Although on the other side of the coin are cooperatives which had not even considered Greenchoice as being able to help in their recruitment efforts. This suggests that while Greenchoice has capabilities useful to cooperatives, it is incumbent on cooperatives to ask for assistance. Whether this happens can be explained in large part in the next section below on *cultural symbolic meanings*.

4.3.1.2 Cultural Symbolic Meanings

'de energietransitie dat zijn wij!'

The above quotation is translated as "We are the energy transition!" It is the motto featured in HIER Opgewekt's Local Energy Monitor 2018 report to describe the citizen call to action to participate in the local renewable energy movement. Cooperatives along with each of their project initiatives are the physical manifestations of collective action for social good. Their motivations have been discussed at length in the previous sub-section on value proposition. Cooperative respondents discussed in their interviews about the many ways it proactively keeps their membership informed about their activities and also actively solicit internally for members who would like to join the board. Transparency and openness in their operations and decision-making is seen as an asset to maintaining the trust of its current members while also attracting new members who want to feel a genuine sense of participation in an organization formed in their own community.

When asked to describe their satisfaction with the relationship with Greenchoice, cooperative respondents all responded positively. Not only did they feel that their account manager at Greenchoice was easy to reach, their requests were handled by Greenchoice in a timely manner. Respondents also described having little hesitancy to discussing challenges or new ideas with Greenchoice. Though, some respondents appeared to be responding this way as if it were a hypothetical situation, indicating that although they had not actually discussed matters not related to the PPA with Greenchoice before, they were open to doing so.

Third-party respondents added a new dimension to this dynamic. The respondent from HIER Opgewekt commented that cooperatives have a reputation for evoking a high degree of self-reliance:

> *Cooperatives tend to want to do it on their own. (Respondent)*

All seven cooperative respondents were polled through an online questionnaire after their interviews inquiring, among other things, to rate their level of agreement with this statement as it relates to their own organizations. The responses partly support this characterization.

Please rate with how much you agree with the following statement: *"My organization would like to do as much as it can on its own."*	Totally Agree	3
	Somewhat Agree	2
	Neutral	1
	Somewhat Disagree	1
	Totally Disagree	0

Table 7: Post-Interview Survey Question Exploring Cooperative Desire for Self-Reliance (n=7)

The respondent from 02025 contributed further with his opinion that cooperatives can use all help available to them. But, they are also selective on where they feel comfortable seeking it. And while Greenchoice performs to a cooperative's expectations of any energy supplier, they do not necessarily consider it enough of a peer due, in some degree, to their difference in size.

> *If someone has a larger stake, it's always scary to work together. And most of these energy cooperatives are really strong and knowledgeable. But, they also seem to think they [themselves] are quite small. Because they started small and they work with narrow margins. So, it's scary to work together with a big party like Greenchoice. (Respondent)*

While the vast difference in size may be an issue, Greenchoice's status as a commercial entity clearly poses no effect to cooperatives according to post-interview polling data:

Greenchoice's status as a commercial energy supplier influences my organization's approach to cooperating with them:	Positively	0
	Negatively	0
	Their commercial status does not make a difference.	7

Table 8: Post-Interview Survey Question Exploring Whether Greenchoice's Commercial Status is an Influential Factor in Cooperation (n=7)

However, the results of a post-interview question concerning cooperatives' openness to an expanded role for Greenchoice in their organizations similarly tracks in the middle just as with the earlier question exploring their independent attitude:

Please rate with how much you agree with the following statement: *"My organization would like to see Greenchoice play more roles for us."*	Totally Agree	0
	Somewhat Agree	2
	Neutral	4
	Somewhat Disagree	1
	Totally Disagree	0

Table 9: Post-Interview Survey Question Exploring Cooperative Interest in Expanded Role for Greenchoice (n=7)

Referring back to Greenchoice's motto of 'sustainably close by' and their position that the energy transition is achievable by all parties working together, they state this position rather publicly in much of its external communication. And while this may grant them a competitive advantage in securing PPAs with cooperatives, Greenchoice is perceived by them in an almost strictly business sense. However, one of the third-party respondents mentions that many of Greenchoice's actions and contributions happen behind the scenes and therefore do not get acknowledged by cooperatives.

> *What I really like about Greenchoice is that they don't have to be in the front of everything. So, they put the energy cooperative first. And they also let the energy cooperative use their own logo and own communication. And they do a lot…in the background that a lot of people don't know about. But, they also don't brag about it. So, I really like that attitude about them. (Respondent)*

4.3.2 Product or Service

All cooperatives interviewed except for Zuiderlicht[1] have project portfolios that are exclusively collective solar rooftop projects. Each of these projects is designed in-house or by an independent project manager, typically with an engineering background, who brings the project idea to the cooperative. After researching all associated up-front costs to realizing the project, a business case is developed and shared with the roof owner for agreement. Once agreement has been achieved, the cooperative initiates a campaign to recruit investors to purchase shares of the project. Once the campaign concludes and the project is fully funded, installation of the panels and the connection of the site to the electrical grid begin. It is at this stage where an energy supplier is identified to which the generated electricity can be sold and subsequently resold to its customers. This agreement takes a contractual form called a Power Purchase Agreement (PPA). The revenue earned through the PPA represents the single-most significant revenue stream for the cooperative. The project is considered fully realized and the cooperative seeks to replicate it elsewhere according to 1.) wherever it can find a desirable project site with a supportive roof owner, and 2.) a postal code cluster where the cooperative knows demand exists for a project. On this second point, a cooperative can easily gauge demand based on how quickly the shares of a previous project serving the same postal code zones were sold. If demand exceeds supply, the cooperative typically maintains a waiting list if another project is in the pipeline or if a participant on an active project wants to sell his or her shares and exit the project.

[1] Zuiderlicht owns a 10% share of an aging wind turbine in Flevoland with other LRECs. The thinking behind this purchase is that it allows Zuiderlicht entry into the Zeewolde Wind Park, the largest onshore wind farm in the Netherlands, where the business case for entering late into the turbine's expected lifespan was good. It is expected that this wind farm will undergo a full replacement with new and larger turbines with more generation capacity.

When asked whether any signs of competitiveness could be observed in places where cooperatives may have overlapping jurisdictions or postal code projects in their pipelines which share eligible postal code zones, the respondent from third-party organization 02025 stated that he has been observing not only small signs of competitiveness, but the formation of project specialities:

> *What we see is that they start to move into niches. So, Ecostroom in Amsterdam. I think it's by coincidence. But, they are quite good at turning business and office roofs and put solar panels on them. We see Zuiderlicht develop a specialty with schools. And Amsterdam Energie told us that they like to focus on the small VVEs. Because there are plenty of them [VVEs] in Amsterdam and in loads of urban areas. But, it's quite hard work before you get something. And, it's just a few solar panels. So, we see that they move into niches. (Respondent)*

4.3.2.1 Technology and Infrastructure

The cooperatives interviewed for this research represent a prevailing business model to design and implement collective solar projects. This model appears attractive for several reasons, perhaps most significant is the ability to realize a project without outside investment (as compared to a wind turbine). The barrier to entry to the latest 'fourth wave' local renewable energy project market is considerably lower, leading to the founding of cooperatives almost purely based on ideals. An accessible knowledge base of third-party organizations and other similar cooperatives enable new initiatives to become quickly oriented to the process of realizing a collective solar project, and thus making the endeavour more inclusive than other technologies like wind and district heating, which still require more specialized technical expertise.

Collective solar projects also appear attractive in the sense that local support for them is generally high in terms of the number of members each cooperative has reported in this research as well as in the positive feedback from their members. And perhaps while not unique to collective solar projects, renewable energy projects at the local level enjoy generally positive support by the mere fact that participating residents can see their financial contributions in action in their own neighbourhoods. The characteristic of closeness these types of projects have to residents place the cooperatives who are responsible for them in good favour as local actors working for local interests.

Even according to the cooperatives interviewed that have two or fewer realized projects, when asked to reflect on their future plans, there were reports of interest in pursuing other technological initiatives such as electric vehicles or power storage. However, in all cases where this was mentioned, it was qualified by saying that these were still only ideas. Cooperatives appear to take a passive approach, waiting for volunteer members to bring forward not only the idea but also the study of its feasibility. Until more resources are available or the administrative workload on the 'core business' is made more efficient, time is in short supply for volunteer-operated cooperatives to pursue these other technological innovations in earnest.

4.3.3 Value Architecture

The method of value created by the cooperatives interviewed are nearly identical in terms of the partnerships they create both internally and externally to develop collective solar projects. The details of how cooperatives arrange their partnerships is explored in further detail according to the niche dimensions of **user practice, governance, sector structure, and policies and political power** in the following four sub-sections.

4.3.3.1 User Practice

As described above in sub-section 4.4.2.1, collective solar projects are seen rather positively as a local solution with local benefits to address a larger societal imperative to make an energy transition. However, supporting them in conversation and supporting them through meaningful financial contribution (as briefly covered in the 'new business' section of sub-section 4.4.1.1) are different. Proka, Beers, et al 2018 characterizes this niche dimension as whether individual cooperative members consumed energy more conservatively themselves as a result of holding membership. Because user practice or behaviour was not a focus of this research, the understanding of this dimension is modified slightly to represent the level of motivation for residents to participate as project shareholders.

To that end, cooperative respondents often cited their awareness of Greenchoice's ability to mobilize its customer base residing in areas where its partner cooperatives have projects in mind and needing investors. In some cases, they reported that although they did not yet need outside help to recruit investors, they were aware Greenchoice was willing and able to help. Others who did utilize Greenchoice for this recruitment help described their positive experience:

> *They are also sending e-mails. If we have a new project in one area, they always will send to all their customers in that specific postcode area, 'You can join Ecostroom'. And we always receive 100 new members. Well, it depends. (Respondent)*

4.3.3.2 Governance

Similar to the previous sub-section, governance was also not a core focus of this research. However, interviews confirmed that the cooperatives share similar governance models with each other. General membership can be achieved through a nominal annual fee. A general members meeting is convened approximately twice per year where the board presents on two general themes: project accomplishments and new initiatives, and also financial performance. Also in this forum, decisions are brought up for a vote by the general membership. The board of each cooperative has a minimum of three seats for the core positions: 1.) President 2.) Secretary 3.) Treasurer and at least two additional seats. In some cases, an operations team is installed underneath the board where day-to-day project management and new business activities take place.

Different cooperatives interviewed for this research were found to have different structures with respect to the relationship between the cooperative and its projects. In some cases, such as with Drechtse Energie and Zuiderlicht, a centralized model is employed where despite however many projects are realized, there is only one board. The financials for all projects are managed together in an integrated way, and shareholding participants earn according to the performance of all projects in the cooperative portfolio despite holding shares in one project site.

More commonly observed was a decentralized model, such as with Energiefabriek013, Blijstroom, and Ecostroom, where each realized collective solar project has its own board and operates as a distinct legal entity to the 'mother' cooperative. This ensures more autonomy at the project level and perhaps more representation of the interests of the individual shareholding participants of that project. Project-level boards can make adjustments to their business model as they see fit.

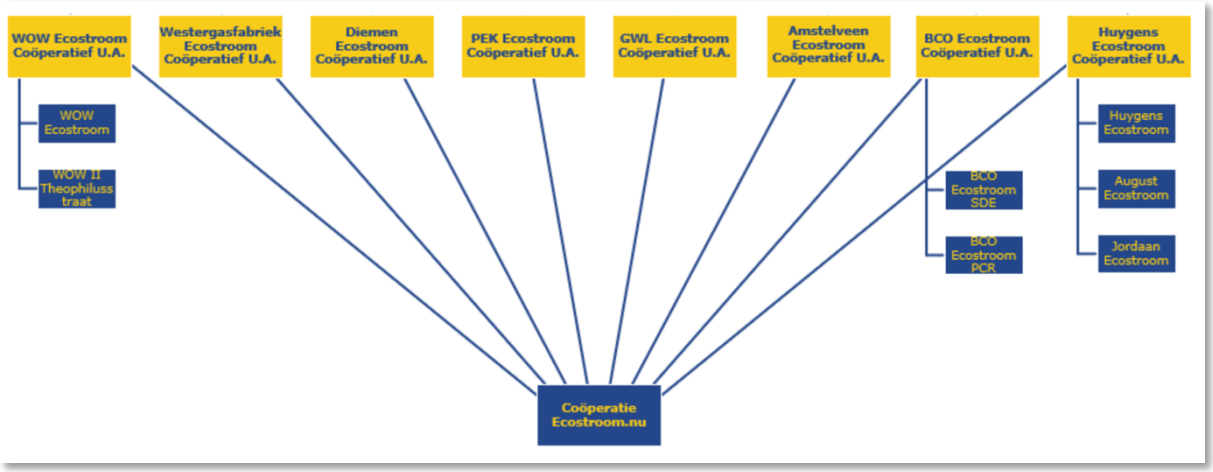

Figure 10: Example of Ecostroom's decentralised organizational structure where each project cooperative operates as its own distinct legal entity to the mother organization (Ecostroom.nu 2019).

The discussion on governance on this research has relevance with respect to how Greenchoice interacts. Legally speaking, the power purchase agreements (PPAs) are created at the project level regardless of whether the cooperative decides to govern the projects in a centralized or decentralized manner. It was cited in interviews of cooperatives employing the decentralized model that a project-level board being able to renegotiate terms with Greenchoice directly provided the participants of that project an additional sense of ownership.

On the other hand, the role of Greenchoice at the project level is constrained to one dimension – as a power purchaser. As it concerns postal code project administration, Greenchoice typically has one point of contact with each cooperative who manages the production data of all projects regardless of whether they employ a centralized or decentralized model.

4.3.3.3 Sector Structure

According to Greenchoice's respondents, their organization (unlike other energy suppliers) offers a variety of services to cooperatives which are particularly helpful during their start-up phase. Start-up support includes advising on the development of a new cooperative's statutes, governance structure, and working together on their first business plan for the first project they want to develop.

However, none of the cooperative respondents were able to contribute any first-hand experiences of these Greenchoice start-up services themselves, as they were able to get started on their own or with the help of the broader local cooperative sector. However, questions intending to identify the challenges currently of these cooperatives yielded more information. These findings have been detailed in sub-section 4.3.1.1 on organizational logic.

Particularly with respect to new business challenges, the respondent data was rather clear that these challenges fall into one of two categories: acquiring project sites and acquiring participants for projects. Cooperative respondents more often associated Greenchoice as being able to help with the participation challenge, while only the respondent from Zuiderlicht considered the possibility that Greenchoice could be helpful with acquiring project sites. The reason for this is not entirely clear. On the one hand, the respondent data indicates consistent awareness in Greenchoice's ability to mobilize its customers to consider participating in upcoming cooperative project initiatives in their postal code zone. However, there was no respondent data available to determine any level of perception that Greenchoice is similarly capable of attracting property owners to make available their rooftops for collective solar

projects. From the perspectives of cooperatives, the challenge of acquiring project sites requires local knowledge, which large organizations like energy suppliers simply lack.

The 'Cracking Roofs' campaign was Greenchoice's attempt to create more interest and momentum among property owners to consider cooperating with their local cooperative on a project. The shortcomings of this campaign according to the perceptions of cooperatives are detailed in sub-section 4.3.1.1. However, Greenchoice's response to the critical comments from some cooperatives indicated that the territorial boundaries of the sector appear to be in development.

> *We are continuing to find the sweet spot between their local role and our national/regional role and the combination. And what's the best story that also our customers who are their members understand who is who. But that's a continuing thing. (Respondent)*

The issue of Greenchoice and other energy suppliers conducting activities at the local level arose a number of times by cooperative respondents. Often cited by respondents was an example where employees of Greenchoice formed their own cooperative in Rotterdam, the city where Greenchoice is headquartered. Another example cited by the respondent from HIER Opgewekt was an initiative (since discontinued due to unprofitability) by Eneco to set up local energy cooperatives of its own. Such initiatives by large energy suppliers at the local level were perceived by at least one cooperative respondent with peculiarity.

4.3.3.4 Policies and Political Power

In a somewhat related fashion to the previous sub-section on sector structure, this sub-section discusses findings related to a cooperative's external relations with the wider sector and how its affiliation with Greenchoice has the potential to affect it. When asked whether being affiliated with Greenchoice helps, hurts, or has no affect their image, cooperatives responded that the affiliation is helpful, though to varying degrees. And while Greenchoice is the only Dutch energy supplier in its class of large energy suppliers with 200,000 or more customers (Kuijper 2019) independently evaluated to be among the most sustainable, its ranking falls when compared to other smaller more niche energy suppliers (Consumentabond, Greenpeace, Natuur & Milieu, WISE 2018). Cooperatives and third-party organizations alike cite this annual sustainability ranking of energy suppliers to be a factor of some importance in how Greenchoice is viewed by their membership. This is to say that while Greenchoice has a positive reputation as defining its position publicly in support of the energy transition since the company was founded as an energy supplier after the consumer energy market was liberalized in 2004, it now has competition and is thus being judged more critically.

"Yes, I think Greenchoice has a very positive image."
-deA

"I think it is helping [our image]. But not a lot."
-Blijstroom

"It helps [our image]. It's OK."
-Deelstroom Delft

> *There are only a few companies that are really popular with energy cooperatives. And Greenchoice is one of them. That's something they earned. (Respondent)*

Regarding the question of prioritizing its challenges, the respondent from Energiefabriek013 offered a unique perspective on its motivation to grow its membership. Since the cooperative's founding in 2013, the board's focus was for the cooperative to be able to build its reputation based on the success story it could tell from its first project. However, in the last year, he reports that the board has since shifted its priority to growing its membership not only for revenue purposes, but because it feels that the appearance of being a large organization could yield

more influence, particularly with the municipal government. He further reports that the board lacks a strategy for capturing new members. Though, the ideas being discussed in this regard have more to do with improving the content and appearance of its external marketing and communications, without any mention of Greenchoice. It is not clear though from this research whether a cooperative's affiliation with Greenchoice has any effect on its ability to attract and retain members.

4.3.4 Valuation Method

Among the background questions asked in the interviews with the cooperatives were ones concerning costs and revenues. While there are some small variations in how cooperatives use the postal code scheme for its projects, the line items are largely similar. Below is a table of indicative line items. It is not meant to be an exhaustive list, but only reflects what was uncovered during the interviews.

Costs (General and Administrative)	Staff (e.g. consultants, legal advisement, etc.)
	Office Rental
	Communications
	Events (e.g. general member events)
Costs (Project-related)	Legal Fees
	Site Feasibility Evaluation
	Equipment Purchase
	Grid Connection
	Insurance
	Periodic Maintenance
Revenue	Energy sale to energy supplier (Greenchoice)
	Referral fees for every new Greenchoice customer
	General membership fees

Table 10: Illustrative Cost and Revenues for a Cooperative. Author created based on primary and secondary data.

It is not the intention of this research to go into greater detail about the financial standing of the cooperatives interviewed. However, a general observation can be made on the challenges that cooperatives face in maintaining the financial viability of their organizations when they are not profit-seeking and set their 'prices' so to speak for project shares and general membership on a cost recovery basis and a timely return on investment. An emerging theme arising out of the interview with respondent from third-party organization, 02025, was this idea that profit margins for cooperatives have historically been rather thin and that the growth projections for outyears have not been met. They appear to be as thin now as they were when the cooperatives were founded several years ago.

Considering that power purchase agreements (PPAs) are the only formal mechanisms in the production partner model being researched that brings together energy cooperatives and energy suppliers, this study had an a priori expectation that not only the PPA rate but also the cooperative's perception of the fairness of that rate is an influential descriptor of the nature of cooperation between them. When asked whether they considered the PPA rates offered by Greenchoice to be fair, all cooperative respondents responded affirmatively. Some further explained the rate construction logic that Greenchoice uses, which is more or less the average rates being offered by the three largest Dutch energy suppliers: Essent, Eneco, and Nuon. Respondents described the PPA negotiation process to be transparent and straight-forward. The respondent from third-party organization, 02025, posits that Greenchoice's profit margins are similarly thin to that of cooperatives. On the other hand, respondents from Greenchoice report the impression that cooperatives perceive Greenchoice as having a lot of money and could afford to offer better rates.

> "They [cooperatives] always think that, in the end, we are a company making a lot of profit. I really have to convince them that this isn't the case. And our proposition is really a hard negotiation [internally]. But they still think there is a lot of money…I think that being a commercial entity is not [necessarily] being evil. We really believe that we are a social enterprise."
> -Greenchoice

4.3.4.1 Knowledge Base

Growth of the local renewable energy cooperative community is currently experiencing a surge owing in large part to the postal code scheme and the high degree of replicability of postal code projects. This replicability is made possible in part by the knowledge publicly available for anyone of any experience level considering to attempt a collective solar project in their neighbourhood. Greenchoice has an interest to support such projects in order to further realize its own mission to provide sustainably and domestically produced energy to its customers. Among the soft services that Greenchoice states that it provides to cooperatives in a start-up phase is advisory support in the areas of setting up its statutes and reviewing the business case for their first project. It further claims that it can be a knowledge source for other non-solar technologies that a cooperative might be interested in pursuing, such as wind and biogas.

Cooperative respondents were asked whether Greenchoice played a role in providing new knowledge in any aspect of their organization. None of the respondents could cite a situation where Greenchoice added any knowledge value. Their perception of Greenchoice is, first, as their energy purchaser. For new knowledge, cooperatives would prefer to inquire within their own niche community or to HIER Opgewekt. As it turns out, the respondents from Greenchoice informed that it was a strategic decision more than seven years ago to become one of HIER Opgewekt's main sponsors, and is therefore playing an indirect role in supporting the knowledge base for cooperative initiatives and building capacity. The respondents from Greenchoice expressed disappointment that cooperatives do not realize that Greenchoice supports knowledge sharing and capacity building through their affiliation with HIER Opgewekt.

4.3.5 Contributions to the Dutch Energy Transition

Data from respondent interviews, information available on the websites of cooperatives, and from HIER Opgewekt's Local Energy Monitor inform the following table below which represents the answer to Sub-Q3.

The seven cooperatives participating in this research together with Greenchoice have added 22 postal code scheme collective solar projects, over 3,000 members, and nearly 4 MWp of electricity to the energy transition. All but one project was realized in the last two years.

	# of Projects	# of Members (incl. Shareholders and General Members)	Production Capacity (kWp)
Drechtse Energie	2	475	249
deA	3	900	208
Blijstroom	2	140	100
Energiefabriek013	1	250	205
Deelstroom Delft	1	170	91
Ecostroom*	11	485	3039
Zuiderlicht^	2	750	52

* Ecostroom does not have individual general membership, only project participant shareholders.

^ Zuiderlicht has a total of 11 projects, 2 of which fit the scope of this study (PCR projects). It is believed that Zuiderlicht's other projects use the SDE scheme and are thus required to work with the energy supplier that the roof owner uses, which may or may not be Greenchoice.

Table 11: Contributions to the Dutch Energy Transition Made by Seven Cooperatives in Coordination with Greenchoice since 2014.

4.3.6 Summary of Findings as Related to Sub-Questions

Sub-Q1

Although the motivations of cooperatives and Greenchoice are aligned with respect to growing the local sustainable energy movement in terms of production capacity and membership, the nature of their cooperation has a decidedly business-like orientation. Therefore, the level of cooperation is rather limited according to the limited perceptions cooperatives have for Greenchoice as little more than its client purchasing energy produced from its local projects. The relationship is still rather new, only taking shape as recently as two to three years ago with the emergence of the postal code scheme. While Greenchoice appears to be a good fit for cooperatives' business models in the arena of PCR collective solar projects, they continue to explore what the other is willing to stake in terms of future project opportunities. Cooperatives consider it a good idea to discuss more of its ideas with Greenchoice, but have done so inconsistently in practice. For its part, Greenchoice appears to have a more opportunistic attitude in working more closely with cooperatives, though does not yet provide a compelling reason for cooperatives to share with it their domain over local activities (and the challenges that come with it). Offering some kind of direct skill or capacity development training or strategy-building opportunities could be effective ways Greenchoice could bring cooperatives closer in a partner orientation.

Sub-Q2

Cooperation between cooperatives and Greenchoice have been enabled heavily through policy. Realizing PCR collective solar projects requires an entity to have an energy supplier's license, the requirements for which generally exceed the capabilities of most cooperatives. They are drawn to Greenchoice as an energy supplier with a good image, solid administrative capabilities, whose ideals align with their own, and are financially stable.

Sub-Q3

Cooperation has resulted in tangible outcomes in terms of a successful business model yielding projects, energy produced, and growing the awareness of residents on the value of local renewable energy projects. However, there are many more actors who also contributed to the successful realization of these projects. The scope of this study does not cover these actors (e.g., property owners, municipality, grid operator, insurance company, et cetera) and therefore does not have a view into whether any of them meaningfully impeded project development. However, the following section on data analysis demonstrates that Greenchoice plays a necessary yet positive role in cooperatives realizing projects. Furthermore, the successful realization of these projects does not necessarily indicate that these cooperatives' business models are necessarily transformative in their own right (as the energy transition is still ongoing, and by many measures, has a long way yet to go). However, it would appear that the transformative potential of these initiatives is positive, particularly with a like-minded regime counterpart like Greenchoice.

4.4 Data Analysis

This section intends to reflect on the findings in order to understand the relationship between the independent and dependent variables. This is achieved using two processes, the first of which assesses Greenchoice's interactions with the seven production-focused cooperatives researched in this study according to the seven niche dimensions of the TBM. This process is intended to quickly determine whether the interactions were helpful, harmful, or neutral to a cooperative's ability to realize projects and thereby contribute to the energy transition.

The second process analyses the influences of Greenchoice's interactions with cooperatives according to the different phases of project development as described previously in sub-section 4.2.3. This is intended to assess potential areas of opportunity where cooperation could be expanded.

4.4.1 Assessment One: Greenchoice and the Niche Dimensions

The findings confirmed the study's expectation that Greenchoice is viewed by cooperatives as being a commercial regime actor on the one hand, yet a unique actor far ahead of its peers to publicly embrace a transition to a sustainable energy system. This puts Greenchoice in closer alignment to the **culture** of cooperatives, certainly than other commercial energy suppliers. However, their culture is also identified by their strong desire to do as much as possible on their own. The findings uncovered some variances among the cooperatives interviewed regarding their openness to collaborate. Third-party respondents remarked that a cooperative's openness often depends on whether the leader is open and actively seeks unlikely partnerships. One cooperative respondent revealed its participation in a cross-sectoral consortium of project partners for an unspecified European Union grant to pilot a smart energy project. In any event, this culture alignment is assessed as positively influencing cooperatives' ability to realize projects. While the current policy framework governing PCR and other schemes for local renewable energy projects all but require that an energy supplier be involved in the project, cooperatives view Greenchoice as being a good fit for the vision they have and the image they desire for their projects.

The findings also revealed significant interaction from Greenchoice with cooperatives' **organizational logic and structure**. As non-profit-seeking community-led social innovations, they offer local participation and ownership of renewable energy production projects which contribute tangibly to the broader energy transition. This is made possible by a combination of self-financing from its membership and projects as well as a shared ideology around sustainable

energy behaviour. Greenchoice offers an additional financial means to cooperatives by way of the referral fee it pays for every new customer it earns through the cooperative as a sales channel. This increases a cooperative's expected earnings from each new general member it gains, which is valuable during a cooperative's start-up phase when its membership base is small. Greenchoice also adds value during a cooperative's open campaign to recruit participants to become shareholders for its projects. Because advertising budgets for cooperatives were observed to be small and limited to newspapers, the cooperative's website and social media, Greenchoice has the ability to inform its customers residing in eligible postal code zones that a cooperative is developing a project in their area. Especially in the case of Ecostroom, Greenchoice's recruiting efforts yielded noticeable additional interest from residents wanting to participate in one of their projects. In these ways, Greenchoice's actions positively influence project development.

However, despite being well-intentioned, Greenchoice's national awareness campaign 'Cracking Roofs' was perceived by some cooperatives as confusing. It was unclear to them their role, if any, in this campaign because they had not received any information about the campaign from Greenchoice ahead of its launch. On the other hand, Greenchoice maintains that the intention of the campaign was to raise awareness of the kinds of rooftop collective solar energy production projects that cooperatives have been responsible for. The effect on cooperatives' abilities to realize projects was neither positive nor negative, given that the campaign only ended in July 2019 with small grants being disbursed to rooftop 'winners' shortly thereafter.

The other touchpoint that energy suppliers like Greenchoice have with cooperatives is in the administration of postal code projects. While observed as near-universally burdensome by all respondents, it is accepted as necessary in order to remain compliant with PCR. While some cooperatives have adopted a CRM system (e.g., Voorstroom and Econobis) in order to automate certain aspects of the sharing of participant production data with energy suppliers, other cooperatives were observed to administer this manually without the aid of such software. It was also observed that energy suppliers have yet to come up with a common data model and collection method for the participant production data it needs in order to settle the energy tax credits on their customers' invoices. While Greenchoice believes it has the most convenient procedure, cooperatives did not comment as to which energy supplier had the most convenient procedure. They only commented that they appreciate Greenchoice's good customer service with regards to administrative matters of all kinds. Because this administration occurs after a project has been realized, it does not have much relevance to a cooperative's ability to realize a project in the first place.

Furthermore, neither Greenchoice nor any energy supplier influence cooperatives in any observable way to select collective solar projects as their **technology** product of choice. The role of Greenchoice as an energy supplier is, so far, neutral in this regard. On the other hand, technology selection may become an issue in the future as cooperatives begin to plan PCR projects where their postal code zones may overlap with each other. The findings revealed indications that cooperatives operating in areas like the municipality of Amsterdam, where local energy project growth is active, are adapting into niches that specialize in certain project types. One cooperative works well with schools, another with industrial buildings, and another with housing associations, et cetera.

While Greenchoice is observed to be active in helping cooperatives mobilize its own customer base to be informed about cooperative projects in their area, a prospective project participant comes independently motivated. Other than the energy tax credit offered by the PCR, Greenchoice does not provide any other stimulus or incentive to any participating member of

a cooperative project. Put differently, it can bring a horse to water, but it cannot make it drink. Therefore, at this time, Greenchoice's actions have a neutral or mildly helpful effect on **user practice**, or in other words, helping a cooperative close its fundraising campaign in a timely manner.

The findings made with respect to **sector structure** are closely linked to how Greenchoice affects a cooperative's organizational logic. It is active in funding cooperatives indirectly (through referral fees paid for member-customer conversion) and thereby improving a cooperative's value proposition of providing opportunities for residents to participate in projects benefitting their own neighbourhood. The structure of the local energy sector as it concerns cooperatives, suppliers, knowledge platforms, property owners, and the government is such that cooperatives are in a role of their own choosing to some degree. Cooperative respondents described in slight variation the theme of 'growth that which brings influence'. Whether growth is measured by projects or members, both contribute to the energy transition and to their standing within the broader sector. However, the findings indicate that it is desirable for cooperatives to achieve this growth through their own actions as much as possible. This leaves supportive regime actors like Greenchoice having to navigate the sector carefully, providing help in a considered way that does not take away from the social innovation that cooperatives seek to achieve as niche actors.

As one of among the largest commercial energy suppliers in the Netherlands, Greenchoice has a long and established reputation as a frontrunner in the sustainable energy movement according to all respondents. It is perceived to be considerably more knowledgeable compared to its peers about national climate policy and emerging developments that may impact the way it and cooperatives do business. Regarding the **policies and political power** dimension, Greenchoice is assessed as being helpful to cooperatives with limited policy knowledge who may be realizing its first or second postal code project. On the other hand, both Greenchoice and cooperatives are operating in a national policy environment that they alone cannot change. Cooperative respondents such as deA considered the possibility that Greenchoice could bring cooperatives to the table of regional energy strategy development. It is in this forum where pilot projects are discussed and planned. This access, if possible, would give cooperatives considerable help identifying new project opportunities.

4.4.2 Assessment Two: Greenchoice and the Project Phases

Using the results from Assessment One, the two niche dimensions where respondent data was most frequent and voluminous for understanding a cooperative's experience in realizing projects with Greenchoice were also the two most closely linked dimensions as well: **organizational logic and structure** and **sector structure**. These two dimensions are also significantly broader in terms of the different topics discussed among all respondents as compared to other dimensions. Questions concerning structure formed the researcher's understanding of the various phases cooperatives undergo in order to realize a project. Questions concerning goals, ambitions, and challenges to achieving goals helped the researcher understand the organizational logic of the cooperative, where Greenchoice fits within this logic, and opportunities for other places where Greenchoice could provide more of its regime resources to expand its fit and cooperation. While questions associated with the remaining dimensions (**culture**, **user practice**, **knowledge base**, **technology**, and **policy**) can also be mapped to the various phases of cooperative project development, respondent data trended significantly toward the structural dimensions. This is explored according to each phase of project development.

4.4.2.1 Knowledge, Attitude, and Reputation

Informed by literature and confirmed through respondent data from the field research, cooperatives establish a culture and identity linked to their motivation to form in the first place. They are driven by pro-sustainability ideals and are purpose-built to create a grassroots following intended on realizing local renewable energy production projects. As social innovations in contrast to regime actors, they structure themselves as member-owned and -operated, not-profit-seeking, and prioritizing transparency and shared responsibility.

This niche idealism and strong local identity echoes a broader advancement of the movement indicated by a 20% increase year over year of the number of local energy cooperatives forming since 2015 (Lokale Energie Monitor 2018). With the total production capacity of solar projects having increased by 50% in the last year alone compared to the capacity level in 2008 (Lokale Energie Monitor 2018), project replication is facilitated by a high degree of knowledge sharing both among cooperatives and through third party knowledge platforms, notably HIER Opgewekt. While respondent data from Greenchoice indicates their ability and willingness to serve in a knowledge sharing role as well, the respondent data also showed that cooperatives had not considered Greenchoice as a knowledge resource. However, Greenchoice's effect on knowledge sharing is not zero, as they contribute financially to some of HIER Opgewekt's activities, notably their annual event focused on local energy cooperatives (HIER Opgewekt 2019).

Cooperative respondent data indicates that even after the realization of the first or second collective solar project, cooperatives already begin looking at other services and production technologies to diversify their offerings. Both Ecostroom and Deelstroom Delft mentioned their interest in district heating. Electric vehicle sharing was also stated to be of great interest to Deelstroom Delft. However, in both cases, the respondents stated that these are parked in the 'idea' stage without business cases developed yet, knowing that there is still more to gain in continuing with their solar pursuits first. The respondent from Deelstroom Delft stated that it was aware that Greenchoice is participating in electric vehicle pilots in other cities. And though they have not approached Greenchoice yet on this subject, it felt comfortable doing so at an appropriate time in the future.

As mentioned in Assessment One, the cooperatives interviewed hold a prevailing position for wanting to do as much as they can on their own. However, realizing local production projects that connect with the electrical grid require that they work together with a licensed energy supplier. For small-scale PCR projects that were the subject of this study, cooperatives are able to freely select a supplier. Despite being the closest cultural fit to cooperatives, Greenchoice is largely still viewed in a business orientation where topics of discussion are limited to matters concerning their PPA, PCR project administration, the referral fee scheme, and in limited cases, project participant recruitment. However, cooperatives' abilities to identify and capture new opportunities, whether new roofs for PCR projects or piloting new technologies, appears limited by the sector structure they choose for themselves.

On the other hand, the third-party respondent from 02025 suggested that expanded coordination could be unlocked if Greenchoice better defined its 'stake', meaning what it is willing to do for cooperatives. All cooperative respondents and the 02025 respondent stated to some degree their perception that Greenchoice primarily handles administrative and billing matters. While smaller cooperatives like Deelstroom Delft and larger cooperatives like Ecostroom and Zuiderlicht alike are aware that Greenchoice's door is open for discussing non-administrative matters, it is unclear what they can reasonably expect Greenchoice to do as an outcome of such discussions.

In fact, Ecostroom and deA, two of the 'Top 15' energy cooperatives both in terms of number of realized projects and total realized production capacity (Lokale Energie Monitor 2018) both reported that they in fact consider the municipality as their most important partner in terms of expanding their presence as a legitimate organization to more residents in their communities. Newer cooperatives like Deelstroom Delft share a similar view as well. If local knowledge and reputation is valuable for the next project development phase, acquiring a project site, then cooperatives do not view Greenchoice (or any other energy supplier) as being of much value in this regard. Coordination with the municipality is a more logical choice for cooperatives.

4.4.2.2 Project Site Acquisition

All cooperative and third-party respondents stated that identifying project sites and negotiating with the property owners is the number one challenge for cooperatives. However, according to the respondent data, there is no observable influence Greenchoice makes on this phase. The "Cracking Roofs" campaign addresses this phase, although drawing confusion and suspicion from some cooperative respondents in the process. However, to Greenchoice's own admission, the campaign was operated at a national level because they view the sector structure such that cooperatives desire to have full domain over campaigns at the local and regional levels.

For privately owned sites, cooperatives appear to be negotiating with owners on their own and, as the respondent from Zuiderlicht states, without much leverage. A 2018 amendment to the Building Decree sets a deadline whereby all office buildings must have a minimum 'C' energy rating by January 2023 (Ministry of the Interior and Kingdom Relations 2018). However, according to the Zuiderlicht respondent who feels that a favourable business case is available now, non-compliant office building owners still see this deadline as far off and are not feeling compelled to take corrective measures at this time. The Zuiderlicht respondent also mentioned that Greenchoice has a number of large roof owners as its clients, where it would be interesting if an introduction to them could be provided to Zuiderlicht and other cooperatives. It can be time consuming for a cooperative to research the owner of a particular commercial property and to find contact information for them.

For municipality-owned sites, the three cooperative respondents from Amsterdam and Delft cited municipal government counterparts as being proactive in trying to match cooperative PCR projects to their rooftops. Ecostroom and Zuiderlicht both mention a recent bid solicitation by the municipality of Amsterdam where they were both awarded batches of municipal-owned rooftops to implement collective rooftop solar projects. Greenchoice is also a partner in Amsterdam municipality's implementation of its climate goals, securing a 15 year energy supply contract with the municipal government as of last year (Greenchoice 2018). This describes a potential new area of cooperation and an opportunity for Greenchoice and Amsterdam-based cooperatives like Ecostroom and Zuiderlicht to collaborate on local energy solutions envisioned in the municipal government's contract with Greenchoice.

Overall, government appears to be a greater influence in this project phase for cooperatives rather than Greenchoice. Although, in cases where Greenchoice is an influential player within municipal government, potential exists for collaboration with cooperatives on co-designed local project solutions on municipal-owned property.

4.4.2.3 Participant Acquisition and Project Operations

As stated previously, respondent data indicated that the second highest priority challenge for cooperatives after acquiring a project site is to find participants to invest in the project. One of the Greenchoice respondents observed what he perceived was a trend with the inverse relationship between the supply of roofs versus the supply of participants. Some cooperatives have an abundance of available roofs. However, they then find it difficult to acquire

participants. Other cooperatives have participant waiting lists for new projects because the roofs are harder to acquire. While Greenchoice has limited influence in the project site acquisition phase, respondent data from all parties indicate that Greenchoice's regime resources are more appropriate in assisting cooperatives through the participant acquisition phase of project development.

The local focus of PCR projects implies that it is unlikely that the resident demographics of any two postal code clusters are identical. Therefore, the marketing approach to acquire participants benefits greatly from having local knowledge. Cooperative respondents were widely aware of Greenchoice's ability to send e-mails to its customers residing in postal code zones where new projects are in development, with some cooperatives like Ecostroom and Blijstroom actually using this service and experienced varied levels of success. For cooperative respondents who are willing to seek additional resources from Greenchoice in marketing, they stated their desire to have Greenchoice to help financially (while the cooperative remains in charge of the content) with direct mailing campaigns to acquire project participants.

The dimensions of a potential participant's willingness to participate in a PCR project is outside the scope of this study. However, respondent data on the question of what challenges cooperatives face in acquiring participants revealed socioeconomic factors to be evident. While the intent of marketing campaigns is to inform residents of the existence and value of these social innovation initiatives, the financial circumstances of some potential participants can still remain an issue.

The cooperative respondent from Energiefabriek013 informed that there are five energy cooperatives operating in Tilburg municipality. While the four others appear to have low amounts of social housing in their operating areas, Energiefabriek013 has a high amount and therefore the highest number of residents with financial resource constraints.

It had the idea to pilot a participation scheme for low-income prospective participants to pay their investment over a 20-year period. In discussing this idea with Greenchoice, they agreed with Energiefabriek013 that it would be possible to adjust their billing procedure to accommodate this more complicated scheme, as they already had such a protocol in place for its own customers who, at times, have difficulties in paying their energy invoices. Although a limited case, it highlights a challenge that other cooperatives may be facing during this phase, and an innovative solution involving Greenchoice as a collaborative partner.

The Energiefabriek013 respondent also referred back to another instance where Greenchoice was sensitive to the financial challenges in realizing their first project 'Oude Leij' where it had offered to advance 20% of the project's required funds in order to enable Energiefabriek013 to begin purchasing the equipment, contingent on their ability to first sell 80% of the necessary shares on its own. While Energiefabriek013 never needed to avail of this '80/20' assistance package, it thought it would be a useful option should they encounter difficulties with funding their upcoming project.

Both of these examples brought in by the Energiefabriek013 respondent show a mutual sense with Greenchoice of awareness of a market of potential project participants who are financially constrained yet who are no less deserving of being able to help bring a renewable energy project to their community. Arguably, this demonstrates a degree of reflexivity as referred previously in literature. Transformation is more probable with a heightened awareness of market constraints.

The means which Greenchoice can offer its resources to cooperatives during this phase of project development, namely with marketing, is tangible and direct. All cooperative

respondents recognize that participant recruitment has been a challenge for some cooperatives and will continue to be in the future.[2] However, Greenchoice as a commercial entity has expectations of realizing value for the marketing services it offers to cooperatives. These expectations generally concern branding (or co-branding) products with the Greenchoice visual identity, and to publicize openly their affiliation with and support of cooperatives.

However, given the prevailing cooperative attitude of doing as much as it can on its own, there is observable friction between cooperatives and Greenchoice in this regard. Most websites of the cooperatives researched in this study include a button or link that redirects the user to Greenchoice's new customer registration portal. However, it is in many cases not so prominently featured on their websites, and cooperative respondents generally commented that they do not actively try to convert its members to Greenchoice customers. And while only one cooperative respondent reported friction regarding its desire to have its branding more prominently placed on Greenchoice's invoices to its project participants, it is worth noting it here.

Respondent data from Greenchoice revealed that on the one hand, they were satisfied with the level of support they provide to cooperatives in all matters (as compared to their supplier competitors), they are occasionally disappointed. Greenchoice respondents shared their perception that some cooperatives can be quick to minimize the value of support they receive from them. This suggests that this kind of marketing cooperation is, in some cases, less collaborative and more transactional. It is unclear whether this friction has any observable effect on the potential effectiveness of Greenchoice-assisted marketing campaigns for cooperatives and their ability to realize projects. However, it does speak to the nature of the coordination in this regard, namely that it could be improved if approached in less of a business orientation.

4.4.2.4 Project Realization

The presence of Greenchoice has now been discussed in each of the previous three phases of a cooperative's PCR project development. With exception to the referral fee scheme in phase one, the other discussed forms of support are offered in more informal terms (e.g. knowledge sharing, marketing, and to a limited degree, linking cooperatives to opportunities with pilot projects or commercial property owners) that are not necessarily codified in a written agreement, the arena where cooperation occurs formally, according to respondent data, is in the final development phase.

One of the final tasks before a project is fully realized is the establishment of the power purchase agreement (PPA) with Greenchoice, which formalizes the agreed upon price that Greenchoice pays for the energy produced by the project. This study had an a priori expectation that the PPA represents perhaps the single most significant factor affecting the nature and level of cooperation, as it was theorized that LRECs seek from a regime counterpart financial resources that they lack in order to realize their transformative project initiatives. While the data now confirms that cooperatives can and do obtain financial resources through a business model that develops PCR collective solar projects, this study also intended to explore whether cooperatives were satisfied with the financial arrangements made in their Greenchoice PPAs.

Respondent data from all cooperatives indicate universal agreement that setting up the contracts with Greenchoice is quick and that the purchase rates from them are fair and meet

[2] Especially as other prospective participants are waiting to see how policy developments associated with the national Climate Accord may affect the energy taxes for gas and electric, according to respondents from deA, Ecostroom, and HIER Opgewekt.

their prior expectations set when developing their business plan for the project. There is no observable contention for Greenchoice on this subject. Furthermore, the contracting process poses no delay to the actual realization of the project. In fact, cooperatives do not seem to consider Greenchoice, or any other energy supplier in this role, to be an influential factor determining success or failure of the project. Cooperative respondents and third-party respondents alike agreed that challenges in this final phase of development are about technical matters concerning panel installation and coordinating the physical connection to the electrical grid with the property owner and grid operator.

Discussing the project administration experience after the project is implemented is relevant with respect to the required time that must be shared with the time needed to go through the sequence of development phases again in order to keep the cooperative's project pipeline (and therefore, the cooperative's future) healthy. Project administration for settling energy tax refunds on customer invoices requires the energy supplier to have a robust administration system. From an outside view, this appears as if the cooperative is able to outsource a significant administrative burden to the energy supplier, which is more experienced and better resourced for administration. Consequently, valuable volunteer time can be preserved for activities focused on helping to grow the cooperative, whether it be on member acquisition or project site acquisition.

However, cooperative and third-party respondents are in agreement that because these projects belong to cooperatives, they also share in the administrative burden. Energy suppliers are unable to implement the energy tax settlements without first receiving the production data per participant. Only the cooperative has the ability to calculate this production data, which must adhere to a number of requirements set by the postal code scheme. Cooperatives are additionally responsible if a participant relocates his residence somewhere outside of the postal code zones covered by the project he participates in, and they must inform the energy supplier of the relocation date so that an appropriate pro-rating of the tax credit is applied.

Therefore, project administration is far from being fully outsourced. It represents a significant time commitment, and amplified with the more energy suppliers a cooperative must coordinate with. Therefore, the cooperative is incentivized to make discrete attempts to steer its participants to switch to energy suppliers it prefers, so as to consolidate the time required to coordinate with, for example, 15 energy suppliers per project down to perhaps three or four suppliers. Of course, pointing participants to switch to Greenchoice has an added financial benefit to the cooperative. On the other hand, cooperative respondents uniformly agree on a passive approach to this. Not only do they avoid making overt attempts to convert its members to other preferred energy suppliers, cooperatives seemingly shield their project participants from these administrative hassles and instead own them as their own problem. Some cooperative respondents also feel partly responsible if one of its participants has a bad experience with their new supplier.

4.5 Summary

This research has discovered through background reading and confirmed through field research two key milestones (both in 2017) that have enabled the latest wave of production-focused cooperatives developing collective solar projects to cooperate with Greenchoice: the postal code scheme (PCR) and the ability for cooperatives to create direct connections to the electrical grid. On the one hand, the PCR necessitates that cooperatives work with a licensed energy supplier, the liberal energy market enables cooperatives to select a licensed supplier according to their own discretion.

This PCR context places Greenchoice in each of the four business phases (value proposition, product, value architecture, and valuation method) although in varying degrees. The seven niche dimensions are used as a framework for the seven cooperative subjects as social innovations working in support of a regime transformation anywhere across the seven dimensions. The research has learned that having a close cultural alignment with cooperatives allows Greenchoice to be selected in an open energy market where its purchase price may not be the highest, but it is still considered fair. Once Greenchoice is selected as the regime actor cooperatives chose to work with, the resource exchange begins. The arena where this takes place is limited to a producer-purchaser business arrangement, where the cooperative only draws enough resources to realize the project.

While cooperatives are optimistic about the idea of collaborating further with Greenchoice, there is not clear data to suggest that Greenchoice has been sufficiently accepted by cooperatives for them to have open peer-to-peer discussions about future plans. However, the policy context (which affects the business model that cooperatives really have only been able to learn and use for the last two years) is also fluid, which challenges cooperatives who may also want to conduct longer-term planning. On the other hand, the research finds interesting the ways some cooperatives have been reflexive even in the current policy context, as they actively find administrative solutions with Greenchoice to be more inclusive of residents with limited finances who would otherwise be enthusiastic participants of a project.

This research has explored cooperatives' project development experience, their challenges, and in what ways Greenchoice's service offerings have addressed some of those challenges. There is room for the coordination to expand, notably in the project site acquisition phase. However, this suggests a coordinated strategy to be developed among the cooperative community on how it can best leverage other resources from Greenchoice, of perhaps a capacity building or skills development nature to capture more roofs. Similarly, Greenchoice must also be more clear about the stake it wants to have together with cooperatives on developing future projects.

Chapter 5: Conclusion and Recommendations

The Netherlands now has a track record of more than 30 years where local energy cooperatives form in an effort to alter the country's heavy usage of carbon intensive fossil fuels by implementing renewable energy projects and promoting more sustainable consumption behaviour. As a movement, local renewable energy cooperatives (LRECs) are growing due in part to the evolution of national and international discourse on climate change and resiliency to the threats posed, particularly on urban populations. Albeit slowly, national and municipal governments in the Netherlands are moving to address the dirty nature of their legacy energy systems by committing to carbon reduction and renewable energy targets and creating financial support schemes to stimulate the creation of more renewable energy production facilities. This, in simple terms, describes in part the country's energy transition effort. However, these targets have been missed and pushed back, and the financial support is perceived as insufficient. There appears to be desire to preserve the 'top-down' nature of the current energy system, which is controlled by a small group of large scale commercial energy actors, with a similar looking group of large actors installing large scale renewables. LRECs see this transition as slow-forming and instead envision a more radical and urgent transition that opens renewable energy production possibilities to the greater society.

While generally motivated by their willingness to act on their own and with their own resources to address the social imperative of climate change, LRECs invariably interact with government and commercial actors in the energy sector. The study intended to generate more insight into the nature and level of the cooperation between LRECs and Greenchoice as a mission-driven renewable energy supplier to determine the extent to which the needed resources sought after by LRECs have enabled them to realize production projects and thereby contributing to the energy transition. The assumption was that Greenchoice provides LRECs with key financial means to realize their business model in order to further their project activities. It was also further assumed that this financial aspect was a key determinant of the nature of their cooperation.

Through literature, the study established LRECs as social innovations whose experiences have already been framed by the multilevel perspective and are further framed in this study using transformative social innovation theory and the transformative business model proposal. These frameworks were used to analyse seven LRECs who operate in urban contexts, developing collective solar production projects which make use of the government's postal code scheme, and sell their energy to Greenchoice.

The study fills an apparent gap in the body of research available on Dutch LRECs in a number of areas. First, the seven cooperatives researched in this study represent the very latest type in a long evolutionary history of the movement which actually produce energy through collective action in the urban context. Secondly, while the body of research is rich about the scaling potential of LRECs and the need for them to network and find institutional fits, there appeared to be very little information available on the specific one-to-one interactions they have with energy suppliers. And thirdly, the study has the potential to inform the renewable energy market on the challenges and opportunities of coordination between niche players and regime actors when their goals are aligned.

The answers regarding the research sub-questions are summarized as follows: With regard to the nature and level of cooperation, Greenchoice fulfils the expectations of cooperatives in the limited realm of their business relationship. The cooperatives researched all consider the agreed upon purchase prices with Greenchoice to be fair. Yet, they seem to encounter challenges in meeting their own growth expectations for projects. And while cooperatives consider

Greenchoice to be a good fit for them as a business partner, there was not strong data to suggest that they consider Greenchoice as a peer that they actively collaborate with to resolve their growth challenges.

Both the cooperatives and Greenchoice appeared to be conducting themselves in their activities in good faith with each other. Furthermore, the cooperatives felt that their partnership with Greenchoice is positive for their own image. Considering that the policy and regulatory environment make it burdensome for cooperatives to easily obtain a supplier's license and therefore must partner on postal code projects with a license holder, Greenchoice presents itself as a quality option for cooperatives who may otherwise feel like they have to compromise if they only had the legacy energy suppliers to choose from.

Using the seven niche dimensions from the transformative business model, the study found that culture, organizational structure, and sector structure were the most relevant dimensions to describe Greenchoice's interactions with cooperatives' business models and the phases of their development of postal code projects. Rather than considering them separately, they appear to be linked. Without being a close cultural fit to cooperatives, Greenchoice would not be their definitive preferred energy supplier. Similarly, Greenchoice easily sets itself apart from its competition by having a dedicated 'energy cooperative department' which offers a customer referral fee, marketing support, and, on a case by case basis, a modest funding advance to assist projects facing challenges in acquiring participants.

Each party views this value exchange differently. Whereas Greenchoice takes a more opportunistic view in working together with cooperatives as partners in promoting local energy project participation, cooperatives are mixed in their view with some being more progressive than others in terms of how realistic it is to be able to realize projects on their own and their ability to view Greenchoice as anything other than their energy supplier. While all cooperative respondents were interested in having more open discussions with Greenchoice, it was also evident that they consider certain challenges related to acquiring project sites to be their own problem.

The positive coordination observed in this study has led to the realization of 22 PCR collective solar projects by the seven cooperatives researched since the postal code scheme began in 2014, the vast majority of which were realized just within the last two years. It is imprudent for this study to assess whether this outcome occurred quickly or not, as there is no baseline for an ideal PCR project development timeline. Likewise, it is challenging, if not impossible, to account for any externalities such as the level of cooperation with the property owners or the willingness of participants. What can be determined, however, is that these projects were developed despite any externalities and without any negative interference from Greenchoice.

A series of recommended actions for Greenchoice and cooperatives are proposed at the end of this chapter. They are made under a key assumption from the researcher that there is genuine intent from both parties to collaborate and share more equal responsibility for promoting sustainable local energy projects. This gives way to a needed discussion about strategy and determining exactly whose work should be leading this transition effort: whether it should just be cooperatives' work or if it can be shared with energy suppliers. A regime actor's size need not be a disqualifier for more effectively cooperating with comparatively smaller cooperative with a purely local focus. Their respective assets can be complementary if they are able to come closer together in sharing both risk and success in project development.

Reflection on the methods and results of the research:

This study researches a quickly evolving contemporary topic concerning local renewable energy cooperatives operating as social innovators coordinating with a commercial energy supplier whose motivations are aligned to encourage a more transformative energy transition in the Netherlands. It avails of frameworks recently developed by the Dutch academic community analysing the transformative potential of these cooperatives. However, considering the newness of these frameworks (TSI and TBM), they are in a theory-building state which can give the researcher high discretion on how to interpret and apply the frameworks, and thus contribute to further building of the theories. Firstly, the conceptual thinking of the researcher in this regard should be documented. It is done so as follows:

The application of the TBM business model dimensions and niche system dimensions in Proka, Beers, et al. 2018 was done in such a way to analyse a case study concerning a singular subject: the Dutch LREC, Deltawind. Whereas, this research analysed LREC case studies not exclusively on their own, but together with a second subject: Greenchoice. Therefore, the application of these TBM dimensions, namely their relation to each other was amended from the Proka research to this research. An example of this is as follows:

In Proka, it found that Deltawind's *value architecture* affected the broader system of the niche Dutch renewable energy movement through the niche dimensions of *cultural symbolic meanings* and *knowledge base* (Proka, Beers, et al. 2018). Instead, this research used these niche dimensions as indicators that evaluate each LREC researched rather than the broader movement. This research rather sought to describe the coordination between LRECs and Greenchoice, and how it affects their business models through the niche dimensions offered by the TBM. It explored the nature of cooperation through the themes of, for example, *organizational logic and structure*, *cultural symbolic meanings*, *technology and infrastructure*, and so on and so forth.

Secondly, the small number of cooperatives covered under this study was not due to any time constraints in particular, but more due to the study being conducted over the summer season. This study has no evidence to suggest that the cooperation experience between one cooperative with Greenchoice versus another cooperative's experience would be notably different for any reason like geographic location, for example. Rather, the data suggests that a greater determinant of the level of cooperation is the attitude of the cooperative, be it one of self-determination or of openness and flexibility. Of the 12 provinces in the Netherlands, this study had cooperative representation from four of them. This study may have benefitted from having representation from additional provinces. In any event, the case study format of this study is not meant to be generalized to all cooperatives and their relationships with all energy suppliers.

Thirdly, as mentioned in the conclusions, the independent variable of coordination between cooperatives and Greenchoice and the dependent variable of projects realized that contribute to the energy transition could have been argued more strongly if the study were able to account for externalities, namely the nature of cooperation with other actors in the project development experience such as property owners and project participants (i.e., shareholders). Thus, it is suggested that the results of the research may likely have been more robust if it studied specific PCR projects as case studies. Studying all the actors involved around a singular project event would provide rich information about the coordination challenges and success across a constellation of actors and therefore, could provide a more accurate picture of how the project came to realization.

Fourthly, while the respondent data indicated that Greenchoice's status as a commercial energy supplier has no influence on the cooperatives' approach to cooperating with them, it would

nonetheless be interesting to identify whether there are cooperatives who have project experiences with both Greenchoice and cooperative-only energy suppliers, and to perform a comparative analysis.

Recommendations for further study:

In addition to the suggestions made above about creating a study at the project level exploring more actors, and making a comparative analysis between Greenchoice and a cooperative-only energy supplier such as OM, additional recommendations for further exploration include:

- A study into coordination experiences between cooperatives and other regime actors, which can further the theory-building. Cooperatives have been observed to be working together with grid operators and research institutions on technological innovations, financial institutions, and governmental bodies such as Staatsbosbeheer, Rijkswaterstaat, and ProRail. While this study chose Greenchoice for its clear ability to provide financial and knowledge resources sought after by cooperatives, it is unclear whether cooperatives are able to obtain resources from these other actors.
- Further study into the spatial dimension of collective solar projects. Considering that acquiring project sites (even in urban areas) is not necessarily a supply issue, but rather obtaining use rights from property owners, research into the different kinds of acquisition configurations (e.g., one-to-one negotiations with property owners, government tenders for municipal properties as have been experimented by the municipalities of Amsterdam and Rotterdam, et cetera) would be of great use.

Recommended actions:

All respondent interviews from cooperatives, Greenchoice, and third-party organizations alike all touched upon a common thread about each other's roles being unclear and how it would be beneficial if they were better clarified. In order to close the gap between how cooperatives perceive Greenchoice's responsibilities versus their capabilities, it is recommended that:

1. Greenchoice take stock of its past non-PPA related actions to assist cooperatives. This includes all marketing efforts (both general and specific to one or more cooperatives in a region), emails to customers residing in postal code zones to inform about ongoing projects in development, et cetera and make an assessment of what worked and did not work and what they would like to continue with going forward.
2. Greenchoice account managers take all opportunities to inquire with cooperatives in their portfolio during the natural course of business about any opportunity leads they may have for developing future projects, in order to assess whether there is any prospect for Greenchoice to provide assistance.
3. Information gathered in the previous two steps can inform the development of service guidelines to be used by Greenchoice account managers in offering a clear and consistent set of support services that are tailored depending on which phase of project development a cooperative is currently in.
4. Understanding that a cooperative's marketing and communications functions are either performed using volunteer support or contracted out to a firm, Greenchoice has a talented, experienced, and well-resourced marketing and communications department that cooperatives could make use of in order to build stronger capacity in-house at each cooperative. Greenchoice should consider designing a training or workshop aimed at

cooperative volunteer communications officers who are interested in building their skills in suggested topics such as layout/design/content/delivery of external communication products (e.g., flyers, e-mails, social media), or content writing (e.g., human success stories, project performance metrics, etc.).

5. Understanding that acquiring new project sites is both perhaps the highest priority and the most challenging, Greenchoice should consider holding roundtable discussions with cooperatives to determine common challenges. It can then determine what type of appropriate support it is able to provide, along the lines of skills development (e.g., effective negotiation points for cooperatives to use to convince property owners) or opportunity matching (e.g., Greenchoice introduces its commercial customers to local area cooperatives).

Furthermore, cooperatives are suggested to take a more inclusive approach to their organizational planning. The level and extent can be determined by each cooperative. Examples could range anywhere from merely sharing meeting minutes from a workplanning session with their Greenchoice representative. Or invite their representative to participate in workplanning meetings in person or via telephone.

These recommended actions are intended to create more areas of contact between cooperatives and Greenchoice, thereby creating more visibility into each other's organization and to have a greater appreciation for the realities that niche and regime actors must understand of the other in order for cooperation to expand from a business orientation to a partner orientation. The ability to demonstrate to the municipality or other property owners the close and effective partnerships that they have with energy suppliers and other organizations is a key determinant of success for cooperatives and the local sustainable energy movement moreover.

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Annex 1: Interview Questions

This research is being conducted as part of the requirements for the MSc Program in Urban Management and Development of IHS. The primary objective of this study is to assess to what extent has the cooperation between renewable energy cooperatives as social innovations and Greenchoice a mission-driven renewable energy supplier contributed to the Dutch energy transition.

Information from interviews with key experts and representatives of the locally-generated renewable energy sector is vital to this research and the data collected will solely for academic purposes. Confidentiality will be protected and transcripts of the interviews or interview notes, in case the respondents do not wish the interview to be recorded, will only be accessed by the student researcher, Don Cuizon, and his thesis supervisor, Dr. Alberto Gianoli.

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1. Introduction
    a. Position in the organization
    b. Years in the organization

2. Value Proposition
    a. Motivation and origins of the organization
    b. Type of organization (cooperative, energy supplier, third party)
    c. What is the best selling point that you offer to your members/customers?

3. Product or Service
    a. Describe the exact product or service that you offer.
    b. Which technologies do you use? Why?
    c. Have you noticed any change in your membership's behavior regarding energy consumption?

4. Value Architecture
    a. How many members do you have?
    b. How is ownership arranged?
    c. What are your key activities (and key resources)? What role do you take in the energy system (value chain)?
    d. How is your organization organized internally?
    e. Who are your key partners? Would you say that Greenchoice is your most important partner?
    f. What kind of interaction/relationship do you have with Greenchoice?

5. Valuation Method
    a. What are the most important costs in your operation?
    b. How do you make revenues?
    c. Have you received any subsidy or grant?
    d. Do you make any profit? How do you manage it?
    e. In what respect do you differ from other actors generating energy? In what respect do you differ from Greenchoice? What have you struggled with; has any conflict emerged? What kind of barriers/challenges have you faced?
    f. What kind of actions did you take to circumvent them? What kind of actions did Greenchoice take?
    g. Are there vulnerabilities in your business model? Do you see a role for Greenchoice in addressing your vulnerabilities? If so, what role?

Thank you for your valuable inputs.

Annex 2: Post-Interview Electronic Questionnaire

Thank you for participating in this brief questionnaire as a follow-up to our interview session earlier this summer. This 10-question form should take approximately 5 minutes to complete!

1. How many completed *Postcoderoos* solar projects does your organization have?

2. What is the total production capacity (kWp) of all these completed postcoderoos solar projects?

3. How many *Postcoderoos* solar projects do you anticipate are in your pipeline?

4. I am satisfied with Greenchoice's performance currently on its services to my organization.
    a. Totally agree (1)
    b. Somewhat Agree (2)
    c. Neutral
    d. Somewhat Disagree (4)
    e. Totally disagree (5)

5. My organization would like to do as much as it can on its own.
    a. Totally agree (1)
    b. Somewhat Agree (2)
    c. Neutral
    d. Somewhat Disagree (4)
    e. Totally disagree (5)

6. Greenchoice's status as a *commercial* energy supplier influence's my organization's approach to cooperating with them:
    a. Positively
    b. Negatively
    c. Their commercial status does not make a difference.

7. Please rank the following criteria for how your organization decided to select Greenchoice to be your energy supply partner for your postcoderoos solar projects:
    a. Reputation
    b. Stability (e.g. a financially healthy company)
    c. Administrative Capabilities (with regard to coordinating data sharing for postcoderoos settlements)
    d. Customer Service (e.g., ease of access to your contact at the company)
    e. Price/Tariff
    f. Sustainability Score (on the WISE/Consumentabond ranking)
    g. Willingness and ability to let your Cooperative stay visible (e.g., co-branding, etc.)

8. My organization would like to see Greenchoice play more roles for us.
    a. Totally agree (1)
    b. Somewhat Agree (2)
    c. Neutral
    d. Somewhat Disagree (4)
    e. Totally disagree (5)

9. In addition to being a financial means to your organization, would you like to see Greenchoice offer any skills-building activity for your volunteers?
    a. Yes
    b. No

10. If yes, please select the types of skills you would be interested to receive advise or training in:
    a. Layout/design/content/delivery of external communications products (e.g., flyers, e-mails, etc.)
    b. Content writing (e.g., human success stories, performance metrics, etc.)
    c. Strategy development (e.g. inventorizing potential roof sites, their owners, and plans for making contact with them)

d. Effective negotiation skills (e.g. talking points when negotiating with a specific roof owner)
e. Other: Please describe.

Thank you for your time!

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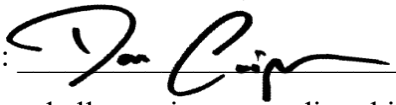
Your Signature(s) : 

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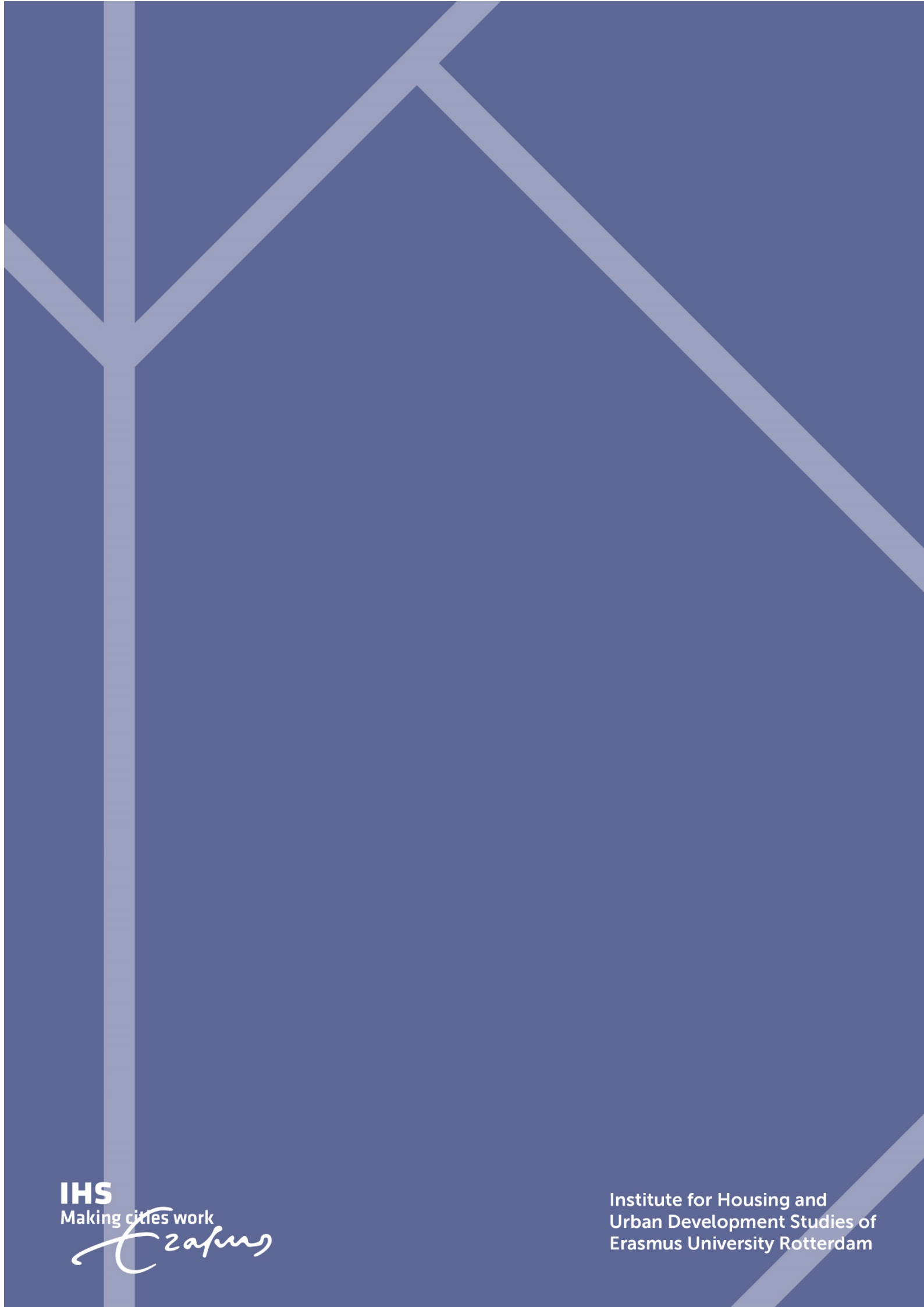

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