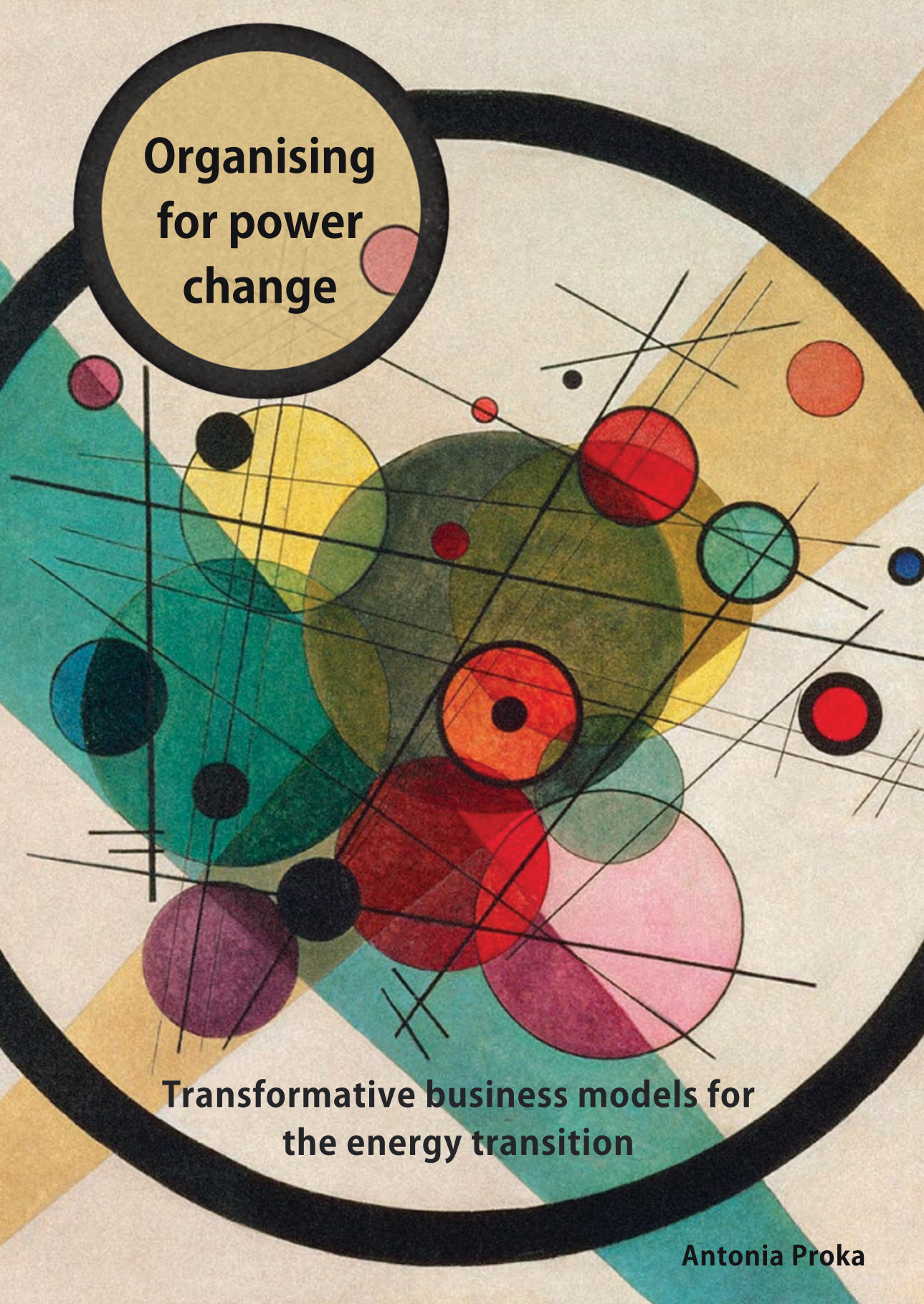
Organising for power change



Transformative business models for the energy transition

Antonia Proka

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The research resulting in this thesis has been financially supported by the Netherlands Organisation for Scientific Research (NWO) under the research programme “TRAPESES” (2014–2018) [grant number 408-13-029].

Cover idea by Antonia Proka, and layout by R. J. Bavington

ISBN 978-94-6416-480-0

Print Ridderprint BV

Organising for power change

Transformative Business Models for the Energy Transition

Organiseren voor machtsverandering

Transformatieve businessmodellen voor de energietransitie

Thesis

to obtain the degree of Doctor from the

Erasmus University Rotterdam

by command of the

rector magnificus

Prof.dr. F.A. van der Duijn Schouten

and in accordance with the decision of the Doctorate Board.

The public defence shall be held on

5 March 2021 at 13.00 hrs

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"the circle is the synthesis of the greatest oppositions.
It combines the concentric and the excentric in a single form, and in balance"

W. Kandinsky

quoted in Will Grohman, Wassily Kandinksy: Life and Work, trans. Norbert Guterman (New York: Harry N. Abrams, 1958), p. 188.

Cover page illustration features parts of W. Kandinsky's "Circles in a Circle" from 1923. Public domain, via Wikimedia Comons

Acknowledgements

I am grateful to my co-promotor Matthijs Hisschemöller, first of all, for trusting me and giving me the opportunity to do research on a topic that I love. The path has not always been easy, but I will never forget the detailed feedback, the critical comments, and the constant push to keep things simple. I thank my promotor Derk Loorbach for inspiring me and challenging me to move forward, pushing me in his special way when I got stuck. I am indebted that Derk mediated in critical moments of my PhD path, and that he did not forget about me when I decided to finish my writing while helping some EU Islands to decarbonise. I have learned so much working with you both.

Next I want to thank all (ex)DRIFTers Chris, Flor, Frank, Julia, Katharina, Niki, Giorgia, PJ, Marleen, Roel, Shivant, Rick, Frederick, Felix, Sophie, Sarah, Marieke V., Mees, Marijke, Marieke C., Ilonka, Karlijn, Charlie, Steffen, Sem, Timo for all the insightful discussions but also laughs during a great number of acceleration- and deceleration sessions, wonderful (Monday) lunches, as well as the spontaneous talks in the kitchen or at DRIFT's corridors; we have had lots of them also with Maryce, Shifra, Helmi and Sandra, to whom I am thankful for the support (and their patience with my broken Dutch). I have cherished every moment.

Special thanks to Katharina and Giorgia who have always been there, backing me emotionally and professionally throughout this path. I am grateful for their friendship and for reminding me to enjoy every moment! I also want to thank Chris, one of the most (socially) active DRIFTers (others use the word activist) for all the positive energy and drive, as well as the support with fixing my oral and written Dutch. Sharing a new city with you truly helped make it home.

I wish to also express my gratitude to three colleagues that functioned as my role models: Flor Avelino, the passionate, engaged scientist and political being, Niki Frantzeskaki, the insightful fighter for gender-justice in academia and beyond, and, Julia Wittmayer, the kind and reflective action researcher. I am grateful to have worked with you.

I want to also take the opportunity and thank a couple of people that added colour to my PhD journey:

Philip, Zoe, Periklis, Angela, Wendy, Peter, Flora, Bouts for all the people's kitchens and rebel cinema evenings that we organised across Amsterdam, as well for all the debates and actions that followed throughout the years.

Mariana, Kleoniki, Dimitris, Nikoleta, Athina, Vicky, Ioanna, Manos, Marios, Faidonas, and many others for all the marches, demonstrations, and info evenings we organised with the ambition to (self-)ReInform (in) the Netherlands. You have become a family to me. Especially, I want to thank Mariana and Dimitris for all the care and support through the hard but also good times of my PhD journey. Also, I am grateful to Kleoniki, with whom beyond a flat, we shared a lot of stories and experiences while writing our PhDs (day and night).

The Aman Molli collective Chrats, Pericles, Nikos, Irini, Kleoniki, Mariana, Cid, Emrah, Yannis, Kostas, Marios, Alex, Esmail, Paris, Dimitris, Stefania for the magical music

evenings bringing together different yet so similar cultures blending past and future in the now.

All SEYNers and especially Alex, Dirk, Maja, Ignacio, Susana, Dimitris, and Katherina for showing that the change we want to see in the world can already start now.

Eleni, I also want to thank you for the sporadic breaths of art, and the… interpretative moments you shared with me these years. Spending time with you is always a pleasure!

I want to thank Pieter, and Jeppe for all the direct and indirect feedback on my PhD through our discussions, in the context of islands, EU politics and beyond.

I am also grateful to my flatmates in Brussels Stefi and Silvia for allowing me to occupy the living room during most weekends to finalise this PhD.

Also, a big thank you to Lazaros and Annamaria, Natasa, Ike and Chris, Eleftheria, Flora, Zoe, Akis, Efi, Danai, and my brother Christos for kindly not asking how the PhD goes.

Furthermore, I want to thank Rob for helping me see Kandinsky from the bottom-up, and for turning an idea into a masterpiece. In that, the contributions of Christos, Anne and Felix are also appreciated.

I thank Felix, who having had to listen to all my PhD frustrations, kept urging me to quit, and, at best, repeatedly asked me why I am not quitting. This question has, in fact, helped me keep reflecting about my role in the energy transition and the role of my research in supporting me to fulfil it. I am glad to have had your emotional and cognitive support (a crucial sounding board for all my ideas!), but trust me, this question has undeniably been what helped me the most.

I am grateful to my family for believing in me (most probably more than I do myself) and for supporting my wish to explore, learn and grow, even if this comes at the cost of my time with you. My research developed in parallel with an important transition in our family and the roles we have learned to play. We are learning new ways to think and act, and I am glad that these have brought us closer, even if we are far.

Last, but certainly not least, I want to express my gratitude to all the people that accepted my invitation for a talk and helped me address my questions regarding the energy transition in the Netherlands. My thesis would not have happened without the valuable contribution of their time, energy and expertise. I sincerely hope that the insights presented in this thesis, as well as my future role will somehow return the favour.

Preface

Behind this thesis lies the ambition to investigate and contribute to the energy transition. The energy transition is a shift away from the unsustainable, centralised energy system dominated by the large-scale combustion of fossil fuels. This is an inevitable, yet inherently uncertain process in terms of outcomes, and has deep social implications. The reason I have decided to focus on the energy transition in the first place, is because "*it is the answer to lots of different problems*", as one of my interviewees once pointed out. The energy transition is a lot more than just part of the solution to the climate problem. Transitioning to an environmentally sustainable and socially just energy system can spur wider fundamental changes in society.

A source of inspiration for me is my country of origin: Greece. Greece made headlines and travelled the news worldwide about the deep financial crisis it is in and its impact on the population. Despite its abundant renewable energy resources, the country still spends billions of euros every year on fossil fuels[1], often sourced from unstable political regimes, and proceeds with the exploration and exploitation of hydrocarbons in its territory[2]. Yet, by taping its native renewable energy potential the country can break its dependency on costly fossil fuel imports and avoid the controversial oil and gas exploration and exploitation in its waters and land. The transition to local renewable energy resources may enable the country to safeguard its energy self-sufficiency and benefit society, without harming the natural environment and the climate. A shift to the local renewable energy potential can ensure that significant financial resources remain in its territory and get reinvested where most needed: in public infrastructures on health, education, transport, water or waste management.

My drive is to understand why a democratic energy transition which can lead to a stable supply of sustainable energy, which preserves the environment and benefits local communities is not happening and how it could be supported. Technological innovation alone, without consideration of who is benefiting and who is being excluded, may get us to a 100% renewable energy system that is controlled by a small group of powerful global renewable energy companies. This may slow innovation and increase consumer prices. At the same time, while the energy transition can lead to democratisation in the energy

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[1] The county's Balance of Payments regarding fuels rose to -3,568 million euros in 2018 (Source: National budget report 2018 available at https://minfin.gr/documents/20182/7655501/%CE%95%CE%99%CE%A3%CE%97%CE%93%CE%97%CE%A4%CE%99%CE%9A%CE%97+%CE%95%CE%9A%CE%98%CE%95%CE%A3%CE%97.pdf/d100d4de-02c3-4651-be19-58020e917e84)

[2] Since 2012, offshore oil and gas concessions amounting to 72% of the Greece's territorial waters have been granted to four multinational and two Greek companies. Four onshore concessions have also been provided. Each ratified concession is set at 25 years from the moment of exploitation. (Source: https://www.theguardian.com/environment/2019/jun/07/why-replace-dolphins-with-oil-drilling-battle-for-greece-marine-life-hellenic-trench)

domain and more inclusivity, it seems likely that higher prices will also come along, exacerbating existing inequalities. As every solution creates new problems, reflection and coordination of action among the actors aspiring to transform the energy system is vital for the transition towards a sustainable future.

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1. Introduction

"The greatest danger in times of turbulence is not the turbulence – it is to act with yesterday's logic"

Peter Drucker

This thesis is about organising for power change: it focuses on the sustainability-oriented actors and initiatives that pursue a fundamental change in the energy system with broader socio-political and economic consequences. Such *transformative change,* that is deep and overarching, may embrace principles such as energy justice, democratic control and ownership, or responsible energy production and consumption, along with a shift to decentralised renewables. Specifically, this thesis is about the impact of alternative organising: the business models that actors and initiatives develop in the pursuit of transformative change. I am interested in the way renewable energy initiatives self-organise to materialise their vision, in the practices they employ and the internal structures and partnerships they build to that end, which are all decisive for the impact they may have on the system, if any.

Replacing fossil-fuel-based infrastructure with renewables is much more than a technological substitution; the social implications associated with this transition could be transforming the way we live (Stephens, 2019). This transition, in combination with energy savings through enhanced energy efficiency and conscious energy consumption, could result in decentralised, locally based energy systems with a mix of locally available renewable sources enough to satisfy 100% of society's energy needs. Nevertheless, factors such as vested interests around assets of high investment costs and long lifespan, misconceptions of reliability of renewable energy technologies, or people's low interest in energy complicate such a transition. Also, an unequal playing field and the lack of consistency of regulations and policy schemes undermine the commitment of the engaged actors. Yet, the global socio-political, financial and environmental crises create turbulence and fuel public debates that slowly change the discourse, increasing levels of awareness and spurring transformative action; digitalisation supports such action further. These create windows of opportunities for a shift towards more sustainable and just futures.

Fossil fuel reserves become stranded even marking negative prices (CIEL, 2020), and the depleting oil and gas reserves threaten the security of supply in certain regions. As a result, actors associated with a fossil fuel-based energy regime are pushed to reposition and adapt their strategies (e.g. BP, 2020). If a shift away from fossil fuels and towards renewables ignores the social, economic, and environmental repercussions, then it will result in other significant complications in the future around, for instance, issues of social exclusions, resource depletion or biodiversity loss. Within this context, the transition to a sustainable future far away from business-as-usual is uncertain. Whether the energy transition delivers on this potential of redistributing power, depends on how renewable energy is deployed and how the benefits are distributed. The role of the actors therein is of importance too.

Nowadays, a diversity of actors deploys renewable energy technologies taking different approaches. The impact of a private initiative of a developer may differ from that of a collective of individuals. At the same time, the collaboration between private developers and community initiatives may increase the amount of renewable energy generated. However, this could also contain compromises, for instance around profit sharing and control. This diversity of actors and approaches is typical for early-stage transitions (Loorbach, 2007). By analysing and better understanding this diversity, we can identify the mechanisms, patterns and lessons behind successful initiatives and development. Such insights can then be used to support further diffusion and scaling. In this, it is important to reflect upon the values, models and practices that drive renewable energy initiatives and how these relate to broader transformative changes.

While we already notice evidence that alternative modes of culture, structure and practices in the energy domain are getting wider diffusion and acceptance, the question remains: how much do they impact the system as a whole? To what extent can renewable energy initiatives contribute to the broader energy transition? Can the different initiatives transform our energy system and alter our energy production and consumption patterns? It is rather uncertain whether and to what extent such initiatives are able and willing to reach the necessary scale and depth of involvement that a transition requires. And as it has been pointed out: *"To put it bluntly, can ordinary citizens, creating new institutions for cooperation at local level, make a significant contribution to addressing the global environmental issues of our era, where the most powerful actors and institutions including (inter)national governments, the international scientific community, business and the environmental lobby have been unable to deliver?"* (Hisschemöller, 2012, p. 123).

This question is justified, as renewable energy initiatives often emerge in a context of instability of or even hostile legislative framework, market entry barriers, etc.; the real challenge for them is to start producing renewable energy (Walker, 2008; Hisschemöller & Sioziou, 2013). While fossil fuel-based energy incumbents (still) enjoy legitimacy and wide support from authorities and parts of society, renewable energy initiatives struggle to establish their value proposition.

In this thesis, I focus on such renewable energy initiatives, their (self-)organisation and their role in the energy transition in the Netherlands. I am interested in this small niche of initiatives because, with their strengths and weaknesses, these initiatives comprise a type of social innovation that could help address our major climate issue and transform our society towards more sustainable and equitable futures.

To support a better understanding of the impact of renewable energy initiatives on the energy transition, in this introduction I first take a step back and look at the broader picture. The challenges associated with the current energy regime are highlighted, and then, the sustainability transitions perspective is introduced as a useful lens to understand and navigate the energy transition. Hereafter, the history and current state of the Dutch energy regime are described, followed by a reflection on the emergence, types and motivations of renewable energy initiatives.

1.1. The energy system: interrelated challenges and opportunities

In Greek mythology, it is the fire that Prometheus defies the gods for; the act of giving fire, a primitive source of energy, enables human civilisation and progress.

Energy has shaped society, from pre-agricultural foraging societies to today's fossil fuel-driven civilisation. It has been described as "*the life blood of our society*". The current fossil fuel-based energy system, which contains the system of generation, distribution and consumption of energy, as well as all relevant socio-technical, cultural, environmental and institutional factors, comprises undeniably a very critical infrastructure in our societies, because all societal sectors, such as housing, mobility, food production or health care, depend on a reliable provision of energy (Verbong and Loorbach, 2012). The availability of cheap electricity, through fossil fuel combustion, has transformed the contemporary world and the way we live in it. Access to energy is a basic condition for human development and prosperity, and in recent years, it became the task of the energy industry to provide for it.

The present energy regimes have evolved historically to provide cheap energy mainly through the combustion of fossil fuels in centralised, large-scale power plants. Dominated by fossil fuel-based, market-driven transnational energy companies, the energy sector has been of pivotal importance for the global economy. National and international policies have been focusing on energy security and stability of supply, also prioritising efficiency and affordability; the indispensable uninterrupted availability of energy resources at an affordable price has been widely accepted as crucial for economic and societal development.

Nevertheless, modern energy regimes are commonly associated with multiple interconnected challenges: climate change and air pollution; growing demand and exhaustibility of natural resources; dependency on unstable political regimes for supply; uncertainties about reserves and high volatility of resource prices; disparate social vulnerabilities and widespread injustices among and within communities around the world (Verbong and Loorbach, 2012; IEA, 2014; Stephens, 2019). In fact, the fossil fuel dominated energy industry has ended up threatening the prosperity it once helped to create. The combustion of fossil fuels has been proven to be a major driver of climate change; through the burning of coal, oil and gas the energy sector is the largest single source of anthropogenic CO_2 emissions. Specifically, between 2000 and 2010 the energy and industry sectors in upper-middle income countries accounted for 60% of the rise in global Green House Gas (GHG) emissions (IPCC Working Group, 2014). Climate scientists have been stressing for long that if we want to avoid the most destructive and dangerous effects of climate change, we need to avoid an increase of the global average temperature beyond 2 – if not 1.5 - degrees Celsius above pre-industrial levels (e.g. Hansen IPCC, 2005). This calls for a swift reduction in energy use and decarbonisation of the energy supply; to meet the 2 degrees goal CO_2 emissions need to decline rapidly to net-zero, as

the total carbon budget is expected to last for about 16 years at the current rate of emission (IPCC, 2014).[3]

Climate change is one of the most pressing problems of our era. Our modern lifestyles and living standards are connected to a global, complex economic system that results in considerable harm to the environment and our well-being. Climate change is an issue that affects every person on this planet, yet not in a fair manner. While the major GHG emitters are also going to suffer the impacts of climate change, those impacts are not going to be distributed across the globe in proportion to emissions; the poorest are going to be hit first and worst (Althor et. al, 2016).

As our addiction to fossil fuel consumption has been destabilising our climate, the increasing concerns about climate change have managed to at least (or at last) enrich the dominant energy policy discourse with notions of social and environmental sustainability. In 2015, the Paris Agreement brought for the first time all nations together to join and strengthen their efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so (Secretariat UNFCCC, 2015).

The fossil fuel industry is massively involved in lobbying activities aimed at obstructing climate action. Already since the early environmental warnings of The Club of Rome report and other scientific studies forecasting the Limits to Growth (Meadows et al. 1972), the "*industry's public relations machine has employed a range of hegemonic narratives, as well as skillful political strategies, that have helped increase their control over the availability, production, and consumption of global energy supplies*" (Ladd, 2017, p.15). The financial resources invested in misinformation and lobbying activities have been quite substantial; it is these attempts to legitimise a particular narrative over all others that make this discourse hegemonic. According to a 2019 report "*the five largest publicly-traded oil and gas majors (ExxonMobil, Royal Dutch Shell, Chevron, BP, and Total) have invested over $1Bn of shareholder funds in the three years following the Paris Agreement on misleading climate-related branding and lobbying*" (IM, 2019). Despite this, the past years, several financial institutions began to adopt policies that avoid or sharply limit direct financial support of fossil fuels; among them, the European Investment Bank and the World Bank (CIEL, 2020). Additionally, equity investors are also turning away from fossil fuels. In response, the industry has gone far with lobbying efforts in several US states to criminalize protests against fossil fuel projects and infrastructure (CIEL, 2020). In the societal sphere, actors within the dominant regime in the Netherlands have managed to disengage people spreading narratives such as: (i) renewable energy is expensive and poor people cannot afford it; (ii) renewable energy is not reliable yet; (iii) renewable energy is a very complex technical issue; (iv) the variety of technical solutions makes it impossible to choose the right pathway; (v) climate change is an issue that can

[3] The total carbon budget remaining figure of 2900 GtCO2-e is the value required to limit total human-induced warming to less than 2°C relative to the period 1861–1880 with a probability of >66%. Full details are in the IPCC Synthesis Report (2014). The rate of emissions is based on the most recent year of global emissions and assumes no increase or decrease in emissions year-to-year as a 'business as usual' scenario.

only be addressed at EU level; individual contributions are insignificant (Hisschemöller, 2019).

Apart from vested interests lobbying, basic features of the climate system make climate communication and action challenging (Bushell et al., 2017). A basic characteristic of the climate system is that it features inertia and lags between changes and results. This means that the effects of an increase in CO_2 concentration may not be seen for several years, but also, in case of immediate drastic reductions in CO_2 emissions certain effects will still continue to be seen (Bushell et al., 2017). Furthermore, as the climate system is interdependent with our economic system, suggested solutions may bring unintended and perverse impacts. The misalignment between the long-term nature of climate change and the medium-term election cycles in the policy domain is also challenging; politicians are likely to prioritize their re-election rather than the solution to long-term, complex problems (Bushell et al., 2017). This complexity might not only result in a misalignment between business practice and policy design, but it may also result in marginalising rather than engaging society, especially the most vulnerably low-income households.

As energy production crossed borders, particularly in the form of industrialization in low- and middle-income countries and deindustrialization in high-income countries, an increasing disconnect between places of energy consumption and those of energy production has been taking place (Healy et al., 2019). The countries of import are characterised by "*consumer blindness*", as people are unaware of how and where the fuels they consume are produced (Martinez-Alier, 2003; Huber, 2015 cited in Healy et al., 2019). In the countries of production, energy extraction often involves the "*slow violence*" of landscape destruction and water contamination and the physical displacement of populations (ibid). The business operations of oil and the energy sector in general, are often conducted in settings associated with violence, conflict and war, to the extent that human rights violations and oil acquisition have become inextricably interconnected (Banfield et al., 2003.; Banks and Ballard, 2004; Bannon and Collier, 2003; Englebert and James, 2004; Little, 2002; Painter, 1986, cited in Watts, 2004).

At the same time, powered by the energy system, the industrialised economies and lifestyles put increasing pressure on ecosystems, which is further exacerbated by a rising global population with increasing consumption. Alarmingly, about 60% of primate species are now threatened with extinction and almost 75% have declining populations (Estrada et al., 2017). This happens due to extensive habitat loss through "*the expansion of industrial agriculture, large-scale cattle ranching, logging, oil and gas drilling, mining, dam building, and the construction of new road networks in primate range regions*" driven by increasing global and local market demands (Estrada et al., 2017, p.4). Additionally, the contamination and the destruction of natural water catchment areas for energy and other purposes result in water shortages, which in turn, contribute to food insecurity and famine, thereby contributing to social vulnerabilities. "*The health of ecosystems on which we and all other species depend is deteriorating more rapidly than ever,"* underlines the chair of the United Nations' Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Robert Watson*. "We are eroding the very foundations of economies, livelihoods, food security, health and quality of life worldwide. We have lost time. We must act now*" (UN, 2019). The longer we ignore the social, economic, and environmental interrelated challenges associated with the way we have organised the

energy system and society as a whole, the more pressing they become. Addressing such interrelated challenges requires a major change in our energy system; a change which includes but is not limited to a shift from fossil fuels to renewable energy technologies (IPCC, 2018).

Despite the strategies of the incumbent fossil-fuel-based energy companies, several actors have been advocating for and taking action towards alternative, often conflicting, ideas regarding the future of our energy system. Which alternative scenario will become dominant as this system transition unfolds remains unclear. Shifting technologies may go along with shifting social and political dynamics and vice versa (Burke & Stephens, 2017). Different actor networks may wish to tap into ongoing dynamics to push principles, such as transparency, automation, or democracy and diversity, forward. The energy transition has been envisioned as an opportunity for the introduction of IT solutions and the shift towards a "smart grid" that enables (bi-directional) communication, automation and better management of the variable generation and demand (EDSO, 2019). At the same time, the dynamics in the energy domain gave hope for the democratisation of the energy system through a radical change of the way we generate and consume energy; a shift towards a system which encompasses principles of social justice and economic equity (Vansintjan, 2015; Burke & Stephens, 2017). Others, too, see the energy transition as an opportunity for a more fundamental system change. As David Harvey (1996) underlines, the environmental movement "*can either ignore the [capitalist] contradictions, remain within the confines of their own particularist militancies […] or they can confront "the fundamental underlying process […] that generate environmental and social injustices*" ((p. 400–401) Harvey, 1996, in Healy et al., 2019).

This suggests that in order to address the environmental and social injustices associated with the current organisation of our energy system, a systems perspective should be taken; a perspective that beyond individual projects, considers the underlying logic and broader social context around these projects, and the particular way in which technological solutions get linked with social structures, and articulate distinct cost-benefit distribution.

The deployment of renewable energy is often implicitly considered as environmentally and socially benign because of its crucial role in combating climate change (see Katzner et al., 2013; Hastik et al., 2015; Tabassum et al., 2014; Schuster et al., 2015; Tsoutsos et al., 2005; Turney & Fthenakis 2011; Hernandez et al. ,2014; Carew-Reid et al., 2010; Dauber et al., 2010; Verdade et al., 2015; Frid et al., 2012; Bonar et al., 2015 as cited in Gasparatos et al. 2017). Yet, "*there are no renewable energy pathways that have zero environmental impact presently, especially if they are to be deployed at the large-scale needed to enable a transition towards a Green Economy*" (Gasparatos et al. 2017, p. 174). The deployment of renewable energy projects needs to take social, environmental and economic factors into consideration. A holistic approach, which brings all these dimensions together, is, thus, necessary for the transition to an environmentally sustainable and socially just energy system.

The title of this thesis is "*Organising for power change*" because in studying the energy system and the interplay between the old and the new, I am interested in exploring the broader (possible) impact of alternative organising in the energy field, and its wider societal implications. In that, power is understood here not only as electrical power but

also as social, economic and political power, i.e. the (collective) capacity to influence the general course of events. In other words, this thesis also addresses the power to incur system change supported by a shift in the dominant way of organising the energy function. Addressing climate change requires a fundamental change at a personal, cultural, organisational, institutional and structural level: it requires what is called a "transition".

1.2 A transition perspective on the energy transition

Sustainability transition literature provides an explanatory framework to help us understand and navigate the energy transition. In this literature, a regime is described as the complex of established technologies, associated organizational structures and value chains, along with the political structures, and formal and informal rules that guide the behaviour of actors (Rip & Kemp, 1988; Kemp et al., 1998; Smith, 2007). Regimes are path-dependent and entail incremental changes along specific trajectories due to vested interests, organisational capital, sunk investments and stable beliefs (Verbong and Geels, 2010).

The term *transition* is broadly understood as a non-linear, disruptive change that involves a shift from one dynamic equilibrium, or a regime, to another. Sustainability transitions research applies this perspective to complex societal systems, like the energy system, to understand and explore how these (could) make a structural qualitative shift from (perceived) persistent unsustainability toward a more sustainable state (Loorbach et al., 2017).

A transition is an uncertain long-term process of change. Yet, according to transition theory, transitions progress in a shock-wise, non-linear manner as a result of co-evolving, external and internal transformative pressures. The multi-phase framework of transitions is rooted in the hypothesis that "*the dynamics of transitions in time can be described as altering phases of relatively fast and slow dynamics, which together form a strongly non-linear pattern where there is a shift from one dynamic state of equilibrium to the other*" (Rotmans, 2005 p.23).

However, reverse transition paths can also occur. "*Lock-in"* takes place when "choices made in the past exclude different opportunities now, e.g. by ingrained behavior or ideas"; *back-lash occurs* when the diversity of alternatives is too low and "*too much is betted on the wrong horse*" (e.g. a 'hype'), and *system breakdown* happens when a dynamic equilibrium is disturbed without being re-established (Rotmans, 2005, p. 24).

According to the multi-level perspective, the shift to a more sustainable state requires favourable external (landscape) conditions, a destabilising regime, and matured novelties, which are expected to have been developing in system niches and have gained momentum and break-through (Geels and Schot, 2007).

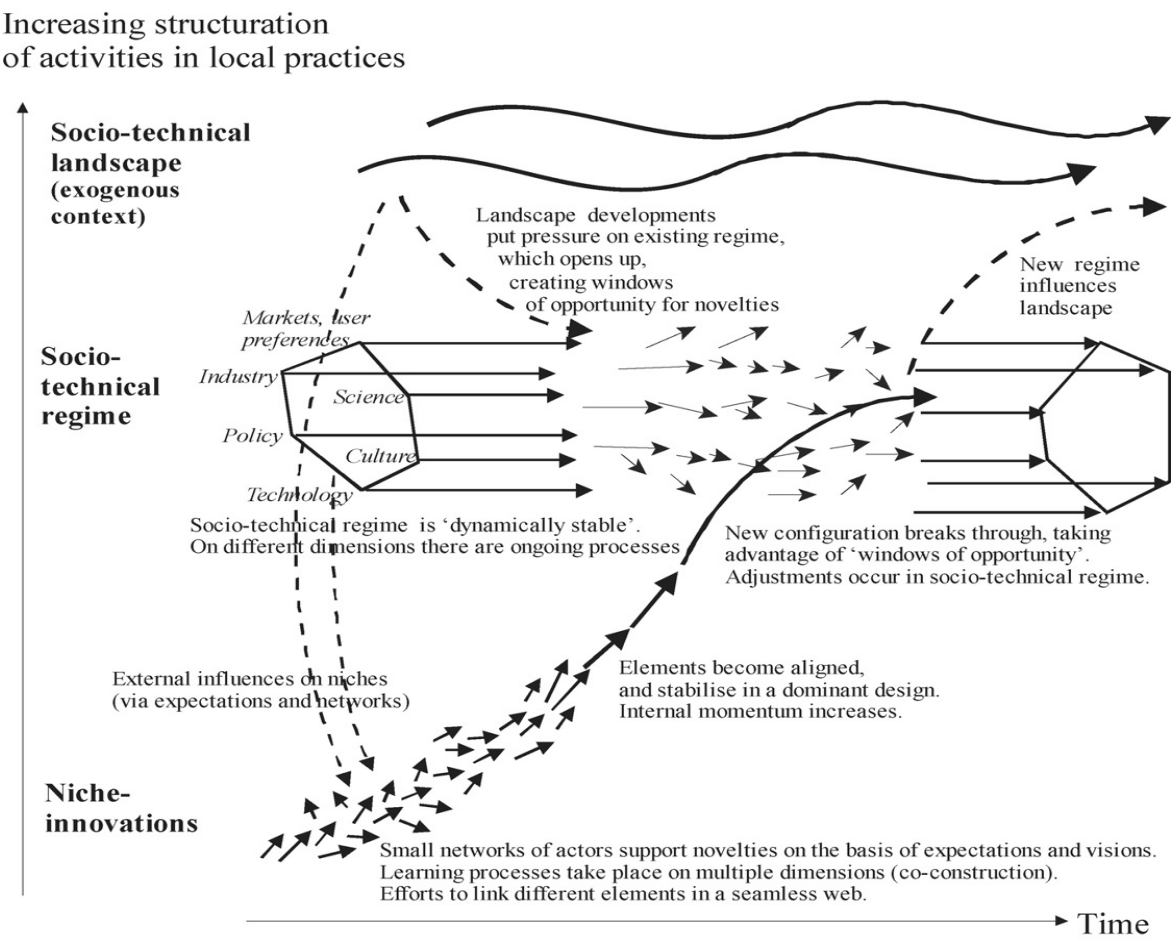

Figure 1.1: Multi-level perspective on transitions (Geels and Schot, 2007)

From this perspective, the energy transition can be understood as a process of disruptive, non-linear and chaotic change in the organisation and the overall qualitative state of the energy regime. In a transition process, as innovations develop and emerge, aligned with shifts in broader society, the dominant institutions of the regime get under increasing crises and destabilise, which may, then, lead to a systemic reconfiguration (Loorbach et al. 2017). The actual transition is a chaotic and disruptive process where new combinations of emerging alternative ideas, technologies, practices and new actors, get connected with transformative regime elements and together grow into a new regime (ibid). The elements of the old regime that do not transform are broken down and phase out (ibid).

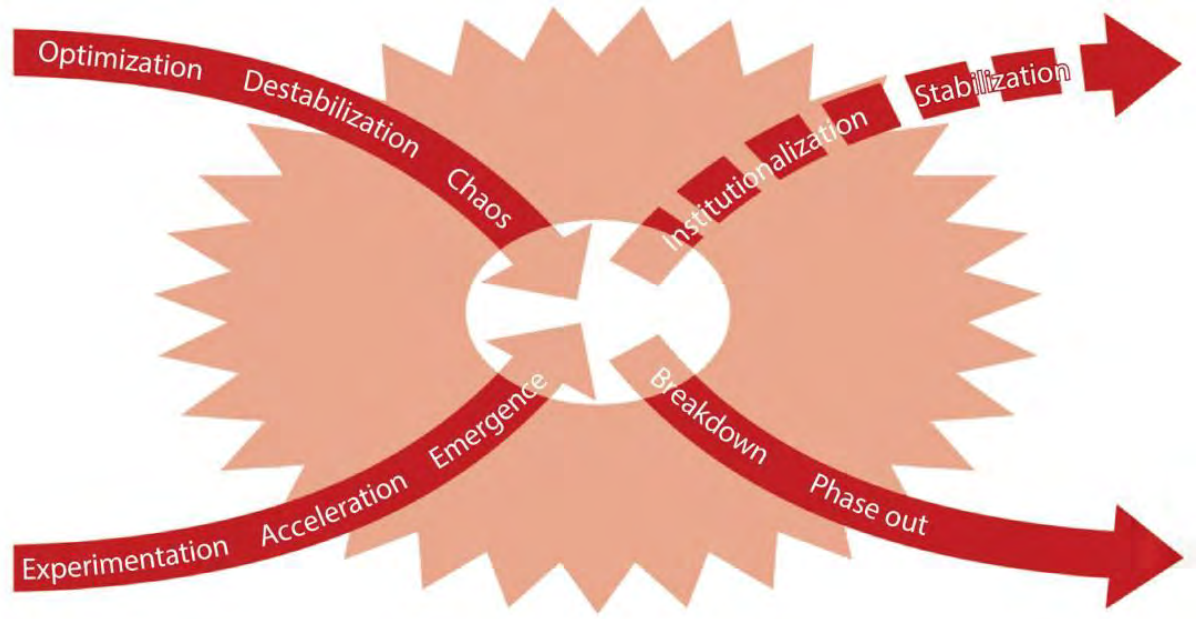

Figure 1.2: The X Curve (Loorbach et al., 2017)

The X-curve (Figure 1.2) has been introduced to illustrate these iterative interrelated processes of the build-up of the new and breakdown of the old. In the X-curve patterns of build-up and breakdown interact with each other and reinforce or offset each other. This interaction takes place in a broader social context. The transition dynamics are visible at system-, sector-, organisation- as well as people level. The X-curve provides an analytical perspective to understand historical changes, indicate current dynamics and reflect on possible future patterns (Loorbach et al., 2017).

1.3. The Dutch energy regime

This thesis applies transition concepts to understand the interaction between the energy regime and niches in the Netherlands. The case of the Netherlands is a specifically interesting setting for studying the energy transition and the actions of renewable energy initiatives therein. This is because the country features a significantly powerful energy regime. It is worth exploring the question as to whether a transition is actually going on in the country and at what phase it is.

With about one-quarter of its area located below sea level and only about half of its total territory exceeding one meter above sea level, the country is one of the strongest economies in Europe (Schiermeier, 2010). Since the 16th century, shipping, fishing, agriculture, trade, and banking have been leading sectors of the Dutch economy, followed by its industrial activity concentrated around food processing, chemicals, petroleum refining, and electrical machinery (Bosman and Rotmans, 2016). The country's top export products in 2017, for instance, have been high tech machinery (28.4%), chemicals (17.4%), food (13.5%), and mineral fuels (12.8%) (InvestInHolland, 2018).

Being home to a great range of academic and civil society environmental institutions, the Netherlands has been praised for its environmental image. The notion of an *energy transition* is deeply rooted in the country's energy debate since its introduction in the

National Environmental Policy Plan in 2001 (VROM, 2001; Bosman et al. 2014). At the same time, the country, home of the Dutch Royal Shell, lags when it comes to the share of renewables in the national energy mix (Schoots et al., 2017).

1.3.1. Main characteristics

The dominant energy regime is characterized by fossil fuels, central organisation and technological optimisation. According to Lodder et al. (2017), three specific characteristics are important for the Dutch energy regime:

1. Massive natural gas reserves: The exploitation of the enormous natural gas reserves in the region of Groningen has contributed to the Dutch national income in the second half of the 20th century.
2. A location by the sea: Its location by the sea makes the Netherlands a favourable transit harbour for several products, including fossil fuels. With Rotterdam having a leading position, the Dutch ports provide together 60% of the fossil fuel supply of North-West Europe. Besides, the sea offers cooling options for power stations and energy-intensive industry.
3. A large energy-intensive industry: Partly due to points 1 and 2, a large energy-intensive industry has emerged in the Netherlands, which consists of (natural gas-fired) greenhouse horticulture, and the petrochemical industry, including fertilizer production.

The Dutch energy regime is highly fossil-fuel-based, and a quarter of all energy is used by energy-intensive industries (which contribute 12.4 percent of GDP) (Weterings et al., 2013). The heavy investments in the existing, centralized, energy infrastructure, which services economically important sectors such as the chemical industry, transport, horticulture, and the food industry by stable and low energy prices, result in a certain degree of lock-in in the existing fossil fuel-based system (ibid).

The energy regime composed of rather few but very big (fossil-fuel-based) companies compared to other countries in Europe, remains a powerful actor in the overall Dutch economy. Since the discovery of large gas reserves in Slochteren (Groningen) in 1959, gas and oil revenues have been an important factor in the national budget (Rijksoverheid Miljoenennota, 2017). The clear interests in the fossil energy supply are the energy companies Uniper, Vattenfall (formerly Nuon), Gdf-Suez, producers of oil and natural gas, such as Shell and ExxonMobil (Lodder et al., 2017). Beyond these, the Dutch government plays also an important role in the gas infrastructure, specifically in the extraction and supply of the natural gas, as a co-shareholder in Gasterra (sales) alongside Shell and Exxon, and as the owner of Gasunie (transport) and EBN (extraction) (ibid). In addition, the Netherlands currently has a very strong position as a European energy hub for gas, oil and coal. And apart from being a shareholder in the ports, the Dutch government is also a shareholder in Schiphol Airport and the airline KLM (ibid).

Network operators have played a critical role in the historical build-up of the country's electricity and gas grids. Since the grid can be an instrument to influence the power balance between the different actors in the energy field, their role in the energy transition is central (Blanchet, 2015). Despite being embedded within the current fossil-fuel-based energy regime, network operators can also support an emerging energy regime based on

distributed renewables. Network operators are, thus, *hybrid actors* with the potential to facilitate the transition to decentralised renewable energy sources.

1.3.2. Historic evolution

To better understand the current energy regime and its resistance to change, we need to analyse its historic evolution. In the 1920s the energy regime was decentralised, small-scale, and based on coal as well as renewables (Loorbach, 2007). Compared to the present day, energy consumption was relatively low, and cars were a luxury product. Local grids were supporting the need for heating in cities (Verbong, 2000: cited in Loorbach, 2007). Energy demand was covered through small-scale technologies and infrastructures based on the domestic sources: coal, turf and biomass (Schot 2000: cited in Loorbach, 2007). This equilibrium was broken by the period of reconstruction, economic growth and consumption that followed the war, which resulted in an increasing demand for energy (Loorbach, 2007).

In the 1940s and 1950s, the population growth along with the economic growth, supported by new technologies and industrial changes led to rapid growth in energy demand. This increasing demand required new infrastructure and resources in sectors such as the chemical industry, agriculture and housing, which in turn led to an increase in energy use. The already existing regime involved many local government-owned energy companies delivering gas and electricity. The gas price for consumers was decided in municipality councils. Political pressure to keep gas prices low led in some cases to a critical financial situation of these utilities, which ended when the government decided to privatize the sector. Additionally, the growth in car-mobility and -ownership contributed to the development of oil-import, refineries and fuelling stations (Loorbach, 2007). Shifting to increasing use of oil, the end of the 1950s the energy transition was in take-off (Schot 2000, p.12: cited in Loorbach, 2007).

Loorbach (2007) notes the following underlying system innovations:

- From coal to gas between 1950-1970 (Verbong 2000),
- From carbo-based to petro- and synthetic-based chemical industry in the Netherlands (Schot 2000) between roughly 1940 and 1980,
- From individual to mass use of automobiles between 1950s and 1990 (Schot et al. 2000).

These co-evolutionary processes led to the dependence on oil (in industry and mobility) and gas (for electricity and heating).

It is argued that by the end of the 1960s and the beginning of the 1970s, the transition reached a stabilisation phase characterized by a long period of optimisation: increasingly efficient use of the existing infrastructures and resources (Loorbach, 2007). During this period the acceleration slowed down. The global oil crisis leading to the first debates on the limited supply was one of the reasons. The environmental concerns increasingly raised during the same period (e.g. Limits to Growth (Meadows 1972)) was another. Although in a very early stage, sustainable energy technologies like wind and solar were put on the agenda.

It is at this point that the ever-growing energy consumption along with its associated side-effects led to increasing public and political pressure. This ultimately resulted in the

first generation of environmental policies and energy-saving measures (Grin et al. 2003: cited in Loorbach, 2007). By the end of the 1980s, the Dutch energy system became increasingly unstable because of economic decline, rising prices and a diminishing capability and authority of the state, and its top-down policies (ibid). In the 1990s pressures from European and global levels, from energy-companies and the dominant political culture of the time, resulted in large-scale privatisation and internationalisation of the energy system in the Netherlands.

End of the 2000s, the Dutch energy regime structure had the same basic energy structure as in the 1980s. Although many alternatives for energy production were already available, the dependence on fossil fuels was strong.

Energy producers have historically exercised significant political influence rooted and enabled through close (regulatory) relationships with governments (Brisbois, 2018). As Johnstone et al. (2017) note, this influence has resulted in "deep incumbency", described as a condition where "*state interests become so enmeshed with those of incumbent firms that it becomes difficult to conceptualize a* "*state interests become so enmeshed with those of incumbent firms that it becomes difficult to conceptualize a functional regime in the absence of those companies*" (cited in Brisbois, 2018, p.151). The close relationship between the Dutch state and the Shell dates back to long before the discovery of the gas reserves in Slochteren in 1959 (Baruch, 1962). By that time, other fossil-based energy companies were owned by the state or local authorities. During the oil crisis in 1973-74, natural gas became of even greater importance to the Dutch economy, but then the liberalisation of the energy market was critical for *"the more or less symbiotic relationship between the State and the relevant parties"* (Correljé, 2003). This symbiotic relationship is central in the Dutch energy regime. From the moment of discovery of the Groningen gas field, the government and the Nederlandse Aardolie Maatschappij (NAM), a joint venture of Royal Dutch Shell and Exxon Mobil for oil and gas exploration and production in the Netherlands, began the negotiations to restructure the gas fiscal regime in order to exploit it. These negotiations shed some light on the Dutch deep incumbency (See box 1.1).

Box 1.1: NAM and the Dutch State

(Adapted from: Correljé et al., 2003)

…At that time, gas exploration was a low priority because gas supply was considered to be a public utility operated on a low profit. In fact, Shell's managing director Salvador Bloemgarten, was allegedly advising to "stay out of gas, there is no money to be made" (cited in Kielich 1988: 19).

…The size of the discovered Groningen field was clearly recognised by both NAM shareholders and the State. Essential issues in their negotiations were the customers' segment to be targeted and the price at which the gas could be offered.

…In contrast to the Shell plan, that assumed that the segment of large users would be the most profitable to supply, the Exxon approach argued that the segment of small users could yield the highest revenues (see Correljé 1998; Heren 1999). Essential conditions for this proposal were: a) that the gas should be made available to domestic users on a very large scale, and b) that gas should be used in as many appliances as possible. This would require the construction of a large country-wide high-pressure transmission system to link the existing and newly established local distribution systems to the Groningen field. Domestic customers would have to be persuaded to switch from coal or oil, to gas-fired (central) space heating, thus expanding the domestic market for city-gas that traditionally was used only for cooking and hot water supply.

…The small, but high value users who would be locked into the gas market once they had converted to natural gas guaranteed a relatively price-inelastic consumption and, thus, became the cornerstone of the Dutch gas system.

When it comes to the organizational structure to be taking care of the Groningen gas, Exxon and Shell feared a weakening in their position vis-à-vis the Organization of Oil Exporting Countries (OPEC) governments, if they were to accept explicit State participation in the Netherlands. Shell offered a way out of this situation. The Slochteren concession would be given to NAM, which thus would become the formal owner of the field. In addition, the Maatschap (Society) was created, in which the cost of production and the revenues from the sales of the gas would be accounted for. Shell and Exxon opted each for a 30% share in the profits of the Maatschap, while another 30% would fall to DSM (later Dutch State Mines), operating as a commercial firm without civil servants on its Supervisory Board. Thus, the set-up would not attract the attention of the OPEC-governments. The Maatschap would transfer the customary 10% royalty directly to the State, thus achieving a 30/30/30/ distribution, plus the State's 10% royalty share. The Maatschap's profits would be taxed at the normal corporate rate. Altogether, the State would collect around 70% of total profits. For the Board's management, however, the voting ratio was 50:50 for the State and both oil companies.

The Maatschap would sell the gas to a national transmission company (later baptised Gasunie, with the same shareholders DSM, Shell and Exxon), to transport the gas to the local distribution companies, owned by the municipalities. A third company, NAM/Gas Export, would export the gas on behalf of Gasunie – in order to avoid attracting the attention of OPEC governments.

Meanwhile, Minister de Pous began negotiations with the large political parties in preparation for Parliamentary approval. The Council of Ministers and the Commission for Economic Affairs of the First and the Second Chamber accepted the draft paper without difficulty. However, Anne Vondeling, a PvdA Member of Parliament, resisted and proposed nationalising the Slochteren concession. When the oil companies accepted a 50% State share in Gasunie (10% direct and 40% through DSM), the PvdA yielded, against Vondeling's advice.

…Three years after the discovery of the large Groningen gas field in 1959, the Minister of Economic Affairs, de Pous, established the main principles of the Dutch gas policy in the Nota inzake het aardgas ("Nota de Pous" – MEZ 1962). In order to generate maximum revenue for the State and the holder of the concession, NAM, the Minister introduced the "market-value" principle as the basis on which the gas should be produced. Accordingly, consumers would never have to pay more for gas than for alternative fuels, but the market-value principle also ensured that they would not pay less. The application of the principle enabled the concession holders, Shell, Exxon, and the Dutch State, to secure much higher revenues than for pricing in which consumer prices were related to the low production costs of gas from the Groningen field.

NAM produced the gas which Gasunie then sold to the distribution companies and some large users. Operating costs for the transmission system plus an annual statutory profit of 80 million Dutch guilders were deducted from Gasunie's gross revenues, and the remainder was transferred to the Maatschap (the entity in which the Groningen Concession was embedded). State revenues were secured in a number of ways; first, through corporate taxes (48%) on the profits of the Maatschap, Gasunie and DSM; second, through an additional 10% government surcharge on the profits of the Maatschap; and third, through the dividends and the State profit share paid to the State by, respectively, Gasunie and DSM. From the early 1970s, a State profit share was also applied to the Maatschap profits (see Wieleman 1982a: 12).

Since the liberalisation of the EU market for power supply in 2004, energy generation and supply were unbundled from the operation of transmission and distribution networks to prevent unfair competition and protect the consumers from higher prices. After the transposition of the EU legislation to the Dutch legislation, all integrated energy companies ought to sell off their gas and electricity networks. The integrated large Dutch energy companies were Nuon (now Vattenfall), Essent, Eneco and Delta, and their shares were held by municipalities and provinces (Janssen, 2017). At the same time, households, companies and other consumers may choose their own supplier, giving rise to competition among energy providers. While the supply market is fully liberalised, suppliers to households and small consumers are required to obtain a licence. This liberalisation allowed multiple actors, including small scale energy cooperatives and large-scale multinational companies, to enter the field of energy generation, and distribution.

The deregulated market also created opportunities for profit-seeking strategies through financial transactions; companies oriented their activities on trading energy derivatives rather than producing energy (Michie, J. & Lobao, 2012). In the end, significant resources have been devoted to political lobbying in order to bring the regulatory regime in line

with the short-term financial interests of the firms that in many cases had seen their power increased as a result of the supposed deregulation (ibid). What is undeniable is that the liberalisation of the market and the consequent privatization of the energy supply companies that followed reduced the municipal ownership of energy companies, resulting in parallel in a shift from small-scale and local- to large-scale and multinational ownership (and control). Given, the pre-existing ties between the Dutch state and the private energy utilities, it could be argued that this transition may have further strengthened the connection of the Dutch state with the private energy sector.

1.3.3. The marginal position of renewables

In this context the role of renewables in the Netherlands is marginal. In 2019 the share of renewables in the national energy mix rose to 8.6 percent of total Dutch energy consumption (from 7.4 percent in 2018) (CBS, 2020). Even though energy consumption from renewables marked a 16% increase compared to a year earlier, the country remains at the bottom among the EU-28 (CBS, 2019). The report by Statistics Netherlands stresses that the Netherlands is by far the worst performing among all EU Member States regarding their respective 2020 targets; the target for the Netherlands involved a share of renewables of 14 percent. Despite the growth, the country is still the worst performing across the EU (EUROPA, 2019).

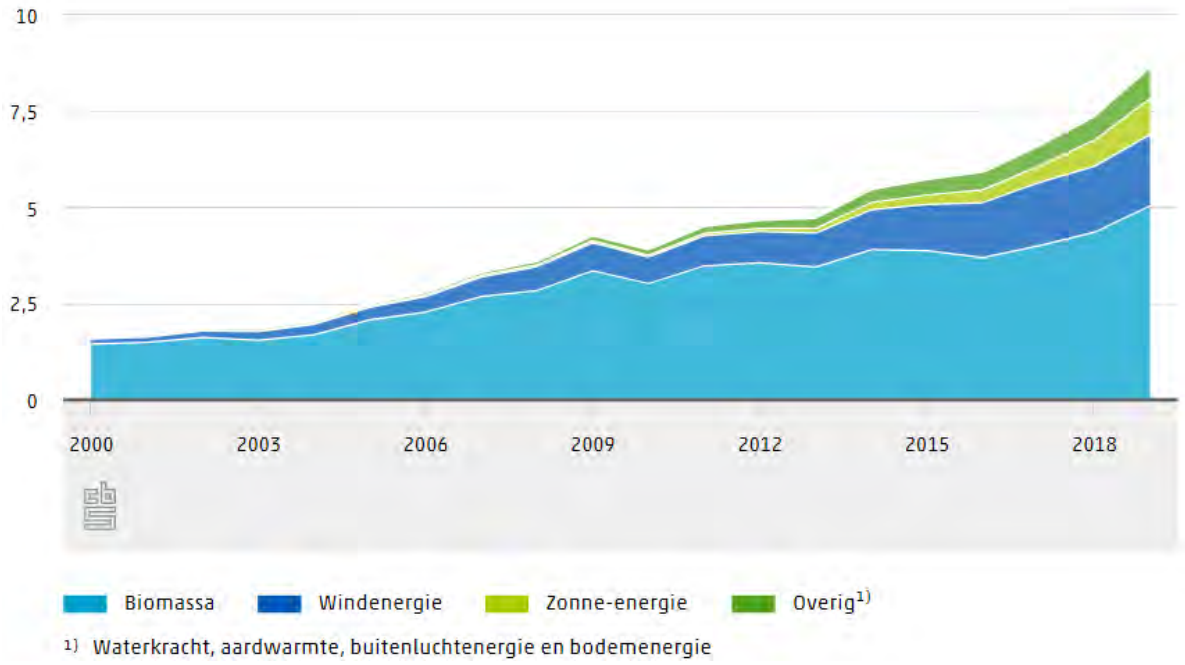

Figure 1.3: Share of renewable energy in gross final energy consumption in the Netherlands (CBS, 2020)

More than half of the increase between 2018 and 2019 was due to higher biomass consumption, mainly due to its combustion in power plants in the form of mostly biodiesel and biogasoline. Solar energy consumption, for both electricity and heat, has also marked a sharp increase; it grew by 37 percent in 2019 to 20 petajoules.

Specifically, the installed capacity of solar panels for electricity generation rose again with a record amount from 2,300 megawatts (MW) to a total of 6,800 MW, an increase of

51 percent. In parallel, wind energy production rose by 7 percent to 39 PJ. The installed capacity of wind turbines went up from 4,400 MW at the end of 2018 to 4,500 MW one year later. The offshore wind farm capacity remained stable at around approximately 1,000 MW.

It should be underlined that the share of solar in the Dutch energy mix is in 2018 even higher than the share of offshore wind. This is remarkable because it illustrates the willingness of Dutch citizens to invest in renewable energy (mostly solar) as compared to the willingness of the incumbent energy companies (investing in offshore wind).

1.3.4. Signs of regime destabilisation

Bosman et al. (2014) mapped tensions in the Dutch discourse, that is to say, the emergence of storylines that undermine the dominant storyline: *a discursive regime destabilisation*, along with a consequent repositioning of incumbents. Multiple interpretations were present within the dominant regime, for instance, regarding the energy market and the role of the government in the energy transition. Bosman et al. suggest that these struggles between incumbents within the Dutch energy regime could imply a growing tension regarding the power structures that underlie dominant coalitions, institutions and infrastructures. These may comprise, indeed. the first signs of regime destabilisation. These internal tensions of the regime where followed by disruptive events, which mobilised further reorganisation within the regime. An event that attracted the attention of the world's media was the Climate Case which was established after the environmental group Urgenda together with 900 Dutch citizens sued the Dutch government requesting more action to prevent global climate change (see box 1.2).

Box 1.2: The Urgenda Climate Case against the Dutch Government

(Source: Urgenda n.a.)

The 2015 Urgenda Climate Case against the Dutch Government was the first in the world in which citizens established that their government has a legal duty to prevent dangerous climate change. On 24 June 2015, the District Court of The Hague ruled the government must cut its greenhouse gas emissions by at least 25% by the end of 2020 (compared to 1990 levels). The ruling required the government to immediately take more effective action on climate change.

The Climate Case, which was brought on behalf of 886 Dutch citizens, made climate change a major political and social issue in the Netherlands and transformed domestic climate change policy. It inspired climate change cases in Belgium, Colombia, Ireland, Germany, France, New Zealand, Norway, the UK, Switzerland and the US.

Following the ground-breaking judgement of the district court on 24 June 2015, the Dutch Government decided to appeal the case in September 2015, despite calls from leading scientists, lawyers, citizens, companies and the 886 co-plaintiffs for it to accept the decision. It made this decision even though it is taking steps to meet the target set by the Court.

The appeal was heard at the Hague Court of Appeal on 28 May 2018. On 9 October 2018, the Hague Court of Appeal decided to uphold the 2015 court decision. In other words, Urgenda won again. On 8 January 2019 the government filled its grounds of appeal to the Supreme Court. Urgenda filed its written defence to the Supreme Court on 12 April 2019 and a subsequent rejoinder on 21 June 2019. On 13 September 2019 the Procurator General and Advocate General to the Supreme Court published an opinion advising the Supreme Court to uphold the judgment of the Court of Appeal.

Current state of play

(Source: de Rechtspraak, 2019)

On 20 December the Dutch Supreme Court upheld lower courts' rulings that the State is obliged to achieve a 25 percent reduction by the end of 2020 “on account of the risk of dangerous climate change that could also have a serious impact on the rights to life and well-being of residents of the Netherlands”. While the State reasoned that it is up to politics to make decisions about the reduction of greenhouse gases, the Supreme Court stated that nation state have direct obligations under articles 2 and 8 of the European Convention on Human Rights (the ECHR) to protect the lives and well-being of their citizens.

Following a 3.4-magnitude earthquake early in January 2018 which damaged more than 900 homes in the province of Groningen and raised concerns as well as protests against gas exploration, the government announced in March 2018 its plan to stop production in the field of Groningen by 2030. This would leave around 450 billion cubic meters (bcm) of gas in the ground, of an estimated value of approximately 70 billion euros ($81.5 billion). The involved energy companies Royal Dutch Shell and Exxon Mobil had stated that they will not issue a claim for missed revenues. After the 2018 court order, the Dutch government announced in September 2019 that the production at the Groningen gas field

will be reduced to 11.8 bcm in 2019/2020, around 40% lower from the current 12-month period and that it will be entirely stopped by mid-2022, about eight years ahead of plan. For this, the government committed to pay an additional 90 million euros as compensation to the involved energy companies.

As the court order instructed the government to ensure greenhouse gas emissions are reduced from 1990 levels by at least 25 percent by the end of 2020, the Dutch government also announced that it will close one of the country's five coal-fired power plants by 2020, four years earlier than originally planned. In addition, the government announced that it plans to shut down the two oldest coal-fired plants in the country by 2024 and the other three by 2030.

In 2019 a report of the Dutch Environmental Assessment Agency (PBL) had shown that the State is not on track to achieve the 25% reduction target by 2020, as its current policies will only bring about 17-24% reduction of CO2 emissions (PBL, 2019). While environmental organisations advocate for more measures to be taken, several renewable energy initiatives in the country are already acting.

1.4. Renewable energy initiatives and their role in the energy transition

This section reviews the historical emergence of renewable energy initiatives in general and with a specific focus on the Netherlands, as well as the motivations of these initiatives and the challenges they face. In this thesis, renewable energy initiatives are understood as organisations whose primary purpose is to provide energy services, and environmental and socio-economic benefits to the members and/or the local community.

In response to a predominantly unsustainable energy system and neoliberal policies of the 1980s and 1990s, an abundance of alternative models of organising the societal function of energy provision has emerged. As part of these alternatives, renewable energy initiatives challenge the unsustainable status-quo, which facilitates an unjust division of cost and benefits, prioritising business interests and privatising profits at the cost of the environment and community interests. These renewable energy initiatives manifest in practice that an alternative way is possible[4].

In 2019, the Netherlands numbered about 582 renewable energy cooperatives, 20% more than the year before, while in 2010 only about 20 of them were active (Schwencke, 2019; Schwencke, 2018; Schwencke 2015). The cooperative movement records a membership of about 85.000 people across the country (Schwencke, 2019). Beyond the registered growth, part of the dynamics in the ongoing energy transition in the Netherlands relates to the fact that renewable energy initiatives began to move out of the experimentation phase. Renewable energy cooperatives, currently invest and manage an

[4] The term 'alternative organisations' has been used to describe politically inspired initiatives which specifically aim to create alternatives to contemporary mainstream capitalist modes of production, consumption, and collaboration (Parker et al. 2014). My focus is on initiatives that *function* as alternatives to the mainstream, deliberately or not.

increasingly bigger part of the renewable energy technological infrastructure, although it is still very small. In 2018, the local renewable energy cooperatives in the Netherlands managed a solar capacity of about 74.5 MWp (2% of the national installed capacity) as well as about 5% of the total onshore wind capacity in the country (159 MW; 40% more than in 2017). In 2019 the collective solar capacity grew by 60%, reaching 119MWp, meaning on average one solar PV per Dutch citizen. As regards wind, the collective installed capacity rose to 193MW, up 22% compared to the year before, covering on average the electricity consumption of about 200.000 houses. Preliminary data from 2020 show that despite the pandemic, the collective solar capacity rose to around 166 MWp (41% higher than in 2019) and that of wind to 229.9 MW (19% higher than in 2019) (Schwencke. 2021).

Participation in these local renewable energy initiatives is often driven by gain- and norm-based incentives, that is, by an interest in financial gains and/or concerns about the environment and future generations (Bauwens, 2016, Dóci & Vasileiadou, 2015; Oteman et al., 2017). It has also been suggested that renewable energy initiatives are based on local and collective values linked to notions of solidarity, rather than profit-seeking (Seyfang and Smith, 2007; Seyfang et al., 2014). However, sustainable energy lifestyles have been presumed to only appeal to a minority of citizens and, so far, (perceived) disadvantages, such as higher energy costs or sacrifices in terms of comfort, hinder their wide diffusion (Baas et al., 2014). Yet, consumer demand for green energy is at least to some extent driving the energy transition (Yildiz et al., 2015). Research suggests that people may be willing to pay a premium for the type of a good they purchase (i.e. renewable electricity) but not for the way (incl. by whom) it is produced (i.e. for consumer-controlled and democratically organised production) (Sagebiel et al., 2014).

Renewable energy initiatives are initiated by a variety of actors, leading to a diversity of different types of initiatives. Citizens take (part of) the production of energy into their own hands installing renewable energy technologies individually or collectively. In this way, they are taking back power from the dominant energy regime. Renewable energy cooperatives stimulate the shift of passive consumers into "*prosumers*", i.e. producers-consumers, who become (pro)active in the collective development and ownership of renewable energy and energy efficiency projects. In parallel, municipal or commercial Energy Service Companies (ESCOs) provide their customers with renewable energy, simultaneously helping them to reduce their energy use. Other enterprises link consumers with existing renewable energy producers or establish online "*crowdfunding*" platforms to sell shares to renewable energy projects under development. The variety of alternative ways of organising is high and keeps rising, gaining higher recognition on the policy level, as well as on the ground, involving continuously bigger part of the society.

The EU's Clean Energy Package acknowledges renewable and citizens energy communities as a distinct market player with distinct challenges and aims (EU Commission, 2019). It has put pressure on Member State regulators to 'level the playing field' for renewable energy cooperatives so they can participate in energy exchange and demand response programmes. This means that unjustified regulatory and administrative barriers should be removed. The Clean Energy Package aims to bring consumers and/or prosumers into the 'logic' of the single energy market (Hall et al., 2019). Within this framework, renewable energy initiatives can improve their revenues

by engaging in flexibility, balancing and ancillary service markets, and by using the produced electricity for functions such as heat or transport. Driven by broader sustainability values, and being reliant on community empowerment and association logics, as opposed to market logics and revenue optimization, such initiatives may be constrained in their growth and expansion (Hall et al., 2019). A "stretch and transform" (see Smith and Raven, 2012) policy would mean that regulators recognise their wider environmental, economic or social community benefits, and, thus, rewrite their energy market regulations to protect them, thereby enabling them to thrive (Hall et al., 2019).

Within the current context, despite their proliferation and diversity, the question remains whether renewable energy initiatives have the ambition and ability to transform the energy regime. The development of renewable energy initiative is driven by the dissatisfaction with and the intention to be independent of the existing energy utilities (e.g. Dóci & Vasileiadou, 2015; Oteman et al., 2017). At the same time, large groups of citizens are concerned about the transparency of governance and the broader direction of society (e.g. Hisschemöller 2012). However, research shows that not all community energy initiatives have the ambition to engage in pursuing wider changes at a system level (Smith et al., 2016; Seyfang et al. 2014). Some wish to remain small and only address local needs and rarely transcend their local boundaries (Hasanov & Zuidema, 2018). Their practices are locally rooted and aimed at addressing local needs, and they often struggle to achieve wider institutional impact in regional or local planning and decision making (Hasanov & Zuidema, 2018; Parkhill et al., 2015).

Other initiatives, nonetheless, may be able to more significantly impact their institutional environment. For example, municipal ESCOs, owned by local municipalities, are often driven by political ambitions and an agenda for CO_2-neutral municipalities, and have, thus, been successful in inspiring change (Jensen et al., 2010). Also in Denmark, a country with several cultural similarities with the Netherlands, the tangible results and overall positive experience by implementing projects based on the energy performing contract concept in municipalities, has influenced the rest of the energy service market in the country (Boza-Kiss et al, 2017).

While it is widely acknowledged that energy access transforms lives, as the climate crisis quite rapidly unfolds, more and more individuals and communities around the world begin to recognize that renewable energy may, in fact, offer much more than reliable clean electricity, pollution reductions, and climate change mitigation. Renewable energy cooperatives are perceived to be a source of democratisation of the energy regime as well as a means to redistribute political and economic power. In the words of Stephens (2019) renewable energy "*provides potential to transform society by redistributing jobs, wealth, health, and political power more equitably"* (p.4). Yet, these initiatives are also limited in the scale of production that they can take on, and they also struggle themselves to become more inclusive or accessible to historically marginalized groups, individuals and communities, including communities of colour, Indigenous communities, low-income communities, marginalised genders, as well as others who may have different priorities and values than the typical cooperative member (Burke and Stephens, 2017).

In conclusion, renewable energy initiatives are reinventing the way social goals (like energy provision) are attained, and in doing so, such initiatives (may) create new institutions and social systems. In fact, the Dutch context, which features a strong energy

regime, pushes the initiatives to experiment with different strategies and alternative innovative models. Their contribution thus deserves our attention. As renewable energy initiatives bring to the fore alternative practices and organisational forms, creating a wide variety of values, we need to assess what these values could mean for the future of our energy system. To systematically capture what values the different renewable energy initiatives create, and what this could mean for the energy transition, we here combine transition theory with a business model perspective. This facilitates the study of the transformative potentials of emerging renewable energy initiatives as well as the exploration of how these initiatives might increase their transformative impact.

1.5. Research aim & objectives

My research focuses on the impact of the (self-)organisation of different renewable energy initiatives. The primary aim of my research is:

To understand and evaluate the potentially transformative impact of renewable energy initiatives on the energy transition

By analysing the way renewable energy initiatives organise themselves and their interaction with their broader institutional environment, and by investigating whether and how *transformative change* takes place, this work contributes to the transition to an environmentally sustainable and socially just energy system.

I use the term "transformative impact" to describe if renewable initiatives have an impact by which they manage to improve their position vis-a-vis the regime over time. This impact is beyond short-lived and fragile success, i.e. upon the system within which they operate. It involves *"effects that are sustained changes on people and organizations, natural and physical environments, and social systems and institutions*" (Wood, 2010 as cited in Liket, 2014 p.54). Drawing on Clark et al. (2004), I understand impact as the sustained changes on societal system level that come as intended and unintended result of an organisation's activity, above and beyond what would have happened anyway. This impact includes both intended and unintended effects, and may be negative or positive (Wainwright, 2002). Therefore, the impact of the initiatives may also be found to be negative, in which case the renewable energy initiatives are unable to release themselves from the way the dominant institutions (make them) think and act.

In this thesis, I investigate *whether* and *how* initiatives, such as renewable energy cooperatives or (commercial) ESCOs, create transformative impact, by evaluating their alternative business models and the associated potential for alternative institutions.

1.5.1. Positioning of the thesis

I put forward the notion of transformative business models as a tool to analyse and reflect upon a renewable energy initiative's contribution to the energy transition, but also as a device to navigate and strategize for increasing this contribution. My ambition is to also identify opportunities for strengthening this potential transformative impact through governance and policy interventions. By using the business model as a methodological device to understand the strategic and operational behaviour of renewable energy

initiatives in the energy transition, this research may be positioned in the interface between sustainability transitions and (sustainable) business models.

So far business model research has neglected the developments at the macro- systemic level, while, in turn, transition research has paid little attention to the dynamics at micro-level (Bidmon & Knab, 2018). Only recently scholars started to refer explicitly to both business model and transition theory. My thesis contributes to the literature at this interface between business model (innovation) and sustainability transitions (Hansen, et al., 2009; Hannon, 2012; Hannon et al., 2013; Bidmon & Knab, 2014; Foxon et al., 2015; Huijben et al., 2016; Schaltegger et al., 2016; Bolton & Hannon, 2016; Wainstein & Bumpus, 2016; Bidmon & Knab, 2018). In contrast to scholars who assess business models as market devices for the commercialisation of sustainable technologies in the context of socio-technical transitions (e.g. Bidmon & Knab, 2014; Wainstein & Bumpus, 2016), I take a broader approach and examine the role of business models in far-reaching sustainability transitions. Also, contrary to Hannon et al. (2013), for instance, I take a strong sustainability perspective wherein beyond economic, environmental and social values are considered too(e.g. Upward & Jones, 2016).

1.6. Research Questions

The central research question can be phrased as follows:

How can we understand the role and impact of renewable energy initiatives in the context of broader systemic changes in the energy domain and how can this impact be increased?

This central research question can be laid out into the following sub-questions. Of conceptual nature, mostly focusing on the conceptual framework:

1. How can we conceptualize the impacts of renewable energy initiatives in the context of incumbent energy regimes?

   (Chapter3)

2. How can a transformative business model perspective help understand the impact of renewable energy initiatives?

   (Chapter 4)

Of empirical nature, mostly focusing on research results and findings to further elaborate the conceptual insights:

3. How do renewable energy initiatives (self-)organise and legitimise their existence through their business model?

   (Chapter 5)

4. What kind of conflicts and tensions arise when renewable energy initiatives interact with the energy regime? What strategies do they develop to overcome or avoid these?

   (Chapter 6)

5. How can the cooperative energy movement coordinate its actions in order to increase its impact on the Dutch energy transition?

   (Chapter 7)

6. How can collaboration with progressive actors from the regime help increase the impact of renewable energy initiatives in the energy transition?

   (Chapter 8)

1.7. Structure of the thesis

The schematic representation of the structure of this thesis is presented below.

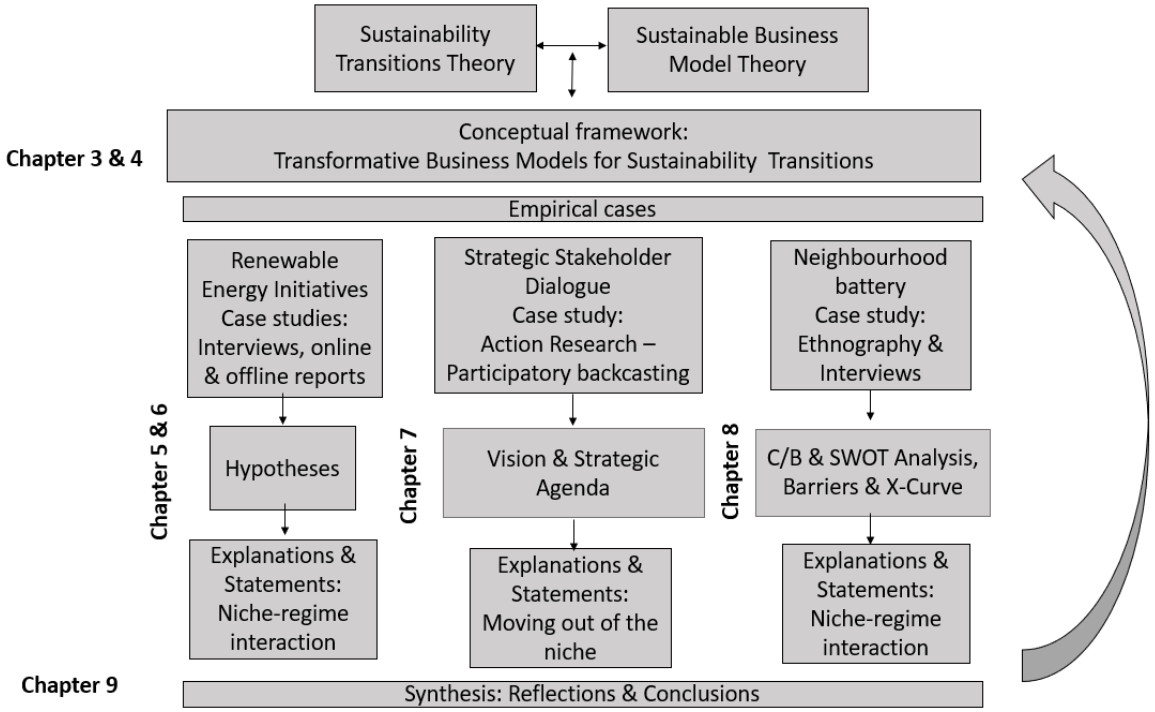

Figure 1.4: Thesis structure

The first part of this dissertation primarily focuses on the conceptual foundations for understanding niche-regime interactions. In analysing these interactions, I combine a lens of sustainability transitions with that of (sustainable) business models. My conceptual contribution encompasses the role of the business model concept in sustainability transitions research. The research questions of conceptual nature are addressed in Chapter 3 and 4; these chapters discuss the state-of-the-art of the literature and introduce the conceptual framework of this research, with the support of illustrative examples (Chapter 3) and one case study (Chapter 4).

The second part of this dissertation covers empirical observations and addresses the questions 3-6. The last chapter synthesises and addresses the overall research question.

The main theoretical reflections of my research have been as follows. My investigation and reflection start with the exploration of the concepts that can support the study of the impact of renewable energy initiatives in the context of incumbent energy regimes. Then, the use of the conceptual framework developed, enables me to first explore how the different initiatives (self-)organise, the conflicts they face and how they organise their (co-)operation to overcome or avoid them. Next, I examine how coordination could help the initiatives increase their impact, and as last, I explore how collaboration with hybrid actors, such as a network operator, could help accelerate the energy transition.

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2. Research methodology

"If the world is complex and messy,
then at least some of the time we're going to have to give up on simplicities.
But one thing is sure: if we want to think about the messes of reality at all
then we're going to have to teach ourselves to think, to practise, to relate, and to know in new ways.
We will need to teach ourselves to know some of the realities of the world
using methods unusual to or unknown in social science."

John Law

2.1. Research design

This research aims to understand and support the potential of renewable energy initiatives, and to contribute to the sustainable transformation of our energy system. The research has been part of a broader research effort in the context of the TRAPESES project standing for Transition Patterns Enabling Smart Energy Systems (see box 2.1).

Box 2.1: TRAPESES project

This thesis was conducted in the context of the NWO funded research project Transition Patterns Enabling Smart Energy Systems (TRAPESES). The central problem in TRAPESES was to find out how synergies and conflicts emerge between existing and new organisations, structures, cultures, and practices in the context of the energy transition. The overall goal of the project was to develop a better insight into the dynamics and mechanisms of accelerating transitions. Specifically, the project mapped the dynamics of emergence and destabilization around the transition towards smart energy systems, which entail institutional, political, economic, legal, user and technological aspects. The project was based upon the hypothesis that transitions are simultaneously about destabilization of incumbent energy regimes (Bosman, 2014) and about the emergence and institutionalization of radical alternatives (the research aim of this thesis). By mapping both dynamics at the regime and niche level the project aimed to explore how alternatives and incumbents co-evolve possibly leading to a reconfiguration of the current centralized and fossil-based energy system to one that is sustainable, emission-free and diversified.

The main research aim of the project was to advance transition theory in terms of a focus on acceleration and the 'desired' hybrid transition pattern, a pattern of social learning through a dialogue between actors with diverging perspectives on the

problem at hand, which, if successful, leads to co-production of new knowledge and experience (cf. Hisschemöller and Hoppe 2001; Hisschemöller and Cuppen 2015).

The more applied aim of the project was to explore these dynamics in a participatory context in which the project brought together selected actors with both a regime- and a niche-background. In the extended User Committee, the findings of the project were discussed in a structured way to gradually develop a transition agenda for the desired energy transition. The User Committee thus functioned as a review and validation board, as well as a transition arena. Furthermore, the project facilitated a 'stakeholder dialogue' with leading individuals from the energy cooperative movement in the Netherlands to develop a shared guiding vision. The dialogue was organized as an action research experiment to explore to what extent a collective envisioning process would help to align strategies and develop a more coherent and strategic position vis-à-vis the energy regime. The secondary aim of the project was therefore to provide input and impulses for the societal process of energy transition.

In order to explore the potential that renewable energy initiatives have to transform the energy system, I followed a case study and mixed-methods approach. This section does not include a detailed description of the process, as this will be discussed in the next section (2.2).

2.1.1. Case study design

The case study method was chosen because it comprises the preferred method for the understanding of real-life phenomena, especially when the boundaries between the phenomena and their context is not clearly defined (Yin, 2009). The purpose of my research has been to understand and improve the role and impact of renewable energy initiatives in the energy transition. Specifically, my empirical research focused on understanding whether and how renewable energy initiatives engage with their broader context and do or do not strategize to enhance their transformative impact.

My first research-case, i.e. the first topic/issue I focused on during my research, involved the study of different renewable energy initiatives in the Netherlands (see Chapter 5 & 6). The Research Questions have been:

RQ3: *How do renewable energy initiatives (self-)organise and legitimise their existence through their business model?* And:

RQ4: *What kind of conflicts and tensions arise when renewable energy initiatives try to impact the energy regime? What strategies do they develop to overcome or avoid these*?

To address these, I explored and compared different initiatives in an embedded multiple-case design (see Figure 2.1 below). The two levels of analysis brought together in my framework involve the organisational level, captured through the lens of business model, and the broader system level, captured through the system dimensions (see next Chapter). In contrast to the holistic design that consists of a single unit of analysis that pools the results across cases, the embedded multiple-case study design allowed for the separation of the findings, for each unit of analysis, enabling the researcher to make comparisons between cases (Yin, 2009). And indeed, through the study of renewable energy cooperatives, commercial Energy Service Companies and other developer

organisations, as well as two intermediary organisations, some commonalities and differences between the organisations emerged, and a number of hypotheses regarding their business model and their interaction with the established regime could be formed (Chapter 5) and explored (Chapter 6). In fact, following the analysis of the organisations as presented in Chapter 5, in Chapter 6 the focus goes to the exploration of the issues that emerged across all organisations, such as the issue around taxation, technology choice or coordination between the different initiatives in the field.

The second research-case builds upon this empirical work that helped to identify dimensions of niche-regime interactions (as captured in the conceptual framework), as well as certain barriers and opportunities for potential interventions. These provided the setting for more experimental action research.

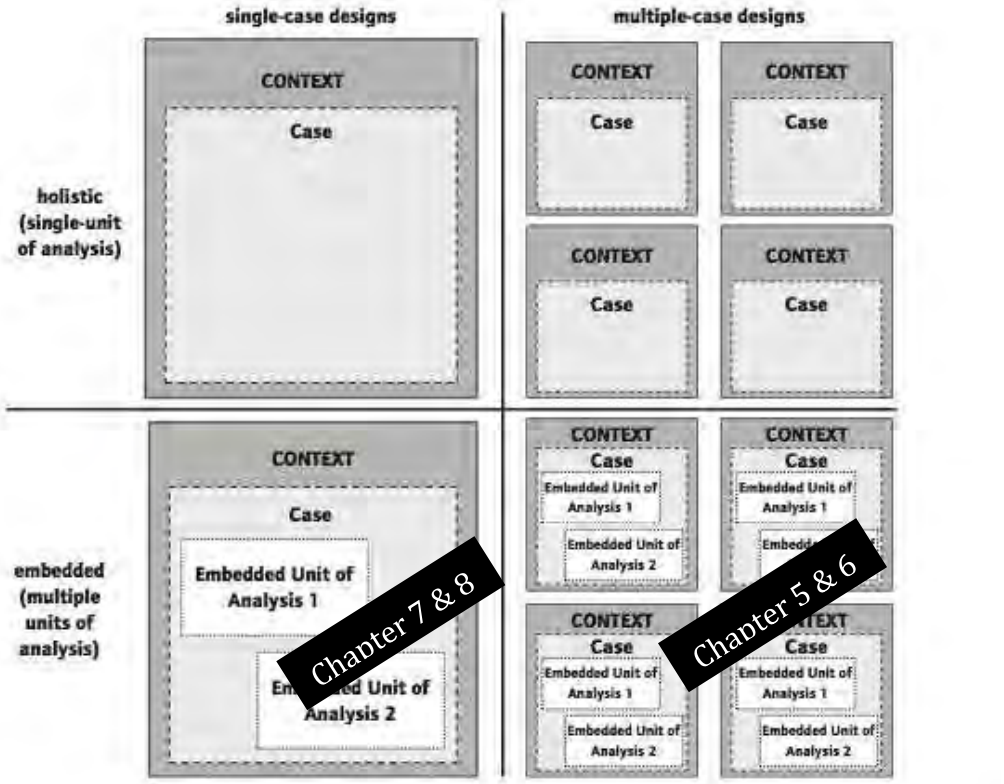

Figure 2.1: Basic types of design for case studies
(Adapted from: Yin, 2014, p.50)

Therefore, the second research-case focused on the role of a particular type of such initiatives in the energy transition, namely the movement of renewable energy cooperatives and involved a strategic dialogue among them (Chapter 7). The specific Research Question has been:

RQ5: *How can the cooperative energy movement coordinate its actions in order to increase its impact on the Dutch energy transition?*

At this stage, the focus of my research, on the one hand, narrows by directing attention on the renewable energy cooperatives, but on the other, it widens from individual cases to the movement of such initiatives. The study on the movement of renewable energy

cooperatives and its role in the energy transition involved a single-case design, meaning that the renewable energy cooperatives that participated in the strategic dialogue were studied and analysed as part of the movement, as members of one unit.

Lastly, on the third research-case, the focus shifts to the specific (business) concept of the neighbourhood battery, an innovation with the potential to influence the energy transition, whose materialisation requires niche-regime collaboration (Chapter 8). The main Research Question has been:

RQ6: *How can collaboration with progressive actors from the regime help increase the impact of renewable energy initiatives in the energy transition?*

The study of the neighbourhood battery involved an embedded single-case design, where the focus has been on the concept and its impact on the energy transition. In that, the insights collected through different methods (see next section) from the interaction with all the different stakeholders (employees of the network operator, renewable energy initiatives, end-users) helped to build a comprehensive understanding of this singe case.

All three research cases have been exploratory. My empirical research involved the comparison and analysis of multiple cases of renewable energy initiatives, their business models, their narratives, their challenges, etc. and their impact on the ongoing energy transition. It also involved the exploration of the role of the cooperative energy movement and its impact on the transition, and it touched upon the potential impact of a collaborative development and management of local energy storage, for which I located myself within the context of a pilot of such innovation. The study of the neighbourhood battery has been used as an instrumental case to enhance my understanding of niche-regime interactions in the context of the energy transition.

Before moving to the next section, it is worth underlining that within a sustainability transitions research context, case studies do not only provide data for the development of new hypotheses and insights for theory, but the approach enables the transfer of research findings to practice (Loorbach, 2010). As such "*case studies, or generally applied projects, are therefore an essential environment to be active in for transition researchers, as much as the library or study hall*" (ibid, p.39). And lastly, it should also be mentioned that, regardless of how meticulously a case study is conducted, it can only serve "*as our best portrayal at this socio-historic time and location*" (Millis et. all, 2012). Therefore, a case study will never be complete. "*It will only be as complete as possible*" (ibid). Therefore, transparency about the limitations of the research methods employed and the overall research process is central.

2.1.2. Mixed methods

During my research I employed a mixed methods approach, combining both quantitative and qualitative tools (Teddlie & Tashakkori, 2011). Having built some background knowledge through desk research, I conducted about 60 semi-structured interviews with a variety of actors involved in the Dutch energy transition: from local renewable energy cooperatives, commercial ESCOs and developer companies, to intermediary organisations or network operators. These interviews enriched my understanding of how renewable energy initiatives work, what kind of challenges they face, and what strategies they employ to increase their transformative impact in the context of the energy

transition. During these interviews I often requested access to more documents, reports, including budget and financial reports, etc., and my desk research continued. Also, as part of my research I have also gained access to a survey of the end-users of a neighbourhood battery.

My investigation focused on both the narrative and the actual structures and practices of the initiatives. Drawing upon Argyris and Schön (1974), I investigated any contradictions between the initiatives "espoused theory" and "theory-in-use" (see Chapter 3). For this, I also used one of the most common methods in ethnographic work, namely, participant observation, which is also one of the most demanding methods as it often requires months (or years) of intensive work for the researcher to become accepted as a natural part of the culture to assure that the observations are of the natural phenomenon. Throughout the years of my research on and the support to the renewable energy cooperatives in the Netherlands, I think that I became myself part of the movement. When it comes to the neighbourhood battery nevertheless, especially as a non-Dutch female person, there has been a limit to my ability to immerse in the culture of the people and the organisation I have been investigating.

Part of this PhD involved action research. More than a method, action research is a philosophy of conducting research, that brings together action (i.e. real-world change), research (i.e. the generation of new scientific knowledge) and participation (i.e. the collaboration of scientists with practitioners) (Greenwood and Levin, 2007). Action research can be understood as "*the collaborative production of scientifically and socially relevant knowledge, transformative action and new social relations, through a participatory process addressing a particular question formed in the interaction between researchers and other actors*"(Wittmayer et al, 2014; Dick, 2004; Greenwood and Levin, 2007; Reason and Bradbury, 2008; Kemmis 2010). While my empirical research started with my observations in the field, in later stages I was actively involved in organizing meetings and engaged myself in normative debates on the energy transition. To be precise, after organising the strategic dialogue with and for the renewable energy cooperatives in the Netherlands, I published the outcomes of this dialogue, along with my broader findings about the cooperative energy field in the Netherlands, in academic as well as popular media. In this way, I joined the public discussions in the country regarding the energy transition and the preferred direction. Later, after my five-month part-time placement within the network operator, I presented my findings to the unit within which I worked, but also to a broader group of employees of the network operator. With my report and presentation, I have contributed to the reflection within the organisation and the role of the network operator in the energy transition, also giving some recommendations about future steps. My research findings were also presented and discussed in international conferences.

The most important advantage of action research is that the direct interaction with the actors under study offers the possibility to observe phenomena that would otherwise be missed. In that, my involvement in the two projects (i.e. strategic dialogue and neighbourhood battery) allowed for the emergence of several insights, in relation to how individuals interact with each other as well as what type of conversations emerge.

Nevertheless, action research does not come without its challenges and limitations. One of the main challenges of action research is that while the role of the researcher is crucial,

there is a lack of training opportunities. For my research, I had the luck to be positioned at an institute with broad experience in action research, and had access to discussions and advice from action research experts; yet, even in this context, I had to learn how to conduct action research by-doing, which also involves making mistakes.

One of these experts, Wittmayer (2016) refers to two intertwined challenges in the context of action research practice. "On the one hand related to the creation and maintenance of spaces for interaction, learning and reflection, challenges include ownership of the process and the outcomes, definition and operationalisation of sustainability, issues of power and politics as well as the actual action the researchers engage in. On the other hand, related to data collection and analysis, challenges include for example upholding certain degree of systematicity and produce trustworthy, transparent and reflexive research results" (p.258).

Indeed, when it comes to the data collection and my actions around it, for example for the case of the neighbourhood battery, I would ideally engage in a one-year placement within the empirical setting of the network operator to gain more fine-grained insights. My placement, however, lasted for five months given my PhD contract. Regarding the systematicity of data analysis, I analysed my data rather pragmatically, maintaining transparency and remaining reflective. I elaborate on this in the next section where I more elaborately describe the research process I followed.

2.2. Research process

In this section, I present the overall research process with as much accuracy as possible. Yet, the process has not been as linear as the following description might suggest. In fact, as the research question and research objectives were missing in the beginning, a linear process could not exist. Although retrospectively I can describe the research process in terms of consecutive and parallel steps, in reality, this process has been less structured. While the broader objective was defined by the TRAPESES project, the particular research questions of this thesis have developed over time; they emerged through 'muddling through' (Bell and Newby, 1977, as quoted in Loorbach 2010, p.41).

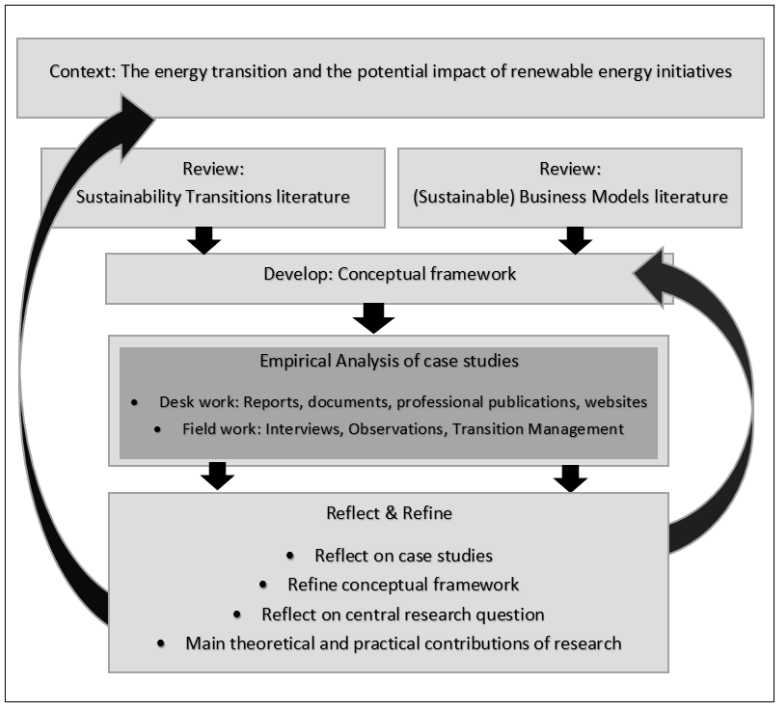

Figure 2.2: Overall research process

The overall research process spanned across a 6-year period: from 2014 to 2020. Figure 2.2 shows the overall research process and Figure 2.3 shows the consecutive and parallel research steps.

	2014 - 2015	2015 - 2016	2016 -2017	2017 – 2018	2018 – 2019	2019 – 2020
Conceptual & Theoretical work	Crafting conceptual framework based on sustainability transitions theory & (sustainable) business models theory Developing analytical framework		Revising conceptual & analytical framework			
Empirical work	Empirical work I: Renewable energy initiatives in the energy transition in the Netherlands			Empirical work II: Strategic dialogue & Empirical work III: Neighbourhood battery		
Writing & desk work	Reviewing literature & writing conceptual chapters		Reviewing literature, analysing data, writing reports & (re-)writing empirical papers		Writing introduction, methodological chapter and synthesis Revising empirical papers	

Figure 2.3: Research steps

At the initial stages of my research, I began reviewing a wide variety of academic and professional material related to the energy transition.

2.1.1. Conceptual work

When it comes to the theoretical and conceptual work, wishing to gain the conceptual tools for understanding and analysing fundamental system change, I first dived into the

literature of (sustainability) transitions. This focuses on processes of fundamental systemic change and how they unfold and the subfield of innovation studies, which focus on the dynamics of emerging technologies and innovations relevant for societal problems, like climate change (Loorbach et al., 2017; Markard et al, 2012). Previous research in the field has focused on questions related to the mechanisms of change, the processes and factors influencing it (e.g. Rip & Kemp, 1998; Kemp et al., 1998; Geels, 2002; Geels & Schot, 2007; Raven & Geels, 2010).

Reviewing this literature helped "setting the scene". Nevertheless, research within these fields, especially on niches and energy transition, tends to emphasize the technological rather than the social aspects of transitions. To study how system change is pushed by alternative actors I turned to grassroots innovation literature, which specifically focuses on "*networks of activists and organisations generating novel bottom–up solutions for sustainable development*" experimenting with social innovations while also using greener technologies (Seyfang et al., 2014, Seyfang and Smith, 2007).

Reviewing the literature, I realised that a systematic way of studying the way such initiatives organise themselves would be necessary for complementing my toolbox for understanding the impact of such sustainable organisations on the system. This made me review and explore research on business model innovation as well as the very ontology of the concept. The recent field of sustainable business models offered insights and a basis to further ground and develop the notion of transformative impact and the organisation it requires (Boons & Lüdeke-Freund, 2013).

The literature on business models helps to systematically study how initiatives (self-)organise their interaction with their immediate context, but the political manoeuvring of the initiatives, according to a transformative agenda crucial for system change, falls beyond the scope of the business models scholarship. To address questions of power and agency of such initiatives vis-à-vis their institutional context, I turned to the work on power and politics in sustainability transitions (e.g. Avelino, 2011), as well as on work on agency and institutional entrepreneurship (e.g. Battilana et al., 2009).

To develop the conceptual framework that enabled me to study the role and impact of renewable energy initiatives in the context of broader systemic change in the energy domain, I particularly focused on the concepts of business models (Magretta, 2002; Doganova and Eyquem-Renault, 2009; Osterwalder and Peigneur, 2010; Boons and Lüdeke -Freund, 2013; Upward and Jones, 2016; Schaltegger et al., 2016) and that of niches (Kemp et al., 1998; Smith, 2007; Avelino and Rotmans, 2009; Smith and Raven, 2012; Fuenfschilling and Truffer, 2014). In my research the focus of the former is complemented by the latter, which can capture innovation in its dialectical relationship with the regime context. A more elaborate discussion around my conceptual framework and the literature I drew on can be found in Chapter 3.

2.1.2 Empirical work

In parallel with drafting my conceptual framework, I attended numerous events on (renewable) energy and community energy initiatives. This participation and the recording of my observations from such events, offered the basis for the research that followed: from the very selection of cases to the development of the necessary good

relations with the groups of actors under study. Such initial work was a pre-requisite for many of the document-reviews, interviews, and participant observations that followed.

Once I specified the organisations selected for my first case, I started the interviews, the observations, and the reviews of documents specifically focused on the organisations selected. Following, for the case of the cooperative energy movement, the research team applied transition management as an action research approach. The case of the neighbourhood battery involved participant observation, as well as semi-structured interviews. More information on the specific methods may be found in Chapters 4-8.

Case selection

All three research-cases have been selected in order to provide insights on the interplay between different models of organising and their impact on the energy transition.

In the first phase of my empirical research (RQs 3&4), as explained in Chapter 6 the selection of the organisations was driven by my analytical framework. While the 12 selected organizations are similar with respect to their focus on sustainability, they collectively represent the largest variation possible with respect to their organizational structure, the technologies employed, user practices (prosumers or not), knowledge base, sector-oriented networking efforts, and use of political power, reflected in their respective business models. To cover the variety of alternative business models which affect energy production and consumption, and the potentially different systemic impact of the initiatives, the case selection included energy cooperatives and private companies, as well as hybrid organisations from the network operators. The selection of the specific energy cooperatives was additionally driven by the wish to select initiatives with different geographical focuses and membership sizes.

In the second phase of my empirical research (RQ5), the selection was also driven by a practical methodological criterion, namely the possibility to conduct action research. In that, the conditions were sought for trust-based interactions with the practitioners involved. The original research idea was to develop a strategic dialogue with the involvement of various actors from the renewable energy sector, yet many of the actors of the cooperative energy movement preferred to hold this dialogue among peers. To maintain the trust of the participants and to safeguard a safe environment for their exchange, the research team has adapted the list of invitees (see Chapter 5 for more).

As regards the latest phase of my empirical research (RQ6), two issues were relevant for the selection of the case. First, the contact with the network operator was already established, as the organisation was a partner in the overall research project and had agreed to support the project in kind. In this context, it has been easier for me to build trust and get accepted in the team, thereby creating the rapport necessary for my research. Second, the specific pilot of the neighbourhood battery was selected in coordination with the network operator, considering the potential value of the project for my personal research (i.e. the investigation of regime-niche interaction vis-à-vis a possible deployment of collaborative business model) as well as the potential value of my contribution to the network operator.

Data collection

The process of my empirical work can be described as multi-layered and rather fluid, as I have been constantly shifting between field notes, interview material, and archival records in order to get broader insights of the topics under investigation.

To build the background necessary for the investigation of the cases, my research started with desk research. This desk research involved the study of academic papers and books, as well as professional reports and publications, including website and blog material, videos and documentaries on the energy transition in the Netherlands (and beyond). The themes I have been investigating relate on a conceptual level to sustainability transitions, grassroots innovation, and (sustainable) business models.

Moving towards the practical level, apart from the contextual knowledge around climate change, my desk research covered topics concerning energy policy, technological and social innovation, and energy democracy. For the professional reports, beyond English, I used Dutch texts. This has been essential because, naturally, most of the reports and documents around my cases have been in Dutch. In fact, documents such as vision documents, statutes, or financial documents as annual results or budgets, provided a lot of information about the official parts of my cases. Important in my desk research have also been digital materials, like website texts, images, videos, and social media. Of significant importance has also been the fact that I was given access to a national database of renewable energy cooperative in the Netherlands ("*Lokale Energie Monitor*" in Dutch).

Overall, during my research, I have conducted about 60 interviews (Appendix). These interviews were mostly semi-structured with certain areas of specific interest (e.g. financial value flows, partnerships, etc.) and lasted on average about 75 minutes. In most of the cases, I approached key figures and organisations, focusing on a variety of actors and positions, e.g. directors, project developers, engineers, lawyers, etc. For further selection, respondents were chosen by 'snowball-sampling', that is through the suggestions of other interviewees. With the exception of the telephone interviews, carried out in the context of the strategic dialogue and in 3 cases in the context of the neighbourhood battery, in most of the cases, the interviewee was asked to suggest the place for the interview. This place varied: from an official work setting to different cafes.

With the permission of the interviewees, all (non-telephone) interviews were recorded. In all cases, informed consent was established by explaining the purpose of the research before as well as during the interview, and by requesting the permission to use anonymised quotes of the interviewee for research purposes. In the case of specific initiatives (Interviews 1-16) reports were sent back to the respondents for clarifications and corrections. In the case of the interviews in the context of the strategic dialogue, the material collected was mainly of practical nature (i.e. would they be interested to participate? Who else should be invited?) and was thus not returned in a written form to the interviewees. Nevertheless, the more qualitative part the discussions regarding the overall interest of the interviewees to participate in the dialogue was partly used as input for the first dialogue meeting. The dialogue participants were asked to provide feedback on the overall report regarding the strategic dialogue. When it comes to the neighbourhood battery, instead of individual reports on the interviews, the interviewees

were again provided with the report on the overall research findings and were invited to suggest corrections or ask for clarifications, if necessary.

During my research I participated and took notes from more than 30 meetings, including meetings organised in the context of the strategic dialogue, meetings with the organisation of the network operator in the context of the neighbourhood battery, meetings in the context of the User Committee of the TRAPESES research project, as well as other major conferences and events of the (renewable) energy sector in the Netherlands, and beyond. In any of these meetings or events, I have been recording my observations in field notes in notebooks or digitally.

My collected empirical material consisted of interview reports, with tables and several transcribed quotes, case-related documents and field notes, including observations, email correspondence and meeting minutes (for the case of the stakeholder dialogue the meetings were transcribed). The reports included quotes as well as tables of primary data (e.g. on costs, project capacities, etc.) in order to allow my supervisors to judge independently my interpretation of the data collected. But how did I analyse the data? Acknowledging that the phases of data collection and data analysis have not been separate, and definitely not completely linear, in the next section, I discuss the methodology for data analysis.

Data analysis

The detailed way I have analysed my data across the different stages of my research can be found in the respective chapters. Here I describe the general principles that the analysis followed.

At first, my partly developed conceptual framework (see Chapter 3 for its final version) helped structure empirical material providing some direction on the questions to ask (deductive reasoning: i.e. deduced from conceptual logic). Yet, the collected empirical material also helped induce some hypotheses (inductive reasoning). And then again, from generating "codes" from collected data, my focus shifted to developing hypotheses, which in turn, guided my subsequent collection of data, by raising new questions. The data in hand was then analysed again and compared with the new data.

The comparative process has been a central element in my research. I analysed the empirical material through close reading, coding, and the development of "thematic tables" to organise them. Coding refers to the "*method to arrest the flow of the world and cluster reality in specific ways*" (Jhagroe, 2016). I conducted the analysis of the empirical material, with a marker and a pen, marking the sections which were relevant to themes of interest such as "value proposition", "network structure", "barriers", "weaknesses", etc. in accordance to my framework. Then, constant comparison followed and only ended when the reflection on "old" and "new" material did not bring any new information to light. This marked both the end of the analysis as well as the formalisation of my conceptual framework. Once the data was analysed within cases, next step was the comparison across cases.

In the first phase of my research focusing on the 12 different renewable energy initiatives in the Netherlands (RQ 3&4), the cases were first compared within the same group of initiatives, and then between the different types of initiatives in order to examine any

possible emergence of patterns. This comparison also covered the financial data which was, at times, provided by the initiatives; when provided, this data was treated with absolute confidentiality.

In the second phase of my research, the dimensions of my framework supported the analysis of the ongoing dynamics, barriers and opportunities for the transformative potential of the renewable energy cooperatives (RQ5). Here, as the focus has been on the movement as a whole, the comparison of the perspectives of the individual participants was relevant for the identification of points of misalignment within the narrative of the movement, but no deeper analysis was performed, regarding possible relations between types of cooperatives and certain statements, for instance.

In the third phase of my research focusing on the neighbourhood battery (RQ6), the collected data was again coded and analysed per topic and perspective, according to the framework. To be precise, the benefits, costs, barriers, etc. under investigation were again grouped per system dimension. Here, the analysis continued, not across cases, as the innovation was studied as a single-case study, but across the 17 interviewees. In that, the perspectives of the different interviewees were compared within the same sub-group of interviewees, and across different sub-groups. Here, I explored possible variations between the perspectives of the employees of the network operator, the directors of the renewable energy initiatives, or the end-users vis-à-vis the different issues under study, and analysed what this could mean for the transformative potential of the innovation.

It should be mentioned, that beyond the comparison and analysis of narratives, when possible, my research also covered comparison and analysis of the practices and structures in place. The added value of this was that the analysis moved beyond what people said or wrote to what they actually "did" and what actually "happened" at specific places and at a specific point in time (Flyvbjerg 1998, 2001; Argyris & Schön, 1974).

Data management

The reports, transcripts, and qualitative analyses thereof have been saved on my EUR laptop, which is protected by firewalls and requires a password to access. In addition, as suggested by the University IT centre, I have been using the software Surfdrive, which is "*a secure alternative for commercial cloud services in the Dutch education and research community*". As a third level of security, the data have also been saved on my personal laptop, which I store at home, and is also protected by a password.

Protecting my respondents and ensuring that their information is dealt with in a responsible and respectable way constitutes my main priority. During my research I have only revealed the names of my respondents and disclosed (part) of my transcripts to my supervisors and one master student who was part of our research team (in the context of the strategic dialogue). This has been the case because I wanted to avoid the possibility of misinterpreting and misquoting empirical data as a result of partial contextual knowledge. Sharing my data with my supervisors helps to ensure that my data are up to academic standards, as they have examined them closely. In fact, such a control mechanism has accounted for a guaranteed anonymity of respondents, while simultaneously also accounting for high academic standards.

2.3. Research approach and principles of scientific quality

In this last section, I reflect about my overall research approach and role as a sustainability-oriented researcher and discuss the principles that have been guiding my research.

This thesis builds on and contributes to the fields of sustainability transitions and (sustainable) business models' research. These research fields differ in their understanding and practice of science and involve a wide variety of methodologies[5] and methods. The field of sustainability transition research is diverse in terms of methodological, conceptual, and analytical approaches, which evokes scholarly debate and reflection (Markard et al., 2012; Loorbach et al., 2017). While some epistemological and disciplinary approaches lean more toward description and conceptual understanding, sustainability transition research explicitly pursues the goal of understanding and contributing to sustainability transitions (Loorbach et al., 2017). The field of business models, while it also constantly widens its scope of issues and methods, it maintains a focus on the organisational value creation, which sustainability researchers have deliberately extended toward the inclusion of social and ecological values (Schaltegger et al., 2015; Wirtz et al, 2016). A similarity between the two fields is that they both acknowledge that multifaceted phenomena cannot be adequately assessed by mono-disciplinary approaches.

As described, in my research I have not only mobilised insights from different academic disciplines, but I have also established collaboration with numerous practitioners, actively recognising and interpreting their experience and tacit knowledge regarding the ongoing energy transition. Throughout my research I have been synthesising the insights from different disciplines with the insights originating in practice in order to solve a 'real world' problem (see Stock & Burton, 2011). Also, building on the premise that transitions are complex, non-linear, long-term processes that unfold as a result of interactions between (transformative) innovations at different levels (Loorbach & Rotmans, 2010), in this thesis, I have combined multiple levels of analysis in the investigation into the energy transition and how it progresses: in particular, the organisational (business-model) and the systemic (societal).

I concur with scholars who suggest that the social world cannot be analysed in similar ways as the physical world; without a doubt, issues of uncertainty, complexity, contingency, and subjectivity, all relevant in the context of sustainability (transitions), undermine the basis for objective knowing (Jhagroe, 2016). And while numbers and figures require some background information too, it is clear that notions such as sustainability or transitions require contextualisation and in-depth description to acquire meaning (Jhagroe, 2016; Avelino, 2011). Reflecting about the fluidity of our social

[5] Methodology refers to the fundamental assumptions that underpin research in relation to the research ontology, which is "*the study of being*", and epistemology, which is "*what it means to know"* (Gray, 2013:10).

world in relation to the methods we use to understand it, Law eloquently notes (2004: 7):

"Nevertheless, in this way of thinking the world is not a structure, something we can map with our social science charts. We might think of it, instead, as a maelstrom or a tide-rip. Imagine that it is filled with currents, eddies, flows, vortices, unpredictable changes, storms, and with moments of lull and calm. Sometimes and in some locations we can indeed make a chart of what is happening round about us. Sometimes our charting helps to produce momentary stability."

To explore possible hidden reasons and mechanisms at play behind the fluid, multifaceted social processes under investigation, I adopt a "*constructive-interpretivist style*", meaning that I acknowledge that in a context of constructed social reality, our understanding is based on somewhat incomplete interpretations. In that, I have embraced the virtue of doubt; academic doubt is constructive as it implies an appeal to keep asking and further investigating (Kuipers, 2014). Nevertheless, the social complexity involved in the social domain does not need to result in vague or relativistic statements. As Cilliers suggests, this complexity should instead lead to a modest position towards knowledge: "*we can make strong claims, but since these claims are limited, we have to be modest about them*" (Cilliers, 2005: 263 as cited in Avelino, 2011). This calls for a more critical and (self-)reflexive stance in conducting science.

Taking a (self-)critical stance also involves reflexivity on the role of the intellectual work of a scientist in the broader social domain. In the past years, a shift appears to take place in the focus of sustainability research: the field has in some degree shifted from research on sustainability to research for sustainability (van der Hel, 2018). With the switch from mode-1 to mode-2 knowledge production as proposed by Gibbons (1994), scientists are not only responsible for their accomplishments in the scientific arena, but they are also responsible and accountable for their role in societal change processes (Rotmans 2005; Avelino, 2011; Wittmayer 2016). In fact, science helps shape certain problem framings and policy discourses and may privilege certain solutions over others, which means that sustainability researchers are directly engaged in the process of changing and shaping society (Turnhout et al., 2016; Wittmayer and Schäpke, 2014; van der Hel, 2018). Actually, the unstructured nature of energy issues, in terms of relevant knowledge and relevant norms and values (Hisschemöller and Bode, 2011), means that the ideas about which issues need to be addressed and how are very dynamic. Therefore, the role of science in shaping the problem framing and the policies for its mitigation is crucial. In practice sustainability research involves a continuous iteration between pursuing fundamental and applied research, and we may thus talk about mode-1 and mode-2 research. This research effort is, thus, not only on- buts also for the transition to a sustainable and just energy system.

Understanding my role as "*not merely academic in this context, but also public or political*" (Jhagroe 2016: p. 64) I have sought to ensure that both the research process and the research outcomes adhere to a number of principles.

2.3.1. Principles for scientific quality

(Neo) positivist-oriented research has established criteria such as validity, reliability, objectivity, and replicability. Nevertheless, while validity and reliability are crucial, judging the trustworthiness of a more interdisciplinary, interpretative research practice, especially when complex and value-laden issues of sustainability are involved, requires additional criteria (Schwartz-Shea, 2006 & Yanow, 2006; Wittmayer, 2016). To establish the scientific soundness and trustworthiness of qualitative research results Lincoln and Guba (1985) suggest credibility, confirmability, dependability and transferability. Credibility is about the level of confidence of a qualitative researcher in the accuracy of the research findings. Confirmability refers to the degree of neutrality in the research findings, and dependability to the extent to which a study can be repeated by other researchers without influencing the consistency of the findings. Last, transferability is about the way the researcher demonstrates the applicability of research findings to other contexts, such us similar phenomena.

To establish credibility in qualitative research, respondent validation is considered crucial, as it is a first validation of one's research findings by one's respondents. Respondent validation involves research participants responding either to forms of initial data, e.g. transcripts of interviews, or to first drafts of interpretive reports in order to check them for accuracy, but also to assess the interpretive claims that are being made (Torrance. 2012). In this research, respondent validation has been achieved through the circulation of (interview) reports and through presentations aimed at getting feedback on the researcher's interpretation of the findings. This check with my research participants was part of the research process. Any possible disagreement could not only provide me with an alternative interpretation (to contrast with my own incomplete interpretation), but also, especially given my interest in contrasting the narratives of the renewable energy initiatives with their actions and structures, such a dialogue could potentially support reflection and learning for my research participants too.

An intrinsic feature of any research process, especially crucial for the scientific soundness and trustworthiness of qualitative research, is reflexivity, i.e. a researcher's engaging in a process of self-awareness and self-criticism. A researcher needs to be "*acknowledging the recursive relation between interpretation and the object of observation, and thus reflecting on one's own interpretation and role in (research) processes*" (Avelino, 2011: 25), which is necessary for the confirmability of one's research. Reflexivity requires honesty and transparency about the personal involvement of the researcher. During my research, I have tried to be honest and reflexive about my personal role in observing, interviewing, reading and writing; through self-reflection and exchange with other scholars about my research, I was confronted with and addressed own biases due to my experiences and values.

This exchange with other scholars, and the transparency about my research approach and methods, about the data collected, and the accuracy in the presentation of my findings (Wittmayer 2016, Hölscher 2019) was necessary to support my findings. Transparency and detailed description of not only a particular behaviour or position of an actor but also of the context in which this behaviour/position has emerged was also important so that an outsider can better understand its meaning. For this reason, I have

been transparent not only about the research method, but also about the cultural and social context of the research setting.

Lastly, while throughout my research I sought the feedback and scrutiny of other scholars in fora such as academic conferences and journals, linking back to the mode-2 scholarship and action research, I believe that the sustainability-oriented research should also be judged on the basis of the impact that both its process and its outcome have created. As it has been specified by Loorbach (2010:38) for sustainability transition research:

"transition research should be concerned with the process (in terms of involvement of stakeholders, process tools, validation of the research process) and with the substance (integration of societal perspectives, knowledge, and goals, structuring problems and solutions and normative goals)."

The outcome, the substantial element of the research, is therefore also important in the assessment of its quality. In the context of my research, I have tried to take on board the perspectives of all the actors involved in the process as well as the outcome of my research. Moreover, to avoid unintended potential negative consequences, during my research I have decided to anonymise the research participants and to not disclose sensitive information (e.g. concerning financial data). Becoming aware of sensitivities does not imply excluding research findings due to their potential controversial nature; instead it means that certain findings are presented in a higher level of abstraction (i.e. per type of organisation).

2.4. Appendix

Interview No.	Role of interviewee	Interview date
1	REC director & REC project developer	11.09.15
2	REC director	17.09.15
3	ESCO project developer	03.11.15
4	REC director	05.04.16
5	REC director	22.04.16
6	REC director	22.04.16
7	REC project manager	19.05.16
8	REC director	07.06.16
9	REC director	22.06.16
10	ESCO developer company director	06.07.16
11	Director intermediary organisation	06.07.16
12	Director intermediary organisation	09.07.16
13	Developer company director	12.07.16
14	REC Intermediary actor	24.08.16
15	REC project developer	22.09.16
16	REC project developer	13.10.16
17	Actor involved in REC sector	14.10.16
18	REC director	14.10.16
19*	REC director	17.10.16
20	Developer company director	18.10.16
21	REC director	18.10.16
22	REC director	20.10.16
23*	REC director	21.10.16
24*	REC director	24.10.16
25*	REC intermediary actor	24.10.16
26*	Director intermediary organisation	26.10.16
27	Director REC utility	01.11.16
28	REC director	01.11.16
29	REC director	02.11.16
30	Commercial project developer	03.11.16
31	Director REC utility	03.11.16
32	REC director	04.11.16
33	REC and commercial project developer	04.11.16
34	REC director	08.11.16
35	REC director	08.11.16
36	REC director	08.11.16
37	REC director	09.11.16
38	Developer company director	29.11.16
39	Professional network operator	25.03.17
40	Professional network operator	04.04.17
41	Professional network operator	05.05.17
42	Professional network operator	10.05.17
43	Professional network operator	17.05.17

44	Professionals network operator	18.05.17
45	Professional network operator	19.05.17
46	Professional network operator	23.05.17
47	Professional network operator	30.05.17
48	ESCO developer company director	18.05.17
49	REC director	22.05.17
50	REC director	29.05.17
51	REC project developer	06.06.17
52	REC director	08.06.17
53	Professional network operator	09.06.17
54	Professional network operator	13.06.17
55	REC director	07.07.17
56	REC director	07.07.17
57	Professional network operator	13.07.17
58	Professional network operator	22.09.17
59	Project developer intermediary organisation	17.11.17
60	Director REC utility	17.10.17

Table A: List of interviews

* *NOTE:* Interviews 17-38, and 49-51 were phone interviews, while interview 15 was performed via Skype. The interviews with an asterisk have been conducted by Dr. Matthijs Hisschemöller, in the context of (the preparation of) our strategic dialogue.

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3. Assessing the transformative potential of renewable energy initiatives: a framework based on business model and sustainability transitions literature

Proka, A., Hisschemöller, M., Loorbach, D., (working paper)

Abstract: As renewable energy initiatives mushroom around the world, plenty novel business models take shape, manifesting an advancing energy transition. The question that naturally emerges is whether initiatives like these can transform the energy system as a whole. This paper explores as to whether enriching a business model perspective with insights from sustainability transitions theory provides a way to analyse the transformative potential of renewable energy initiatives. In order to systematically examine the initiatives' contributions, we suggest studying the business models they develop and implement and how they relate to their institutional context. For this, we propose examining niches as embryonic institutions that exhibit a dialectic relationship with the regime. This work embraces a broad orientation on value that allows, apart from financial, the consideration of social and environmental values and disvalues. The introduced framework enables to comprehensively assess and potentially improve the initiatives' contributions to sustainability transitions.

Keywords: sustainability transitions; niche; business model; energy transition

3.1. Introduction

Renewable energy initiatives are rapidly developing in Europe and beyond. Community energy cooperatives, peer-to-peer energy providers or crowdfunding platforms for solar or wind, are all examples of a variety of new businesses that develop and represent an alternative way of organising the political economy of the current energy system. Notwithstanding many differences, their common point of departure is bridging the gap between energy production and consumption. This is amply illustrated by their preference for decentralized technical solutions and the discourse on 'prosumption', a concept that implies end user involvement and ownership of the energy produced. In Europe alone, more than 3400 renewable energy cooperatives, or as defined in the recent EU-directives “citizen energy communities”, were recorded at the start of 2019 (REScoop MECISE, 2019). As they flourish in numbers and increase their impact through additional projects and services the question that naturally arises is whether initiatives like these have the potential to transform the way the overall energy system works. It is uncertain whether the diffusing initiatives are *willing* and *able* to professionalise, challenge and eventually alter the system without being captured by it. And for this, our research focuses on the following question: “*How and under what conditions could the (self-*

)organisation of renewable energy initiatives contribute to desired transitions to sustainable energy futures?"

This contribution argues that, for those interested in the transformative potential of renewable energy initiatives, i.e. their capacity to radically change the energy system and its underlying institutional framework, the primary question to be addressed is of a conceptual and methodological nature: how can their transformative potential be assessed? Obviously, assessing this potential is not making a prediction with respect to the upscaling of specific initiatives. After all, the energy transition is a complex, long term, and uncertain process (Verbong & Loorbach, 2012). Nonetheless, we do know enough about the current state of the energy transition as to make a meaningful analysis of the indicators by which the potential of renewable energy initiatives can be evaluated.

In order to develop a framework of analysis, this paper will explore and link two concepts. First, the concept of business model, which has been developed to assess the factors that contribute to the success of a company through value creation (e.g. Magretta, 2002; Doganova & Eyquem-Renault, 2009; Boons & Lüdeke-Freund, 2013; Schaltegger et al, 2015; DaSilva et al., 2018). Renewable energy initiatives, organized into cooperatives, are companies, which nevertheless differ from the transnational energy corporations that still dominate the global energy market and the publicly owned energy companies or public private partnerships that in many places still provide heat to local communities. For private companies, value creation has mostly been associated with monetary value, the ultimate goal being an increase of revenues. However, the literature on sustainable business models also points to the relevance of societal values, especially where social innovations are concerned, such as a decrease of Greenhouse Gas emissions or an increase of social coherence at local or neighbourhood level (Stubbs & Cocklin, 2008; Upward & Jones, 2016). Hence, notions from the literature on (sustainable) business models are expected to bear relevance for the topic of this paper. However, whereas the concept of business model is used to assess how businesses operate and relate to their immediate network (Mason & Spring, 2011), its focus downplays the influence of the wider socio-technical context (Schaltegger et al. 2016, p. 284). This wider context is especially relevant for sustainable businesses that have to deal with barriers at system level (e.g. Bolton & Hannon, 2016).

The second concept this paper will explore is that of niche in the context of the theory on sustainability transitions, i.e. long-term, non-linear processes that entail fundamental changes in multiple systems and scales (Grin et al., 2010; Geels & Kemp, 2000). In transition theories, the concept of niche has been used to highlight innovations that provide potential alternatives for the current (unsustainable) regime. In this view, radical innovations are potentially dangerous for the regime, i.e. the status quo of dominant institutions. Therefore, the regime hinders the growth of the niche by obstructing business models for radical innovations. Although niches are frequently associated with technological innovations, this concept may also apply to social innovations, i.e. new social practices with possible transformative impacts (Cajaba-Santana, 2014; Avelino et al., 2017). Renewable energy initiatives are good examples of social innovations that present radical new ways of doing, thinking and organising as compared to incumbent regimes.

Transitions are the result of increasing external pressures from a changing environment, internal tensions associated with the path-dependent regime development and increasingly competitive alternatives (De Haan, 2010). Transition governance literature explores how different types of agency influence the course, speed and direction of transitions (Loorbach, 2010, Brown et al, 2015). But so far, less attention has been paid to agency from within the niche.

This paper's main objective is to explore as to whether linking the transition and business model perspectives provides a way to analyse the transformative potential of renewable energy initiatives, i.e. to identify the dimensions that may serve as indicators thereof. In what follows we first discuss how notions related to the concept of (sustainable) business models can help articulating the aspirations and vulnerability of renewable energy initiatives (Section 2) and then use the concept of niche to put these findings in an institutional framework (Section 3). Building on these insights we ultimately present our framework for the analysis of the contributions of renewable energy initiatives and their transformative potential (Section 4); we then summarise and conclude (Section 5).

3.2. The multifaceted concept of sustainable business model

Social innovations aspiring to contribute to transitions are almost by definition initially driven by idealism, entrepreneurship and experimentation. Yet, to move beyond the phase of local they inevitably face challenges of professionalization, upscaling and mainstreaming. To what extent can the concept of a sustainable business model help to better understand and support this process, especially when institutional settings constrain their space for action (Kern et al., 2015)? A critical exploration will reveal at least three functions of this concept for the framework to be developed in this paper.

The concept of business model is multifaceted and even contested. It originally emerged in the for-profit frame and spread by an extensive use of practitioners and academic scholars. The concept, residing somewhere between economics and business studies without possessing an established theoretical grounding in either field (Teece, 2010; Speith et al., 2014), has been criticized as fuzzy, as it "*seems to refer to a loose conception of how a company does business and generates revenue"* (Porter, 2001, p.73). Zott et al. (2011) found that business models are often studied without an explicit definition of the concept; yet several attempts have been made to cover this definition gap. Business models have been referred to as a statement, a description, a representation, an architecture, a conceptual tool or model, a structural template, a method, a framework, a pattern and a set (Ibid.).

It can be derived that the first critical function of the business model concept is that it refers to a (more or less specifically defined) approach or methodology to be employed by either the company or an observant: a business model may be understood as "*a tool to position the value proposition in the value chain"* (Sabatier et al. 2010, p.442), or as a strategic management tool to improve a company's value chain (Linder & Cantrell, 2000). By working towards a business model an organization seeks its position in the market and finds out about barriers and opportunities. Teece (2010) argues that a business model reflects management's hypotheses about how a business could align its offerings with the needs of the customers in order to make a profit. Hence, a critical purpose of research into business models is a better understanding of "*how managers conceptualise,*

theorise and enact the modelled changes in organisations and market'" (Mason & Spring, 2011, p.1033). Business models enable practices of framing, calculation and decision-making for current and future actions (Doganova & Eyquem-Renault, 2009). However, it is not only the managers' vision that counts. Equally important for eliciting the business model are the organisation's daily activities (Mason & Spring 2011; Schaltegger et al., 2015).

And, indeed, the business model is *"both a cognitive phenomenon as well as built on the material aspects*" (Tikkanen et al., 2005, p.789). These material aspects involve the complex exchange relationships and resource configurations, "*based on contracts and organizing routines*" aimed at creating and capturing value within a value network (Doz & Kosonen, 2010, p.371 In Bidmon & Knab, 2018; Chesbrough, 2010; Teece, 2010; Zott et al., 2011). As a cognitive phenomenon, business models involve their collective cognitive representation; the "*causal links between the material exchange mechanisms of organizations and their environment which exists in managers' minds*", and reaches the minds and actions of employees and partners (Bidmon & Knab, 2018, p.905, citing Baden-Fuller & Mangematin, 2013; Baden- Fuller & Morgan, 2010; Doz & Kosonen, 2010). Business models can, thus, explain how businesses work facilitating the articulation of business ideas and processes of collective sense making for current and future actions (Doganova & Eyquem-Renault, 2009; Massa & Tucci, 2014).

The implication from this is that research into business models needs to do more than just echo a company's claim in this respect. It needs to critically investigate both documentation and practices, asking why things are happening as they do. The findings from this research may point to contradictions between what an organization claims and what it practices. The case of renewable energy cooperatives shows such a contradiction where they claim that their membership consumes the energy they produce, the ideal of 'prosumerism', whereas, in reality, legal barriers exist that prevent cooperatives from selling or funnelling the energy produced (back) to their members. The distinction between a documented vision and practice corresponds to the distinction between "espoused theory" and "theory-in-use" (Argyris & Schön, 1974). The former refers to the claims that an organization makes as regards its behaviour, whereas the latter refers to the implicit theory that governs its practice. Articulating the theory-in-use can be helpful to assess the accuracy and/or truthfulness of business models (e.g. Amit & Zott, 2001). Especially in case of a niche organization, like a renewable energy cooperative, it can shed some light on both the initiative's strengths and its vulnerability. Interventions could enhance a dialogue within and among organizations with a similar sustainability goal, thereby encouraging learning.

Indeed, it has been argued that a business model perspective is about learning. It underlies the awareness that adaptations or radical changes might be needed due to changes internal or external to the organisation (Wirtz et al., 2016). Business models have been associated with securing and expanding a company's "*competitive advantage"* (Ibid). This means that business models become themselves subject of strategic innovation in order to leverage resources as knowledge, managerial and entrepreneurial skills, or to enable reconfigurations of the underlying value chain or value network for organisations to flourish (Schaltegger et al., 2012 cf. Schweizer, 2005; Wirtz, 2011). And as DaSilva et al. (2018) note, it is due to a failure to adapt or create new business models

to incorporate disruptive technologies, for instance, that companies collapse, and not due to the disruptive technology *per se.* Any company has at least as much value to gain from business model innovation as from technological innovation (Chesbrough, 2010).

The notion of learning implies that business models are performative in that they can be understood as a set of interconnecting ideas and practices that co-evolve with the context within which they are practiced (Mason & Spring, 2011). In other words, business models describe and encompass a number of practices, in which actors engage, as regards value creation, delivery and capture, which in turn influence and shape their context**.** Business models can be seen as "*as a reference point for communication*" for the creation, maintenance and transformation of markets; they may be understood as 'market devices' for enabling the emergence of innovations (Boons & Lüdeke-Freund, 2013, p.10; Doganova & Eyquem-Renault, 2009). This is the second critical function of the concept: business models are often launched as inspiring narratives with the purpose to circulate across different actors and fields and attract customers (Magretta, 2002). Combined with a sustainability orientation, business models function as catalysts for awareness of the need for system-wide transitions. Impact driven business models enable social entrepreneurs to create and further develop markets for innovation with a social purpose, shifting the market they operate in (Boons & Lüdeke-Freund, 2013; Loorbach & Wijsman, 2013). Once they are carried by a stakeholder network, sustainable business models act as catalysts to creating and transforming markets towards sustainable development (Boons & Lüdeke-Freund, 2013; Schaltegger et al., 2015).

In case of narratives, too, it is critical to articulate the explicit and implicit assumptions and expectations of the company, because the company can be misguided with respect to both the message content and the addressees. Hence, interactive development of a sustainability strategy is advisable (Stubbs & Cocklin, 2008).

The third critical function of the business-model concept, within the scope and focus of this paper, relates to its content. Theories-in-use may articulate three types of relationships: (1) cause-effect relationships, (2) goal-means relationships and (3) relationships among norms and values (Hoogerwerf 1990). A typical business model articulates the relation between the company's goal, most often referred to as value creation, and the means to realize it. As Wirtz puts it, a business model "*captures the way the firm functions and creates value*" (2010, p.274). Osterwalder (2004) argues that business models explain how organisations create, deliver and capture value. While in the for-profit sector value is almost synonymous to financial value and profit maximization, for sustainable business models this differs. What distinguishes business models with a sustainability focus from other business models is the explicit articulation of normative claims and assumptions. The focus is deliberately extended towards a plea for considering social and ecological values, or in other words, the internalisation of social and environmental externalities (Schaltegger et al., 2015; Boons & Lüdeke-Freund, 2013).

The manifold discussions on sustainable business models imply the question into the relationship between the goal of realizing profits for the company and its contribution to the realization of sustainability values. Stubbs & Cocklin (2008) suggest ideal types of business models on a continuum from "for-profit" to "strongly sustainable". The typology is presented as a tool for businesses to find points of leverage for change towards a more

sustainable business model. However, this typology appears to suggest a contradiction; the more sustainability focus, the less revenues, and vice versa. Yet, many companies today, big and small, convey the message that their sustainability orientation allows the company not only to stay in business but even to increase its revenues. This claim may be based on the observation that many customers are willing to pay more for sustainable than for unsustainable products. Local energy cooperatives in many European countries produce renewable energy thanks to feed-in tariffs or tax exemptions. As a representative from a German renewable energy company phrased it: "*The EEG (Erneuerbare-Energien-Gesetz, 2011) is our business model*" (Sühlsen & Hisschemöller, 2014, p.218). Indeed, government grants and subsidies enable companies to do sustainable business. This not with high revenues but with sufficient income to keep the volunteers in the cooperative going.

These observations are interesting in two ways. First, next to goal-means and norms-values relationships, the valuation part of a business model articulates cause-effect relationships, such as: willingness to pay for a sustainable product on the side of specific consumer groups or governments causes a specific amount of income needed to cover company costs or to realize benefits. A sustainable business model reveals an attempt to identify an innovation's market potential. Its facts and figures point to the vulnerability of the business and specify the need for specific support to realize a responsive cost-benefit ratio. Second, the above observations illustrate that companies with sustainable business models address segments of the market, where a specific group of customers is expected to pay for their product (niche market). The transformative potential of renewable energy initiatives, or in other words, the potential to have systemic impact, is dependent on their willingness and capacity to address a much broader public than only the relatively small part of attentive citizens; this involves a systematic articulation of their envisioned contributions. Yet sustainability-oriented business models are constrained and may conflict with their overall institutional framework. This would mean that next to the immediate context of the business, systemic factors must be taken into consideration (Schaltegger et al., 2015, p.6).

In conclusion, the concept of transformative business model is introduced as a multi-faceted concept that refers to a reflexive tool to reveal how a company best pursues its interests in the context of sustainability transitions. Research into the business model requires that a company's claims and practices are to be analysed and, in so far they are implicit, need articulation. Following the literature in this section, a business model can be laid out into four components:

- The *Value proposition* that clarifies what value (i.e. benefit) is embedded in the offerings of the organisation towards specific target groups (e.g. Doganova and Eyquem-Renault, 2009, Schaltegger et al., 2016);
- The *Product or Service*, which fulfils the value proposition and generates the promised benefit offered to customers (and indirectly to other stakeholders) (e.g. Stahler, 2002);
- The *Architecture of value* that lists the partners and channels through which value creation and delivery is accomplished (e.g. Doganova and Eyquem-Renault, 2009), and,

- The *Value capture*, which encompasses the cost and revenue flows that determine the value (including but not limited to financial value) captured by the organisation and define its viability (e.g. Upward and Jones, 2016; Schaltegger et al., 2016).

3.3. Towards a pluralist niche concept

Transformative business models should be conceptualised as transforming existing (market) contexts or helping to build up new ones. To do so we need additional elements and a better understanding of the dynamics of transitions, for which we turn to transition theory. Central in transitions literature is the idea of the co-evolution of material and social structures, like technologies, markets, routines or discourses, which over time turn into a stable system that enables the fulfilment of a societal function like energy provision (Kemp, 1998; De Haan, 2010; Fuenfschilling & Truffer, 2014). "Regimes" account for the system's stability, as dominant vested interests and path-dependent processes of incremental optimisation have resulted in prevailing "institutions", i.e. formal and informal (explicit and implicit) rules of the game that shape the behaviour of actors involved (Hisschemöller & Bode, 2011, p.14). Yet, transition research, in line with Giddens (1984) structuration theory, suggests that just as actors' behaviour is shaped by structure, structures are maintained and adapted through actors' individual or collective will (i.e. agency). In fact, transition theory allows for the existence of "niches" described as the protected *places* where (radical) innovation emerges (Kemp et al., 1998). Niches embody the *conditions* that allow potentially disruptive innovations to grow and reach the momentum to ultimately transform the system within which they operate.

Concerning energy, next to laws and regulations, pillars of the regime are its physical infrastructures (e.g. a natural gas grid in a fossil regime) and technologies (e.g. gas heaters), as well as passive consumer routines disconnected from production. Next to formal institutions, a regime relates to informal rules that can be just as powerful in shaping the behaviour of persons: the privatized energy market has influenced consumer behaviour (Switch to cheapest provider!). Of special interest is the knowledge infrastructure of the energy regime and the knowledge it (re)produces, such as the notion of energy hierarchy (Trias energetica) that served as a paradigm for the improvement of energy efficiency as a critical step towards more sustainability (Hisschemöller & Sioziou, 2013).

Noteworthy, transition scholars have used the notion of regime to refer to both rules and the actors behind them. In the words of Kemp et al. (1998), Geels (2002) and Smith (2007), regimes comprise of a complex structure of artefacts, institutions *and agents*, and are characterised by path-dependency and lock-in. They involve specific material and technical elements, *networks of actors and social groups* as well as formal normative and cognitive rules that guide the behaviour of actors (Smith, 2007; Geels, 2002) (authors' italics). This broad understanding equally applies to the notion of niche, which is interchangeably used to denote the space where innovations can develop, the innovation itself, together with the person(s) involved in the innovation (e.g. Smith, 2007). This ambivalence in the use of the notions is considered problematic, especially in times of advanced transitions when actors reposition discursively and through their coalitions (Bosman et al., 2014). Such shifts manifest changing power relations typical for transitions, and our use of concepts should allow tracing such phenomena (Avelino & Wittmayer, 2016).

The concepts of regime and niche are increasingly used to conceptualize the dialectics between stability and change rather than two separate competing entities (e.g. Hoffman & Loeber, 2016). Niches can emerge within regimes and regimes may develop within niches. The concept of "capture" is problematised; in analogy with Trojan Horses research suggests that niche-capture may turn out favourable to the "victims" and their envisioned transitions (Pel, 2015). There is discussion on transitions as a result of interactions between regimes from different sectors like mobility, ICT and energy (Konrad et al, 2008), and attention for mechanisms of diffusion of transformation through multi-niche dynamics, such as local energy cooperatives engaging with car-sharing and sharing economy (Gorissen et al. 2016). Still central though is the core idea in transitions research that incumbent interests, institutions and actors will predominantly seek to stimulate optimisation and prevent disruptive changes. From a transitions' governance research perspective, this leads to emphasizing the need for protecting, nurturing and scaling radical innovations (Smith & Raven, 2012).

The Strategic Niche Management (SNM) approach was developed with the aim to serve the management of socially desirable radical innovations oriented towards sustainability, typically facing a mismatch with existing infrastructure, user practices, regulations, etc. (Schot & Geels, 2008). Central to SNM is the distinction between the "*market niches"*, on the one hand, and the "*technological niches"*, on the other (Kemp et al., 1998; Schot & Geels, 2008). The former, in line with Levinthal (1998), imply different selection criteria within the existing regime, e.g. users who have special demands and are willing to support specific innovations for their unique characteristics, allowing them to compete and survive in the (niche) market (Geels & Kemp, 2007). In the case of so-called technological niches, however, it is argued that protection is needed from outside the market because for these types of innovations no available user demand exists yet (Ibid). Evolutionary economists and management scholars stressed that technological niche-innovations must be kept outside the realm of the regime (e.g. Saviotti 1996; Windrum & Birchenhall 1998; Frenken et al., 1999, cited in Schot & Geels, 2008) because of the concern that the regime would otherwise be able to usurp the niche-innovation and use it for its own benefits. While one might expect that SNM would be helpful in addressing the question into the transformative potential of renewable energy initiatives, the literature on SNM is disappointing for three reasons.

First, approaches aimed at studying the governance of sustainable innovation such as SNM and the Technological Innovation Systems (TIS) approach (Hekkert et al., 2007) imply that, among the supportive actors, government is critical for niche protection. This fits the broadly shared view that for innovations to pass the so-called Valley of Death governments (must) act as "launching customers" (Agostini & Naggi, 2009). Above all, government is supposed to guarantee a level playing field and, where this is absent, to support those who cannot compete on the terms of the fossil-based energy regime. Yet, this notion of protection is inherently problematic. From the perspective of an antagonistic relationship between regime and the more radical niches it sounds oxymoronic: the wolf protecting the sheep. Given that incumbent policies are by definition part of the regime, this risks the danger of policy creating niches not to accelerate but to control and potentially delay transitions (Loorbach, 2014).

Beyond dispute, governments facilitate in many ways R&D, experiments, demonstration projects, and market entrance for renewable energy innovations. At the same time, though, governments worldwide benefit from fossil-based energy (in the form of tax revenues) and financially support it. A study by Coady et al. (2015) reveals that fossil fuel companies benefit from global subsidies of about $5.3tn a year, an amount that exceeds the total health expenditure of all states. Hence, it would be naive to expect government protection of energy innovations would come naturally.

The role of government is critical and probably distinct from the role of any other societal actor. However, this is not because governments have an exceptional role to play in niche protection. In fact, Transition Management (Loorbach, 2010, Rotmans & Loorbach, 2010) points to the critical function of 'frontrunners' from niches or even regimes for the speed and direction of sustainability transitions. If we look at renewable energy initiatives, which have to compete with market forces that benefit from an externalization of environmental costs, the role of government appears to be critical; what makes it critical, is that all social, economic and political contradictions related to the energy transition cling together in public decision-making. Government action affects financial schemes, research agendas, physical planning, infrastructure etc. It can thus be expected that the business models under development within the energy niches reflect the institutional settings within which they emerge and articulate specific needs for public policies, beyond financial schemes, which may enable them to eventually surpass niche conditions.

It is worth mentioning that the very idea that niches benefit from protection has been criticised too. It was found that technological niche-innovations may benefit more from a confrontation with incumbent market forces in a relatively early stage, so that they can engage in practical learning with respect to their own strengths and weaknesses (Hommels et al. 2007).

This brings us to a second issue. By focusing on specific *technological* solutions and being principally interested in their emergence and diffusion, the focus of SNM loses sight of innovations that go beyond (socio-)technical developments that occur in a market economy. This has also been pinpointed by grassroots innovations scholars, who begun to apply the niche concept to social innovations occurring in civil society (e.g. Seyfang & Smith, 2007; Seyfang et al., 2014). What is important here is that unlike SNM, grassroots innovation literature emphasises collective agency as a force towards a more sustainable society (Middlemiss & Parrish, 2010).

Niche-innovations are indeed not passive in their interaction with societal actors: they have agency. In other words: they have a capacity to mobilize the support they need. In shaping their identity, they develop storylines and strategies (Seyfang et al., 2014; Smith & Raven 2012). This is especially true for social innovations, the energy cooperatives or the Prosumer movement: they have increased their membership, have actively built their support networks, they have developed narratives on the benefits of Prosumerism and strategies for receiving recognition through policies and regulations at national and EU

level[6]; they even compete with regime actors in tendering procedures for renewable energy projects. In short, in shaping their identity vis-a-vis a hostile regime, initiatives in fact produce, evaluate and reproduce business models. These business models articulate both its specific need(s) for support as well as the innovation's (anticipated) potential.

The third issue, most important for addressing the transformative potential of energy initiatives, relates to niche categorizations. First of all, concerning the already-mentioned *technological* and *market* niches, what is referred to as a technological is almost synonymous with a *market* niche without a (niche) market. Avelino (2011) distinguishes between so-called "*moderate"* and "*radical"* niches; the former being embedded in existing institutions and the latter (possibly) embedded in new institutions, exhibiting antagonistic relationships with the regime. Social niches for grassroots innovations like energy-based currency or time banks are seen as radical, given their antagonistic relationship with the regime. Still, it is in regime's interest to create its own (moderate) niches and to experiment with new structures, technologies and institutions, which do not challenge the dominant trends (Avelino, 2011).

Without doubt, the energy transition witnesses many examples to substantiate the categories cited. Within the realm of technology development, a typical example of an innovation developed within the energy regime is the micro Combined Heat and Power (CHP). This micro-CHP uses natural gas, yet it involves big efficiency improvements, as it delivers both heat and electricity. A competitive development outside the natural gas-based energy regime in countries such as the Netherlands, has been the electric heat pump. This innovation uses electricity combined with a heat source (either air, water or thermal). The market penetration of electrical heat pumps across Europe triggered another innovation aligned with the fossil regime: the so-called hybrid heat pump combining a heat pump using outdoor air with a gas boiler. This innovation was presented as a big step towards renewable heating, but it is also considered an attempt to delay the transition away from natural gas. The realm of social innovations, too, has witnessed active attempts of the regime to appropriate niche innovations. The appeal of the cooperative energy movement has led incumbent energy companies to also establish energy cooperatives, although the membership is by contract part of their clientele.

However, where the distinction between two types of niches, radical and less radical, at first sight appears to make sense, it turns out to be confusing when it comes to the question of the transformative potential of niche-innovations. The more radical the niche-innovation, the more constraints it faces in its attempts for expansion, the more protection it needs, the less it receives. It could even be concluded that innovations

[6] Specifically, the recast Directive 2018/2001 (Renewable Energy Directive II, or REDII), recast Directive 2019/944 (the Internal Electricity Market Directive, or IEMD) and recast Regulation 2019/943 (the Internal Electricity Market Regulation, or IEMR) contain provisions that establish a supportive EU legal framework for community ownership. The Clean Energy Package defines two new concepts labelled "renewable energy communities" and "citizen energy communities". It also requires Member States to secure certain rights of energy communities and establish enabling frameworks to ensure a level-playing field and promote their development.

strengthening path dependency would have more potential for sustainable system transformation than radical niche-innovations, because the former are more acceptable to the regime. Smith (2007) highlighted this paradox pointing that while niche success improves with better regime compatibility, the latter implies lack of significant divergence from it, which in turn limits regime transformation.

A transition comes nevertheless with a paradigmatic shift. Transitions suppose system destabilization, featured by tensions and conflicts, which, in the case of the energy transition, affect system boundaries and even the very existence of the system itself (Loorbach, 2010). A (socio-)technical innovation like an electrical heat pump could enable a shift from natural gas-based residential heating to electricity, but this is not a transition. However, combined with a very low-temperature heat infrastructure in ownership by the end users, it could become part of the emerging institutions of a decentralized renewable system that links renewable energy to the management of fresh water, waste (water), local agriculture and the like, shaping a system completely different from the existing energy system. In other words: the system in the sustainability transition is defined and redefined by the social contradictions and struggles that make up for it.

Transitions relate to the parallel breakdown and building up of institutions. A niche or a combination thereof is in fact an embryonic regime, as it has not (yet) attained a strong degree of institutionalisation: niches imply "*nuclei for future (radically different) regime structures*" (Fuenfschilling & Truffer, 2014, p.773). They thereby articulate different dimensions, technological as well as social. However, rather than assuming niches are either "*moderate"*, "*mildly antagonistic*" or more *"radical"* and even "*revolutionary"* (Smith et al., 2010; Avelino, 2011), Fuenfschilling and Truffer (2016) suggest that the potential of a (socio-technical) innovation to bring about institutional change depends on the institutional work required given its *reconfiguration capacity*.

In some respects, the niche and the potential institutional reconfiguration it embodies could be quite similar to features of the incumbent regime, in other respects it could be quite different. This observation is in line with Laclau and Mouffe (1985), who argue that social contradictions are pluralistic in character rather than bipolar. Actors operating within the niche shape their identity, and in turn the niche in which they operate, in an "*antagonistic"* way, as this identity is pursued by differentiation from other identities. However, it cannot be taken for granted that the antagonisms are similar for all niches alike, as it cannot be assumed that actors with an interest in the incumbent regime would pursue similar strategies to maintain their position.

So, instead of bipolar niche categorizations, this section concludes that a pluralist niche concept is preferable for the evaluation of the contributions and the transformative potential of innovations. In an era of system destabilization, more radical innovations gain social acceptability where lock-in options have failed. Specific features of niches, associated with just one or a cluster of innovations, can make a difference where a niche-innovation's transformative potential is at stake. More relevant than a niche's alleged "radicality" vis-a-vis the regime is the match between specific niche features and its base for social support through which the niche can increase the pressure on the energy regime and political decision-makers.

3.4. The analytical framework

The main purpose of our framework is to help understand and analyse the transformative potential of renewable energy initiatives; that is, the value they bear to transform the system within which they operate. For this, we revisit the work of Smith and Raven (2012). The scholars addressed the questions of how the protective space is created, maintained or expanded. Having derived from the literature the different selection pressures regimes exercise on niche-innovations, they mapped the regime dimensions. Then, they suggested that the dynamics that play out between technological innovations and the broader process of transformation should be understood through processes like *shielding* (protecting an innovation against mainstream selection environments), *nurturing* (improving an innovation's performance) and *empowering*. The latter refers to multi-dimensional work to "*fit and conform"* or "*stretch and transform"* the regime. In the first case empowerment means that after a short period of protection the innovation will be able to successfully compete under mainstream selection pressures. In the second, the work aims at altering the mainstream selection environments in a way that parts of the shielding becomes institutionalised, as new norms in a transformed regime: the innovation does not conform to but instead transforms conventional selection criteria in ways favourable to the innovation (Smith & Raven, 2012; Verhees et al., 2013).

Of interest to us is the "stretch-and-transform" process, where the actors seek to reform institutions, or in other words, reframe the rules of the game that define the prospects of mainstreaming their innovation (Raven et al., 2016). Our work addresses the recommendation of Kern et al. (2015) to amend the framework of Smith and Raven (2012), which in its current form over-focuses on actors, their networks and the narratives they articulate, failing to sufficiently capture the influence that the surrounding institutional settings have on empowerment work. Building on Fuenfschilling and Truffer (2014) who suggest that niches can be considered as embryonic regimes, we argue that practically the same dimensions can be used to describe both regimes and niches. This allows us to capture the niche in its dialectical and antagonistic relationship with the regime context. The dimensions work in a twofold way: on the one hand, they represent the new institutions the initiatives build in their attempt to be *self-empowered*. On the other, the same dimensions depict the institutional settings within which the initiatives operate, which are the ones they aim to influence to their favour. In other words, the dimensions enable the study of the innovation within its context and the investigation of enabling or inhibiting factors regarding its growth and expansion.

In what follows, the framework of Smith and Raven (2012) is used to create a framework that helps to assess the transformative potential of (social) innovations, enabling a hybrid understanding of system change and how the transformation unfolds. This will be illustrated by examples from the field of renewable energy initiatives in the Netherlands. The framework has the following seven dimensions:

1. Sector structure

Sector structure involves the expertise and networks addressing a societal function, like energy or health. Renewable energy initiatives, by engaging stakeholders who were not active in the energy sector before, blur the boundaries between different sectors. This

may have a significant impact on the power relations between regimes and niche-level innovations. For instance, NDSM energie is a prosumer initiative of 60 companies located in the port of Amsterdam.

2. Technologies and Infrastructures

Technical standards along with the associated infrastructure of technologies lead to path-dependence. Although some largely fossil fuel-based incumbent energy utilities invest in RES technologies too, the types and scales they opt for differ from what energy cooperatives do. While the former prefer large-scale centralised solutions like big off-shore wind, the latter go primarily for (rooftop) solar and (mainly) onshore wind. This in turn, has implications on the necessary supporting infrastructure and partnerships (e.g. electric heat pump vs. hybrid heat pump).

3. Knowledge base

Knowledge base involves formal and tacit knowledge that guides the behaviour of people. Knowledge claims are used to make space for transformation to happen or to consolidate the existing system. Regime knowledge base for instance is featured by energy savings; hence consuming less but remaining fossil. In contrast, niche knowledge base relates to the attempt to avoid fossil, i.e. transitioning to a 100% CO_2 emissions reduction, encompassing considerations about the environmental and social implications of fossil fuels.

4. User practices

User preferences and routines are also critical. Becoming members of a cooperative people turn from passive energy consumers to energy prosumers, producing their own energy and acquiring ownership and control of their utilities. Joining a cooperative people become more interested, even temporarily, in monitoring (and reducing) their energy consumption (Hargreaves et al., 2013). Moreover, in the case of energy neutral or positive houses, where the gas related infrastructure is replaced by the respective electricity options, the shift to electric cooking might be met with resistance, and thus more work is needed for its diffusion.

5. Cultural significance

Symbolic meanings, guiding principles and related values of a system, influence the diffusion of innovations, through mechanisms of appreciation, for instance. Different actors, thus, engage in aligning with or reframing concepts rooted in culture to the benefit of their innovation. Solar energy for instance, is communicated with bright images of the sun: a bright, clean future for the coming generations. Sustainability and people's wellbeing become central, while the notion of *security* is interpreted in a broader way, in terms of long-term viability of the energy system, the planet and all life on it.

6. Policies and political power

As already discussed, policies like national or municipal regulations are critical. Local energy cooperatives anticipate entirely different policy frameworks from the dominant ones. Through their umbrella organisations, they try to, on the one hand, strengthen the community energy sector (in-ward orientation) and on the other, influence the framework within which they operate through lobby (out-ward orientation) (Raven et

al., 2016). Although actors within the niche do not have the capacity to design policy like actors linked to the regime, they may engage in institutional work influencing its direction, through official structures, like their umbrella organisations, and unofficially, through ad-hoc appointments, that may eventually result in disruption of the existing institutions (and the creation of new) (Lawrence & Suddaby, 2006). At times, niche favouring actors have the opportunity to directly co-design policy affecting them, especially at municipality level.

7. Organisational logic

Lastly, the dimension on organisational logic relates to processes, routines and activities such as task allocation and coordination across the value chain, as well as, ownership issues and relationships between investors, producers and users. Smith and Raven (2012) considered issues like user-producer interaction, shared routines and capabilities as part of the industry structure (for us sector structure). We choose to disentangle the organisational logic of an initiative from matters concerning its broader (umbrella) networks, platforms for interaction and their collective capabilities. This, because our focus on social innovations brings to the fore the importance of scrutinising the so-called "best organisational practice"; the way business is organised. We share the impression with Bidmon and Knab (2014, 2018) that these issues are not adequately captured in the framework of Smith and Raven and we thus suggest treating them separately through a distinct dimension, as this type of issues may be critical for the diffusion of innovation. For instance, cooperative principles as democratic control, open membership, participation and independence conflict with the dominant organisational paradigm in the energy system.

Figure 3.1 presents our framework. The business model is placed at the centre of the niche dimensions to exhibit the centrality of the concept, as it is through the coordination of different actors and activities, that business models keep the seven dimensions together. Said differently, niches may be shaped by establishing alternative ways of thinking and organising within one social system, like the energy system.

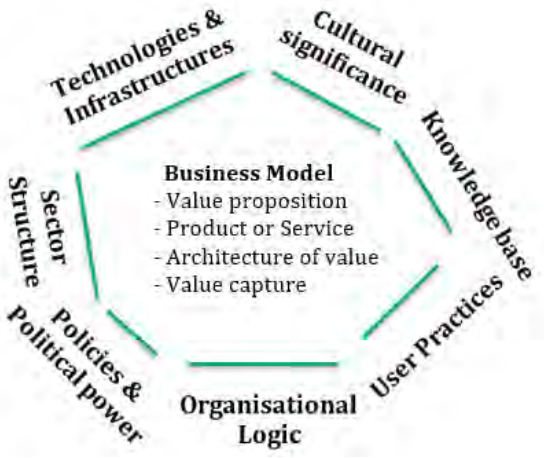

Figure 3.1. Analytical framework

These dimensions constitute the relationships between niche and regime. Niche-innovations may be considered as such because they differ from existing (regime) features in certain aspects but not so much in others.[7] In other words: a niche may be radical on certain dimensions, but not on others. The plurality of niche-innovations becomes, therefore, easier to grasp. For some, the implications for all aspects maybe clear from the outset, for others this may be less obvious.

This in turn, has an impact on the innovation's transformative potential. Not only can the dimensions be used to analyse the selection pressures that constrain the niche in its expansion, they can also be used to analyse the variety of the work required for its growth. In fact, the extent of the lines of the niche dimensions represent their (possible) degree of institutionalisation. Their length may rise through institutional work, whose type is determined by the respective dimension, and it may involve, among others, advocacy, changing normative associations, or constructing normative networks where practices become legitimised and spread (Fuenfschilling & Truffer, 2016).

We look into these processes from a business model perspective. Business models play the role of coordinating and giving direction to the actions undertaken by the actors who wish to diffuse the innovation beyond its niche context. The business model encompasses both in-ward oriented action for the institutionalisation of its alternative niche features, as well as out-ward oriented action that problematizes the incumbent regime (Raven et al., 2016).

In what follows we wish to illustrate how business models help shape, maintain and upscale niches using examples of social innovations in the Dutch energy transition. Through the study of the initiatives' business models, we can examine their main struggles and the actions they take to circumvent them.

1. Value proposition

The value proposition of one energy cooperative, might relate to climate protection, air quality, social inclusion or local employment, among others. Such offered benefits influence system aspects like principles associated with its functioning (cultural significance), and create new practices oriented towards a future envisioned system. Typically, energy initiatives claim that they turn consumers to prosumers, meaning that they enable them to produce their own energy. A critical researcher should assess whether this is materialised in practice, as in certain occasions the business models of the initiatives do not provide their members with their own, locally produced renewable energy, and only collaborate with them in the production.

[7] Our approach could raise the question of the extent in which a niche should differ from the regime (e.g. number of dimensions), as to deserve to be considered a niche. This paper does not have the ambition to formulate an opinion on this matter. What we consider more important is the observation that there are different dimensions to determine how niches can be similar and different from the regime.

2. Service/Product

In the case of consumers' cooperative, the product embodying the benefit put forward by the organisation is the renewable energy, electricity and/or heat, or e-mobility; most of the initiatives focus on the former, and only few on the latter, while some also focus on energy saving measures. In the case of a producers' cooperative, the product does not reach the member of the cooperative but is sold to other customers. This building block enables thus the distinction among members, clients and other stakeholders. This, in turn, has certain implications concerning the extent in which an initiative influences its context, like for instance, its sector structure, the associated technologies and infrastructures or the user practices.

3. Architecture of value

A cooperative might be organised in subdivisions, like organisation branch, responsible for the overall administration, and project development branch. Typically, energy cooperatives, entrust part of their value creation and delivery to actors from the local community, like local installers, or the cooperative movement. This relates to the fact that the value generated is designed to diffuse and be shared among different actors, often in its direct locality. Interestingly, when thinking about their partnerships the initiatives might consider specific (local) actors as significant partners, missing opportunities that different sort of coalitions would offer. This could be attributed to a dominant organisational logic within the sector or certain policies and regulations designed by the regime. The creativity of the initiatives, though, may shape new rules and structures, exhibiting the organisations' agency therein, like in the case of the wind park Krammer, whose direction arranged a direct Power Purchase Agreement with four multinational companies and "cut out the middle man" (i.e. energy utility).

4. Value capture

Energy cooperatives build on local community involvement. Apart from people's financial support, along with that of local authorities, members' investment in time and effort is central for their growth. At first, the voluntarily invested time compensates for the lack of revenues in financial capital, as volunteers undertake most of the administration in their spare time. Similarly, the costs for growth and expansion are initially low, as cooperative members spread the initiative's value by word of mouth. To that, the local scale and trust plays an important role. A cooperative might diversify its value capture method; it is possible to have independent cost-revenue streams running. For example, often the Board of directors is (partly) run by volunteers and fuelled with members' fees or other funds coming from subsidies, or donations, while the Executive director or Project managers are (at least partly) paid through the income generated by the energy production. Such value capture challenges dominant system patterns in dimensions like organisational logic, sector structure, as well as user practices. It may thus result in tensions that require multifaceted, extensive institutional work.

All in all, we argue that the transformative potential of an innovation should be assessed empirically in relation to the degree of institutionalisation of its systemic features, and the dialectic interactions between niches and regimes. Herein, the business model perspective is critical as it enables us to systematically study the actors' contributions

and the actions they take in order to further develop their contributions and transform the system.

3.5. Discussion and Conclusions

This work sets the basis to understand and (potentially) support the transformative potential of social innovations that advance sustainability transitions. Rather than focusing on the constraining mechanisms implied by regimes, the introduced framework shifts the attention to specifying how actors within the niche promote through their business model their innovation in the face of a hostile regime and, in doing so, shape the conditions that may eventually lead to system transformation.

By using the business model as a methodological device to understand the strategic and operational behaviour of renewable energy initiatives, this research may be positioned in the interface between sustainability transitions and (sustainable) business models. So far, business model research has neglected the developments at the macro- systemic level, while transition research, in turn, has paid little attention to the dynamics at micro-level (Bidmon & Knab, 2018). Only recently scholars started to refer explicitly to both business model and transition theory; our paper contributes to the literature at this interface between business model (innovation) and sustainability transitions (Hansen, et al., 2009; Hannon, 2012; Hannon et al., 2013; Bidmon & Knab, 2014; Foxon et al., 2015; Huijben et al., 2016; Schaltegger et al., 2016; Bolton & Hannon, 2016; Wainstein & Bumpus, 2016; Bidmon & Knab, 2018). In contrast to scholars who take a narrow approach assessing business models as market devices for the commercialisation of sustainable technologies in the context of socio-technical transitions (e.g. Bidmon & Knab, 2014; Wainstein & Bumpus, 2016), our approach is wider, as we examine the role of business models in far-reaching sustainability transitions. And, in contrast to Hannon et al. (2013), we take a strong sustainability perspective wherein beyond economic, environmental and social value are also considered (e.g. Upward & Jones, 2016).

Our understanding of the concept of niche brings more nuance to the niche assessment. Considering niches as embryonic regimes, a niche can be captured in its dialectical and antagonistic relationship with the regime context and its influence on the empowerment work (see Kern et al., 2015). Our framework offers a fine-grained understanding of the actions the initiatives take regarding regime transformation, through the creation of new institutions and the parallel de-legitimisation and destabilisation of the institutions associated with the regime.

We propose examining the initiatives' agency by looking at their business models, as the latter articulate the vulnerabilities and the specific context of support the innovations need; the business model functions as a knot that keeps the niche dimensions together. Mirroring an initiative's strategy vis-à-vis its ambition and reflecting the institutional framework within which it operates, the business model is central in the assessment of the transformative potential of an innovation. And for this, this paper challenges researchers to seek and examine the real practice of practitioners beyond their claims.

Specifically, we argue that the inspection of an initiative's business model vis-à-vis its institutional context enables to systematically assess what value the initiatives contribute and how, and whether they strategize in order to increase it. This perspective enables a

comprehensive investigation of the critical conditions that define the initiatives' contribution to sustainable transitions.

Further research will apply this framework to examine how different initiatives interact with each other and with a shifting regime context; alternative trajectories will be explored and compared as regards their potential contribution to sustainable energy futures. Possible scenarios include individual initiatives a) trying to increase their potential in isolation; b) linking-up, coordinating and organising their collective contribution; or c) collaborating with actors associated with the regime.

Rather than a checklist for the assessment of whether an initiative is transformative or not, (something that can only be demonstrated in hindsight, after the transformation has taken place), our framework aspires to help comprehend and potentially support the initiatives' contributions to sustainability transitions by developing strategies to either confront, synergize or play into specific dimensions in order to increase their transformative potential. As the framework has been designed with a focus on the energy transition, adaptations might be required when applied in other domains.

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4. Transformative Business Models for Sustainability Transitions

Abstract: This chapter discusses the role of business models in sustainability transitions. Sustainability-oriented entrepreneurs develop business models that can transform the societal systems they operate in, functioning in this way as a catalyst for system-wide transitions. But what does it take for a business model to be transformative? This chapter introduces Transformative Business Models as a new framework to advance our understanding of how the business model concept can contribute to sustainability transitions as well as how transition thinking supports the prospects of sustainable business models to unlock their transformative potential. Our argument is that the reflexive dynamics that play out between the innovative businesses and the regimes in which they emerge play a critical role in determining whether the emerging transformations will over time lead to fundamental systemic change. Building on insights from a business model perspective and sustainability transitions, the introduced framework enables a systematic analysis of these dynamics. To illustrate its merits, this chapter presents the case of Deltawind, an energy cooperative in the Netherlands. The chapter concludes by proposing three main characteristics of business models exhibiting transformative potential: a broad value orientation, a broad stakeholder network, and a reflexive orientation.

Keywords: Transformative business models, transition, niche, regime, dynamics, reflexivity, transformation, (social) innovation, energy, energy transition, energy cooperatives, Deltawind

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Proka, A., Beers, P. J., & Loorbach, D. (2018). Transformative Business Models for Sustainability Transitions. In *Sustainable Business Models* (pp. 19-39). Springer, Cham.

4.1. Introduction

The role of business in sustainable development is often related to corporate social responsibility and efforts to decrease environmental impacts of the operation. We however argue that these approaches that seek to optimise a firm's performance, fail to contribute to sustainability transitions in which environmental and social externalities are internalized. Instances like the Volkswagen emissions scandal in 2015 illustrate the need to move beyond traditional CSR and environmental reporting towards more transformative approaches, critical for the transition towards a flourishing society, sustainable forms of economic development and a prosperous natural environment.

Entrepreneurs and businesses are seen as important factors in transitions of societal systems. In such transitions, entrepreneurs can act as catalysts by changing the rules of the game, and/ or creating new markets (Loorbach and Wijsman, 2013). Typical examples of disruptive or transformative businesses like Tesla, Uber, AirBnB are seen to shift basic conditions under which markets operate and create new realities. Yet, despite their disruptive character the nature of such new realities and their relation to sustainability is not straightforward. This appears clearer in the case of InterfaceFlor and its environmentally-responsible modular carpet, which has served as a key example of companies aspiring to shape and radically change the value chains and markets within which they operate along with their companies' internal organizations in line with sustainable development (Stubbs and Cocklin, 2008). Taking a sustainability transition perspective, we are interested in the question how such types of disruptive entrepreneurship could help to accelerate and guide fundamental changes towards sustainability. In other words: what does it take for a business model to be *transformative towards sustainability*?

In this chapter we introduce a framework to advance our understanding of how the business model concept can contribute to sustainability transitions as well as how transition thinking may support the prospects of sustainable business models to unlock their transformative potential. Our framework draws on a synthesis of insights from the business model perspective with the theory of sustainability transitions (Proka et al, forthcoming) and has three distinct features. First, we embrace a broad value orientation. Whereas traditional business models only include value insofar as it can be monetised, transformative business models towards sustainability additionally include value that may or may not be monetised in the future (negative or positive externalities). Second, transformative business models involve a broad stakeholder network. Beyond the traditional focus on the customers, transformative business models additionally take into account the views and preferences of all societal stakeholders. In fact, the very sustainable offering of a transformative business is carried out by a broader stakeholder network that engages in sustainable processes. Finally, our approach explicitly takes into account a changing societal context and allows for a reflexive orientation (cf. Beers and Van Mierlo, 2014; Van Mierlo et al. 2010). Beyond the interest in the organisations' survival and success, transformative business models combine a reflexive orientation with an ambition to shape their context. And in fact, through business model innovation, entrepreneurs may influence or even shape markets and society, more than policy makers and regulations (Geels and Schot, 2007).

This contribution wishes to spur reflection on the interaction between sustainable business models and the transition they aim to accelerate. Our argument is that the reflexive dynamics that play out between the innovative businesses and the regime context in which they operate play a critical role in determining whether the emerging transformations will over time lead to fundamental systemic change. To illustrate the merits of our framework we present the case of the energy cooperative Deltawind, and discuss and analyse in what ways this business model begins to become transformative in the context of sustainability transitions.

4.2. Theoretical framework and methodology

Our conceptual framework brings together two concepts: the concept of business model, which originally emerged in the for-profit frame, and the concept of niche, central element of transitions theory. We study the dynamics between niche and business from a reflexivity perspective. After a brief discussion of the concepts and their origins, we present the methods we followed to conduct our empirical investigation and analysis.

4.2.1. Business model

There are several ways of looking at the concept of business model. Zott et al. (2011) found that business models have been referred to as a statement, a description, a representation, an architecture, a conceptual tool or model, a structural template, a method, a framework, a pattern and a set. The literature thus offers a number of different understandings of what a business model *is* and what it *does*. Concerning the former, the best-known example in the literature is the business model ontology of Osterwalder (2004). According to Osterwalder and Peigneur (2010) business models can be described as the logic of how organisations create, deliver and capture value. Recently, Wirtz et al. (2016) suggested that a business model can be understood as a representation of the activities that a company undertakes in order to generate marketable information, products and/or services through its value-added component.

The power of business models in respect of what they can *do* has also been widely acknowledged in the literature (e.g. Shafer et al., 2004; Doganova and Eyquem-Renault, 2009; Loorbach and Wijsman, 2013). Business models are relevant to all (for-profit) organizations as their survival and prosperity is directly linked to their value creation, delivery and capture mechanisms employed (Shafer et al., 2004; Teece, 2010). Especially within the for-profit frame, business models are associated with securing and expanding a company's *competitive advantage,* something that implies a dynamic perspective: business models need to be readjusted (Johnson et al., 2008).

Business models and their innovation can support the strategic aims of an organisation. In fact, this is what brought the concept into the attention of sustainability management research (Schaltegger et al., 2016). There is increasing interest in new business models (Jonker, 2014), business models for sustainability (Lüdeke–Freund, 2013, Schalteggeret al., 2016), sufficiency-driven business models (Bocken, 2016), etcetera. Within this strand of literature, basic normative requirements have been put forward for each of the constituting elements of business models (Boons and Lüdeke-Freund, 2013). A common characteristic that cuts across all these sustainability-oriented business models is that the focus has been deliberately extended towards the inclusion of considerations around creating social and ecological value (Schaltegger et al., 2016).

Business models for sustainability enable (networks of) entrepreneurs to create and further develop markets for innovation with a social / societal purpose, shifting and transforming the markets they operate in, acting as catalysts for sustainable development (Loorbach and Wijsman, 2013; Boons and Lüdeke -Freund, 2013).

Our understanding of a business model entails both the narrative and the numeric level of how an organization works and sustains itself capturing part of the value it creates (Magretta, 2002; Osterwalder and Peigneur, 2010). In other words, we look at how an

initiative organises its activity by looking both at its narrative, designed and enacted by the organisation, and the "numbers", namely the cost and revenue balance that allows it to pursue its operation. Of interest for our research is to examine both the "espoused theory" and the "theory-in-use" of an organisation (Argyris and Shön, 1974). The former refers to the theory that people believe their behaviour is based on and may be found in their narrative, and the latter refers to the implicit theory that governs their actual behaviour and may be observed in their practice. Such a perspective enables us to assess and help enhance the reflexivity of initiatives by indicating to them tensions between their espoused- and theory-in-use; in this way their potential to transform the system within which they operate may also improve. To operationalise the concept, we group the business model components into four main building blocks:

- First, the *Value proposition* that clarifies what value or benefit is embedded in the offerings of the organisation towards all the stakeholders involved (e.g. Doganova and Eyquem-Renault, 2009, Schaltegger et al., 2016);
- Second, the *Product or Service*, which fulfils the value proposition and generates the promised benefit, which is directly offered to the organisation's customers and indirectly to other stakeholders (e.g. Stähler, 2002);
- Third, the *Architecture of value* that lists the partners and channels through which value creation and delivery is accomplished (e.g. Doganova and Eyquem-Renault, 2009), and
- Finally, the *Value capture*, which encompasses the cost and revenue flows that define the value captured by the organisation and its viability (e.g. Upward and Jones, 2016; Schaltegger et al., 2016).

4.2.2. Sustainability transitions and the concept of niche

In order to investigate the transformative potential of a sustainable business model, i.e. the potential it has to radically change the system, we turn to the theory of sustainability transitions.

Transitions entail large, slow and wide societal changes in the way a system functions. They are long-term processes that involve fundamental changes in multiple systems and scales (Grin et al., 2010; Geels and Kemp, 2000). Transitions do not relate to a further linear improvement of an existing system but a change to a new system. Not: *doing things better,* but *doing better things*. Transitions are especially complex, as they involve changes both at the level of technology and infrastructures, as well as at the level of the social sphere, encompassing changes in culture, practices and institutions, i.e. the formal and informal rules of the game that shape the behaviour of actors (Hisschemöller and Bode, 2011). These major, non-linear changes arise from the coevolution between economy, society and ecology, and, over time, under specific conditions fundamentally alter dominant practices, paradigms and structures (Grin et al., 2010). Their progress and direction is shaped by a co-evolution between actors, material infrastructures and institutions.

It can be said that most businesses have evolved within a *regime* context and thereby operate within incumbent rules and conditions by which they also reinforce them. The dominant business strategy within such a context is one of optimization and efficiency improvements. Related 'sustainability' strategies, including CSR, therefore often only

serve to sustain existing operations by improving performance and decreasing negative externalities and associated risks. Thereby *by definition* not promoting systemic changes that might disrupt the existing business model. Drawing upon transition theory, we understand existing unsustainable markets as (parts of) incumbent regimes that by definition will seek to sustain existence by optimizing along path-dependent trajectories (Kemp et al., 1998; De Haan, 2010). Such regimes however are challenged by so-called *niches*: contexts within which transformative alternatives emerge that might over time help to fundamentally change such regimes (Ibid).

For our conceptual framework we specifically draw on the concept of niche, which refers to a "protected space" or context within which radical innovation emerges (Kemp et al., 1998). Niches emerge at the margins of the mainstream regime where multiple regimes might border and act as incubation rooms for non-conformism with the dominant structures, culture and practices within the societal system (Smith 2007; Avelino and Rotmans, 2009). We consider niches as "*embryonic regimes*", which potentially constitute "*nuclei for future (radically different) regime structures*" but have not (yet) attained a strong degree of institutionalisation (Fuenfschilling and Truffer, 2014, p.773). Niches can be understood as *embryonic* regimes, which offer the conditions for radical innovations to grow and eventually replace the regime. In fact, radical innovations can be said to form their identities in an *antagonistic* relational way, as this identity is pursued by differentiation from other identities (Laclau's and Mouffe's (1985) *Hegemony and Socialist Strategy* cited in Norval, 2000, p.328). As such, practically the same dimensions can be used to describe both regimes and niches (Proka et al., forthcoming). Considering niches as embryonic regimes cf. Fuenfschilling and Truffer (2014), and further building on the selection pressures that regimes exercise on niches as discussed by Smith and Raven (2012), below we present the niche dimensions that constitute central part of our conceptual framework as they help us move our analysis at the system level.

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 significance:* 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. *Organisational logic*: the specific logic of how an organisation generates value, including organisational decision-making processes, routines and activities directed towards the achievement of organisational aims, as well as issues regarding ownership and the relationships between investors, producers and users;
6. *Sector structure*: the organisational networks, the particular sector capabilities, as well as the specific interaction platforms for coordination and negotiation within the sector, and
7. *Policies and Political Power*: the regulations and political power exercised to influence or maintain them.

4.2.3. Reflexivity – dynamic relations between business model and niche

Transformative social innovations can be said to operate at a niche level, and thus by definition conflict with a regime context, which is geared to the value propositions of business-as-usual. In order for business models to become transformative and thus help to change regime conditions, practitioners need to consider the context in which they operate. And for this reason, we argue that the dynamics that play out between niche and regime are crucial. As these conditions also change, specific actions and manoeuvring might be needed. The concept of reflexivity helps to understand the co-evolutionary patterns between emerging business models of sustainability-oriented initiatives and their broader context.

Reflexivity can be regarded as an emergent property of a system innovation initiative that concerns its relations with its systemic context. As a concept, it relates to both the (members of) the initiative and the context. Pertaining to the context, reflexivity concerns co-occurring changes in (Beck et al. 2003; Smith and Raven, 2012; Voss et al., 2006) economy (markets, dominant user/consumer practices), politics (rules and regulations, policy networks, power), technology (infrastructure, technical standards), culture (value orientations, symbols), and science (knowledge in perspective, questioning the value of science). With regard to the initiative, reflexivity concerns the awareness of these outside changes and how the initiative is able to identify obstacles and opportunities as they present themselves, instead of being caught off-guard (cf. Beers & Van Mierlo, 2017; Beers et al. 2014.)

Examining the business models of an initiative through the business model dimensions and the systemic niche dimensions, we can address questions concerning their past, present and future development. We interpret the resulting dynamics in terms of reflexivity. In what follows we discuss the process we have followed as regards our empirical investigation and analysis.

4.3. Methods

In order to explore the merits of our framework we have selected to use one of the most successful energy cooperatives in the Netherlands. This cooperative, called Deltawind, develops a business model with the wish to contribute to the transformation of the energy system. We collected interviews and written materials, which were analysed using both the niche concept and the business model concept. This chapter, thus, reports on part of our research work focusing on renewable energy initiatives. Our case study can be seen as an extreme, as it demonstrates unusual manifestation of the phenomenon under study, yet representative for the issue that we want to explore, namely the conditions under which an energy cooperative may influence the system within which it operates (Yin, 1994; Patton, 1990).

4.3.1. Case description

Deltawind is the energy cooperative of Goeree-Overflakkee, in the South-West of the Netherlands. The cooperative was founded in 1989, with the vision to contribute to "*sustainable energy production and responsible energy consumption*". The cooperative focuses on wind "*as this is financially the most efficient way to produce sustainable energy*" but has also developed one solar park. Today the cooperative numbers about 1.080

members and among other, it shares one of the biggest cooperatively owned wind park in the country.

4.3.2. Data sources and collection

Our empirical investigation began with collecting case-related documents, including official publications and material published online. Next, semi-structured interviews were performed with people involved in the organisations under study. In the case of our focus the principal investigator had good access to the director of Deltawind (case holder) and after a first in-depth interview remained in contact with her through (on-line and off-line) communication. In this way the investigator was able to learn the latest developments around the cooperative. During the interview the case holder was asked to describe the business model of the organisation, how the organisation and the alternative "niche" in which it belongs differs from the dominant energy regime, what challenges they face and what actions they take to circumvent them. The case holder was asked and provided publically-available archival records in order to substantiate the arguments made. The interview was audio-recorded and extensive notes were taken; specific parts of the conversation with high discursive relevance, like for instance concerning the value proposition, were transcribed verbatim. The interview data collected was documented in a summary which was cross-checked with the case owner. The report was complemented with information from secondary sources, like internal documents, scientific and other professional publications. For instance, information on financial status and detailed project capacity was drawn from the national community energy monitor (Lokale Energie Monitor[8]) to which access has been provided after communication with the case holder. Next, based on the analytical framework and the collected data a case report was prepared, documenting all the information collected. Having been discussed between the authors, the report was sent to the case holder for clarifications and verification of the accuracy of the data; in general, only minor adaptations have been made.

4.3.3. Data analysis

Data analysis has been guided by our conceptual framework, that is, the four elements of the business model concept and the seven dimensions in the niche concept. Collected data was first grouped and positioned according to the constituent concrete categories of the conceptual framework, e.g. "value proposition" or "value architecture." In several cases, complete quotes of the interviews, or other data from other online or offline sources were also included. Taking a critical approach, the additional material from different sources was used to assess possible distinction between the claims of the case holder and the enacted organisational practice (Argyris and Schön, 1974). Moreover, the broader socio-political "context" guided us in the extraction of the meaning behind the wording selected by the case holder and the accompanied material. Additionally, in keeping with the exploratory nature of the study, we interpreted the frequently recurring concepts and categories across the data, since dominant patterns and themes emerged in terms of overall organisational processes, challenges, points of friction with the existing system

[8] https://www.hieropgewekt.nl/lokale-energie-monitor

and strategies to surpass them. Resulting additional categories are reported in the next Section.

4.3.4. Limitations

Typically, case study research design is criticised for lack of generalisability, reliability and validity, and this might be especially relevant for a single case study (Yin, 2009). Generalisation from a case study, nevertheless, should not be expected to lead to statistical but rather to analytic generalisation (Yin 2012). Such an approach is specifically interesting for the analysis of contemporary phenomena within a real-life context, as it allows for the incorporation of context and complexity (Flyvbjerg, 2006; Yin, 2009). In fact, a strategic selection of cases has been found to increase generalisability as it activates more actors and more basic mechanisms in the situation studied (Flyvbjerg, 2006). And this is why this contribution focuses on the case of Deltawind. The reliability of the data has been supported with the inclusion of multiple sources and the examination of the report by the case holder, as well as the discussion between the principal investigator and the other co-authors. Finally, we are aware that the validity of our conclusions, given the singe case study, might be limited. Nonetheless, the use of the case study here is principally aimed to illustrate our research framework for the analysis of the transformative potential of sustainability-oriented business models.

In what follows we present the results of our research concerning the business model level and the niche level as regards the renewable energy cooperative Deltawind.

4.4. Transformative business models in the context of the energy transition: the case of Deltawind

4.4.1. Business model level

Value proposition

Central in the value proposition of the initiative is the broad benefit of "*sustainability"*, which is offered to its members, customers and the broader society; Deltawind operates with "*respect for people and nature*", as noted on its website. Its members naturally benefit from the value of "*ownership*" which also brings extra benefits like "*financial gain*." The director argues that the people who live in visual vicinity of the windmills need to also benefit from them. This financial benefit proposed by the cooperative aims to mobilise people that would not join for its sustainability value alone. "*Transparency*", according to the director, is also considered crucial and cuts across the initiatives business model: from value proposition to the entire value architecture.

Product or Service

Deltawind produces renewable electricity from wind and solar energy: "*you see these windmills? They produce your electricity*" is the message the initiative communicates to its members. This also allows the cooperative (to be precise the specific parks of the cooperative) to sell in the market the *Guarantees of origin,* an electronic document which proves that the electricity originates from a specific energy source and enables the traceability of green energy from the producer to the final consumer. The Guarantees of Origin can be traded in the European Union. In addition to that, in the past years, Deltawind has organised a collective purchasing project of roof solar PVs for house owners in the region of Goeree-Overflakkee.

Value architecture

Members

As one of the oldest cooperatives in the Netherlands, Deltawind today has about 2.080 members. To be eligible for membership, one needs to have links to the island, for instance by living at or originating from Goeree-Overflakkee, owning a house there, or, for legal entities, to be officially registered in the area. Deltawind membership begins with investing in the form of giving a loan to the cooperative as much as €50 to up to €5.000. Under-age island residents can enrol with a contribution up to €1.000 but have no voting rights.

Governance

The general assembly, convened periodically by the board, holds the most formal power in the initiative. The most important issues discussed in the assembly are a) the budget of the upcoming year and b) the year review. Depending on the context, decisions are mainly taken on absolute majority yet on a rather informal base "*We never count exactly how many people are in favour/against."* The board currently consists of 5 seats. Each member has one portfolio among a) Legal, PR, communications and membership b) Innovation and Sustainability, and c) Finances; thus, there might be two people working on the same theme. Currently, the cooperative employs 8 people (all part time 5,5 fulltime equivalent). The positions are the following: (1) Director, (2) Policy officer, (3) Project manager, (4) Secretary, (5) Administrative assistant, (6) Communication and (7) two millers, people from the region periodically preventively inspecting the windmills.

Value chain

*Deltawind develops its parks as separate companies, like for instance, private company so*lar park Ouddorp aan zee (In Dutch: besloten vennootschap). According to the interviewee, the motivation behind this decision was the interest to protect the cooperative from the risk of possible failure of any of the projects.

Until recently, the cooperative could not directly provide its members nor other (non-member) clients with the electricity produced by its parks. To reach the end consumer Deltawind had to collaborate with other energy suppliers, which may vary between projects. It's noted that reaching (and keeping) the customer is a "*totally different business*" than the one that Deltawind is "*good at*", hence a certain dependency on the energy providers exists.

For the first wind parks Deltawind partnered with E.ON (wind), an established energy utility. This happened because of a good price arrangement, as well as, due to the fact that one of the parks, namely "Piet de Wit", is partly owned by a private company. In the previous model Deltawind sold renewable electricity along with the respective Guarantee of origin to this utility, who in turn sold it the consumers. The energy of the solar park, built in 2012, is sold to Eneco, and the Guarantee of Origin is sold to the owner of the ground: a recreation park that wants to become sustainable.

Deltawind is not interested in repeating such a collaboration with big energy utilities, as other solutions have emerged. On the one hand, for one of the last wind parks developed, the cooperative collaborated with Vandebron, an innovative platform connecting

producers and consumers of sustainable energy. This platform along with the good energy prices, allows Deltawind to reach the consumers with more "*transparency"* and "*visibility"* for their brand; Vandebron functions as Deltawind's shop. It is pointed that Deltawind is interested in building partnerships with organisations with similar to its own culture ("*cooperation*", "*intrinsic feeling of sustainability*", "*innovation*"); yet a good business proposition is also crucial.[9]

Recently the initiative in cooperation with Zeeuwind, another energy cooperative in the region, has also reached an agreement with four multinationals, which will directly receive the energy generated by one of the wind parks. More specifically, as reported in their press release, the agreement entails that Deltawind will source a total of 350.000.000 kWh a year from a new facility, Windpark Krammer (under construction), once it becomes operational in 2019. The agreement is seen as crucial for both the funding of the wind park and for the sustainable ambitions of the four companies. In this way, the initiative has managed to "cut out the middle man". More specifically this happened with the assistance of Wind4ind, an expert centre on Power Purchase Agreements (PPAs), which negotiated the PPA and set up the back-office processes that made this direct PPA possible, as the special permit (in Dutch: programmaverantwoordelijkheid – programme responsibility) was taken care of by Wind4ind.

For the latest park, the cooperative also collaborated with Enercon, a leading wind turbine manufacturer from Germany. For their project development, apart from the support from the state through subsidies, Deltawind also received funding from Triodos bank's green funds. Stedin is the network operator at the region.

Another important partnership for Deltawind is the one with the "*Windgroep Goeree-Overflakkee*", which was initiated by Deltawind in cooperation with the energy company Eneco. When the province allowed the development of additional 225 MW of wind energy in the province, the group was formed with the purpose of ensuring that the new developments on the island are organized in terms of collaboration between the local initiatives (and not in competition among them) and that the local community will take benefit from them. In this way, there is going to be "*one plan and not 18 plans*" as regards the position of the wind turbines and the community may benefit by the created fund for the support of the surroundings: for each wind turbine built a contribution of 50ct/ MWh goes to the fund. Interview data suggest that this annually results in about €5.000 per windmill or about €200.000 for all the wind turbines on the island. The collected sources are directed to projects, like for example, the installation of solar PVs on schools or other social buildings of the island. Apart from Deltawind and Eneco, participants in the

[9] It is worth mentioning that the reason why the cooperative did not collaborate with the energy provider DE UNIE, a cooperative of cooperatives in the Netherlands, is because of the fact that despite taking on the administration tasks, DE UNIE asks the initiatives to find their customers, something that is not Deltawind's core business and given its scale of operation it is also a difficult and expensive task (the director suggests that for the last wind park, there would be a need for 11.000 contracts to make use of the total electricity produced).

Windgroep are another 12 local initiatives, Nuon, the National Forest Foundation and a dozen of local farmers.

Value capture

Deltawind has a broad base of supporters as members and donators. Members can support the initiative by contributing with the minimum of €50 membership fee, which is what 15% of its members have chosen. Most of Deltawind's members have contributed with a loan to the cooperative between €2.250 and €5.000 euros. In 2013 it has been decided to set a maximum of 5.000 euros per member for safety reasons as *"losing 5.000 euros is a pity but doesn't leave you destitute".* The interest rate for the contribution of the first €50 rises to 10%; beyond this amount the interest fluctuates between 5% and 7%, depending on the average annual wind and solar radiation. Recently the initiative inaugurated a mechanism of financial obligations for people who do not wish to become member of the cooperative, yet want to contribute to its development. This financial tool is furthermore directed to cooperative members that wish to contribute beyond the cooperative's limit to contributions.

The costs of Deltawind relate to the salaries of the employees, the payments of the promised interest rate to the members, some promotion and communication expenses and most significantly the investment in the development of new projects. As regards the costs of the wind parks, apart from the cost per turbine, which is estimated to about 3 million euros per turbine, important costs are a) the costs for the land (which is either bought or borrowed), and which may significantly vary per location, b) the costs for extending the network, which can be extremely high like in the case of Krammer where the extension of the network rose to 15km and c) maintenance costs. It is being noted that "*storage has our attention, but it is not yet cost-effective*".

4.4.2. System level

Technology and Infrastructures

Deltawind focuses on developing and operating wind farms, as wind energy is seen as the most efficient and profitable renewable energy source. Yet, based on a project initiative of one of its members the cooperative has also developed one solar park. The technology and the respective infrastructure under focus is renewables which differs from the old traditional energy industry that is mainly based on fossil fuels, yet, is relatively well aligned with the more recent developments of large energy companies shifting to renewable energy. "*Development, technology and infrastructure is the same; in that way we operate like ENECO*", it is mentioned. Compared to other local energy initiatives, Deltawind's operation is focused on large-scale renewable energy projects. This in turn has implications on supporting infrastructure as regards the network connection for example.

User Practices

Despite the fact that Deltawind is a producers' cooperative, it is interested in examining the impact of the involvement of its members on their overall behaviour. Not turning them into prosumers, that is citizens that are active producers of their *own* renewable energy (e.g. REN21, 2017), as the members may only consume the energy they produce through Deltawind's partners, the organisation cannot directly influence its members beyond the level of their participation in the General Assemblies and other actions

connected to renewable energy production. The initiative hopes to inspire a more sustainable behaviour, yet research on the issue found no strong link between being member of Deltawind and behaving more sustainably (Feiit, 2011). An external researcher has been contracted to examine the image of Deltawind among residents and the impact of people's involvement on their behaviour. The study found that members do not act more sustainably than non-members, yet they are more conscious about the urgency of doing so (Feiit, 2011).

Cultural significance

As regards the cultural representation of Deltawind, interview data suggest that the cooperative is positioned closer to the consumer than the established energy utilities. Developed on the island in close proximity with its members the initiative seeks for direct communication with them. *"I see members at the supermarket*". Apart from publishing news briefs on their website or local newspapers, in addition to distributing information material, or organising Open days for visits at the wind farms, the initiative is interested in the opinion of residents, keeping the communication pathways open. Moreover, through transparent operation and the participation in the Windgroep it wishes to inspire people, inviting them to participate in sustainable energy production and consumption.

Knowledge base

The cooperative is aware of the urgency and the technological means to accommodate a transition to a more sustainable energy system. One main assumption is that the development of renewable energy on local scale close to the energy consumption is going to result in awareness and more conscious energy consumption. Another assumption is that renewable energy offers the opportunity to locals to benefit from the energy transition through the development and ownership of renewable energy projects. Over time, the cooperative has built professional expertise for both the technological side of its operation but also the more social, community-related one. Moreover, for reasons of legitimacy and impartiality, when needed the cooperative also turns to third institutions for external expertise.

It worth mentioning that on Deltawind's website we also find a reference to the cost of externalities. It is noted that: "According to a European study counting social costs of resource use in the Netherlands, coal results in 3 to 4 cents per kWh and gas 1 to 2 cents per kWh (source: ExternE, EU). Wind energy produces only about 0.1 cents per kWh as external social costs." This suggests that the initiative wants to move the debate towards the real cost of energy sources, a political position with certain implications for both the novel sustainable energy initiatives and the fossil fuel based utilities.

Organisational logic

Deltawind exhibits a small organisational structure as compared to the incumbent utilities, yet larger as compared to the small energy cooperatives "*whose members fit arounda table*", as pointed out. "*For some small co-ops we are too big. They compare us with Eneco*." Yet, Deltawind is operating with cooperative principles of decision-making, ownership and inclusiveness, close to the local community. It is interesting to note that the cooperative has entrusted the task of inspecting its wind turbines to two farmers of the area. The scale of its operation, nevertheless, and the (financial) risks involved have

resulted in certain task division and a gradual broadening of the distance between Deltawind and its members. "*The higher the risk, the bigger the agreements are and the harder to translate to something that an average member understands*", as argued. It is worth mentioning that its large scale can explain the decision on, on the one hand, outsourcing the responsibility of finding clients and the respective administration to Vandebron, and on the other, on making the agreement with the multinationals. Furthermore, scale could also be responsible for the decision to introduce the financial tool of Obligations, which allows non-members, who do not necessarily share the same ideas and vision with Deltawind, to invest in the cooperative.

Sector structure

Deltawind participates in several associations for sustainable energy in the country, both the ones more targeted at supporting bottom-up renewable energy initiatives, as well as, the ones shared with the broader energy industry. The initiative sits at the board of the Dutch wind association and learns and influences the developments in the field. Energy incumbents are slowly repositioning themselves moving closer to the consumer, decreasing in this way the distance between cooperatives and traditional energy companies and blurring this distinction. Deltawind innovates by altering the rules of the game as concerns the overall sector structure. On the one hand, it involves local farmers in the inspection of its wind turbines; new actors join the sector working on an energy related project. On the other hand, in contrast to the dominant practice in the field of arranging PPAs with energy utilities, the cooperative through the collaboration with the multinationals on the wind park Krammer leaves out the middle man and establishes a new way to provide energy to a third party without the need to involve an energy utility for the respective permit. As already mentioned, the cooperative managed to achieve this direct PPA in collaboration with the expert organisation Wind4ind.

Policies and Political Power

Deltawind is member of ODE Decentraal the lobby organisation of energy cooperatives, it participates in the Dutch Association for Sustainable Energy, the industry association for companies involved in sustainable energy, and furthermore sits at the board of the Dutch Wind Energy Association. Moreover, it is active in the platform for bottom-up energy initiatives HIER opgewekt contributing to the attempt to professionalise the sector. It is through these organisations that the cooperative tries to on the one hand strengthen the community energy sector and on the other it wishes to influence the framework within which it operates. Its direct (one to one) involvement in lobby processes at a national level has not been so significant though. As already mentioned in the past the cooperative has tried to (unsuccessfully) arrange its business model in a way that it could demonstrate that it could work without making use of the national energy production subsidy at all. Yet, due to the quite significant decrease of the energy prices these plans were dropped.

4.5. Discussion

Deltawind's operation may contribute to the change of the existing regime and shift the energy system towards a more sustainable direction by altering user preferences, technology and infrastructures, as well as, gradually introducing a new organisational logic and cultural significance, et cetera. The selected case exhibits a certain degree of

institutionalisation in several niche dimensions and the framework presented here allows us to systematically scrutinise the instances where transformation starts to take place by identifying points of friction with the broader dominant context.

Through its *value proposition*, in fact by engaging in a narrative that stresses the importance of sustainable energy production and consumption, the role of openness and transparency in sustainable development, as well as, the opportunities that renewable energy offers to local communities, the initiative influences the associations of the system as regards culture (*Cultural significance)*, as well as knowledge (*Knowledge base)*. As discussed, through its participation in the Windgroep Goeree-Overflakkee the initiative offers tangible benefits to the wider community, for instance through the fund for the development of the region. In line with the literature, we note that the cooperative's value proposition embraces social and environmental considerations (Boons and Lüdeke-Freund, 2013; Schaltegger et al., 2016).

With its *product*, the renewable electricity it generates, the cooperative begins to alter fundamental features of the systems functioning. Although the scale is not enormous, it is significant enough for a cooperative. In fact, Deltawind's specific scale allows it to take a specific place in the network of the energy sector. It is sufficiently interesting for both the old (Eneco) and the new (Vandebron) parties. This way the cooperative changes the *technology and infrastructures* involved, as the physical network required. Furthermore, in this way the cooperative begins to alter the quality characteristics of the sector, as regards the type of energy provided and the particular sector capabilities involved, in other words the *sector structure*.

Through its *architecture of value* the cooperative challenges the dominant regime in multiple dimensions. By involving the local community in renewable energy production their *User Practices* start to change: they are not just energy consumers but they also become energy producers, sharing the ownership of wind turbines in their local area. Moreover, through its participation in the Windgroep Goeree-Overflakkee*,* the cooperative shares the value it generates with the broader society. In this way, combined with a transparent operation, the cooperative tries to increase the "*societal acceptance"* of renewable energy technologies and broaden peoples' "*energy consciousness*" and "*responsible energy consumption*". In addition to this, as already mentioned, via the direct PPA with the multinationals as regards the energy produced by the wind park Krammer, Deltawind establishes a new way of providing energy to a third party leaving out incumbent energy utilities, changing in this way, the *sector structure*. This is also the case with the collaboration with VandeBron, an initiative that can be said to originate in another niche, synergetic to the one of Deltawind. Our findings, therefore, are in line with literature on niches and their formation and emergence of disrupting innovation at the margins of (multiple) regimes (e.g. Smith 2007). Last but certainly not least, as part of its overall operation, it participates in lobby organisations like ODE Decentraal and the Dutch Wind Energy Association, in this way it attempts to influence the policy and regulations in the field.

As last, its *value capture*, i.e. the way it sustains its organisation mobilising resources as people and money. The organisation has managed to mobilise significant amount of financial resources starting from contributions from its members yet going beyond this. The cooperative inaugurated the mechanism of financial obligations that will enable it to

gather resources from people who although they don't want to become members, want to contribute to the development of the cooperative. Moreover, despite this, the initiative challenges the dominant way of thinking about the very issue of value. Communicating the full cost of its operation in comparison to the dominant fossil fuel-based mode of operation, Deltawind exhibits a broad orientation on value and in this way, it challenges the basic assumptions of the dominant *knowledge base*. Although the latter only exhibits very primitive signs of institutionalisation, it constitutes part of the cooperative's transformation agenda.

In conclusion, we have identified many ways in which Deltawind develops and influences its context. When a growing scale of production allows it, the initiators are able to strike deals with new partners that are closer to its own views than its initial partners. It is also interesting to note that the initiative is able to use institutions such as EU-tradable Guarantees of Origin to its advantage. Indeed, with its governance structure and its investment scheme, the initiative is an institutional innovation itself. Finally, it has managed to arrive at new point of development, where it still represents a niche of renewable, decentralised energy production, but at such a scale that it has begun getting noticed and acknowledged by the fossil-fuel incumbents.

All in all, the case of Deltawind manifests the power of business models and their ability to support the strategic goals of an organisation (Shafer et al., 2004; Doganova and Eyquem-Renault, 2009; Loorbach and Wijsman, 2013). This illustrative case shows that through business model innovation, entrepreneurs can shape markets and society. In this way, they catalyse the sustainable transformation of societal systems and their functions.

We should nevertheless note that while Deltawind already contributes to the wide transformation of the energy system and society as a whole, its business model cannot *yet* be described as transformative. It is the institutionalisation of the niche dimensions through its business model that may qualify the initiative and thus its business model as transformative. In other words, ex-ante we may discuss the *transformative potential* of an organisation and its business model, yet to qualify a business model as transformative more evidence for the transformation the initiatives are interested in is needed.

4.6. Conclusion

The presented framework is introduced as a tool to enable researchers and practitioners to analyse and support the potential of organisations to contribute to sustainability transitions. Building on transition theory, seven dimensions have been introduced to enable the examination of the initiatives in their dialectic relationship with the context in which they operate. In other words, our framework allows the assessment of how different initiatives attempt through their business model to shape their environment, while being at the same time shaped by it. It is by allowing to scrutinise frictions and reflexive changes that result from these, that our framework becomes a tool to assess and improve an initiative's transformative potential.

Transformative business models are considered the ones that manage to shape their context, by building alternative to the dominant institutions. As exhibited with the example of Deltawind, a business model allows entrepreneurs to influence the system reconfiguring its elements like, Technologies and Infrastructures or User Practices. A business model becomes transformative, once the institutionalisation of the alternative

system configuration suggested and partly embodied by the initiative has progressed and the transformation starts to take shape. Our findings from the analysis of the illustrative case of Deltawind allow us to suggest some characteristics that transformative business models entail.

First of all, transformative business models, entail a broad value orientation that encompasses different dimensions for positive value (or disvalue). This means that transformative business models extend their value proposition beyond members or customers towards multiple stakeholders. One cannot, as many economists are used to do, equate success with economic growth; the system as a whole should be taken into account. This relates to the fact that transformative business models openly take into consideration negative or positive externalities, as these refer to value that may or may not be monetised in the future. In that, this statement resonates with previous research in the field of business models (e.g. Boons and Lüdeke-Freund, 2013; Schaltegger et al., 2016).

In addition, in line with the normative requirements introduced by Boons and Lüdeke-Freund (2013) for sustainable business models, we argue that transformative business models involve broad stakeholder networks. Transformative business models accommodate the views and preferences of multiple societal stakeholders, some of which often participate in their value architecture. In other words, the sustainable offering (product or service) reaches its targeted public through this very broad network.

Last, an important characteristic of transformative business models is that they allow for a reflexive orientation (cf. Beers and Van Mierlo, 2014; Van Mierlo et al. 2010). In fact, transformative business models explicitly take into account a changing societal context, that not only for their own survival but also for wider system transformation. A reflexive orientation means that organisations are able to identify and address obstacles and opportunities that are presented to that end.

All in all, in line with Schaltegger et al. (2016), the concept of transformative business models is introduced with the ambition to help organisations to contribute to sustainability transitions by designing, employing and adjusting their value proposition, product or service, along with their value architecture and method for value capture, in order to capture some value while helping maintain or regenerate social, environmental and economic capital beyond its organisational boundaries.

The added value of our work resides in bridging the literature of sustainable business models with that of sustainability transitions in an attempt to, on the one hand, advance our understanding of how sustainable business models can contribute to sustainability transitions and, on the other, how transition thinking may unlock the transformative potential of sustainable business models.

At this point we need to point to the preliminary nature of the discussed findings and the proposed characteristics of transformative business models. The introduced framework aspires to map the conditions that may allow sustainability-oriented initiatives transform the system within which they operate. The illustrative case is derived from research focusing on the energy transition in the Netherlands. Further empirical research and in-depth analysis of more cases is needed in order to consolidate the suggested characteristics of transformative business models, possibly enriching them with

additional elements. Future research could also apply the introduced framework in other sectors in order to test the propositions made in this contribution. We are confident that our framework is a valuable tool for the analysis of the interaction between sustainable business models and the transition they aim to accelerate and thereby we aspire to support sustainability-oriented entrepreneurs to better strategize in order to contribute to fundamental systemic change.

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5. Renewable energy initiatives: from "organising for impact" to the "impact of organising"

NOTE: This chapter captures the status of the cases under study in 2018

5.1. Introduction

In a context of growing sustainability challenges and increasing urgency to address these, the European Commission has presented a European Green Deal to "make the EU's economy sustainable", promising a transition that is just and leaves no one behind (European Commission, 2020). Energy communities have already been granted legal recognition in the framework of the Clean Energy Package (2019), which acknowledges them as an effective tool to increase public acceptance of new renewable energy projects, to mobilise private capital for the energy transition, and to increase flexibility in the market. Nonetheless, beyond all this, a growing part of our society hopes that the renewable energy initiatives will deliver their full transformative potential and lead an environmentally sustainable and socially just energy transition.

Driven by the ambition to understand (and support) the role and impact of renewable energy initiatives in the context of the energy transition, in this chapter I analyse and discuss how the different cases under study (self-)organise to produce value, intentionally and unintentionally influencing the system within which they operate.

I do this guided by the conceptual framework which was introduced in Chapter 3 and illustrated with the analysis of one case in Chapter 4 (Proka et al, 2018). The question explored here is: *how do renewable energy initiatives (self-)organise and legitimise their existence through their business model,* or put it simply, how and why do they exist?

My focus goes on a first level on the presentation of the business models the renewable energy initiatives under study have developed and employ, and then, on a second level on the impact they (aspire to) have on the system through the implementation of their respective business models. The first part, thus, focuses on the issue of "*organising for impact*" (i.e. on the sustainability-oriented business model), and the second focuses on the "*impact of organising*" (i.e. the impact of this sustainability-oriented business model). To map the latter, the divergence and tensions between the different organisations and the dominant regime is explored.

This chapter starts with a brief discussion of the concept of impact and how my conceptual framework relates to it. Next, I present the 12 initiatives under study. Then, I analyse the cases on a business model- and on a system level. Last, I reflect on the findings and conclude.

5.2. On the concept of impact

Over the last decades, the interest of several societal stakeholders, including governments, investors, employees, and the media, about the social and environmental impact of firms, along with sustainability-oriented enterprises, has developed substantially (Maas and Liket, 2011). Several regulations, guidelines, and initiatives call for transparency, not only about financial matters but also about the social and environmental aspects of corporate, as well as civil society organizations (García-Sanchez et al., 2013; Keeble et al., 2003; as cited in Maas et al, 2016). And indeed, a growing number of organisations measure multiple dimensions of impact, including social dimensions (Maas and Liket, 2011).

While the use of the term impact has met a substantial growth, it is often unclear what the concept really means (Ebrahim and Rangan, 2010; Kolodinsky, Steward, and Butt, 2006 as cited in Liket, 2014). The term impact has been used by a wide variety of actors, in academia and practice, to refer to different types of effects, changes or values (ibid). Some understand impact as the achievement of immediate goals of projects, programs, or an organisation, while others regard impact from a societal perspective and focus on community or societal level changes (Campbell, 2002; Poole et al., 2001 as cited in Liket, 2011).

Impacts may be differentiated from intentions, outputs and outcomes (Mass, 2009). One should, in fact, distinguish "between the resources used for an intervention (input), the intervention itself (also referred to as project or activity), the immediate quantitative synthesis of the intervention (output), the direct changes in people, organizations, natural and physical environments, and social systems and institutions (outcome) and highest order effects of the intervention (impact) (Liket, 2014, p.48).

Liket (2014) stresses also the distinction between two subtypes of impact: *mission-related impact*, and (what she refers to as) *public good impact*. The former involves a measure of the impact of the organisation in relation to its mission, leaving out unintended effects. The latter includes all unintended effects (externalities) and refers to the overall welfare gains or losses for society. An impact may involve both negative and positive effects (Wainwright, 2002).

The concept of impact has been defined by Clarck et al. (2004) as "the portion of the total outcome that happened as a result of the activity of an organisation, above and beyond what would have happened anyway" (p.7, as cited in Maas, 2009). Drawing on this, "impact" is understood here as "the sustained changes at the societal level, that come as intended and unintended result of an organisation's activity, above and beyond what would have happened anyway".

I am interested in the broader, systemic impact, which goes beyond the mission-related impact of an organisation. Drawing on the business model concept and transition theory, my conceptual framework enables a fine-grained understanding of the actions the initiatives take, thereby creating new institutions, and de-legitimising and destabilising (in parallel) the institutions associated with the regime. For this assessment of the systemic impacts of renewable energy initiatives, I evaluate their business model as an articulated *theory-in-use* (see Magretta, 2002; Osterwalder & Pigneur, 2010; Argyris & Shon, 1974), which enables capturing possible unintended impacts of the initiative's

operation. In that, my framework helps analyse the business models developed by renewable energy initiatives and how these help drive the energy transition by facilitating the stabilisation of such innovations, destabilising, in parallel, the incumbent energy regime (cf. Bidmon and Knab, 2018).

5.3. The initiatives

The tables that follow present the cases under study. The first table presents the renewable energy cooperatives (Table 5.1), the second table presents the Project Developers (Table 5.2), and then the last table (Table 5.3) presents the Intermediary actors focusing on energy efficiency and conservation.

	Zuiderlicht (C1)	Eigen Wijkse Energie Cooperatie (EWEC) (C2)	DE Ramplaan (C3)	Grunneger Power (C4)	Deltawind (C5)	De Windvogel (C6)	Thermo Bello (C7)
Founded in	2013	2013	2014	2011	1989	1991	2008
Members	130	165	220	1.200	2.080	3.300	200
Geographic focus	Amsterdam (city)	Wijk bij Duurstede (town)	District in Haarlem (city)	Groningen (city)	Island Goeree Overflakkee	The Netherlands	District in Culemborg (village)
Projects	3 solar & 1 wind	2 solar	1 solar	6 solar co-owned & others developed	3 wind & 1 solar	4 wind & 3 solar	1 thermo & (1 solar)
Capacity	358 kWp	166 kWp	370 kWp	2.911 kWp	15.542 kW & 840 kWp	5.235 kW & 565 kWp	About 9000 GJ/year

Table 5.1: Renewable energy cooperatives

	De Windcentrale (D1)	BAS Nederland (D2)	WeKa Daksystemen (D3)
Founded in	2012	2010-2016	1991
Business Model	Crowdfunding platform for wind cooperatives	ESCO towards energy neutrality	ESCO specialising in solar roofs & insulation
Clients	15.000	about 400	Unknown

Table 5.2: Project Developers

	Cooperatie Hoom (former Alliander) (E1)	Buurkracht (Enexis) (E2)
Founded in	2013 (end)	2013 (mid)
Engagement Phase A	42 districts	130 districts
Engagement Phase B	17 cooperatives	234 districts

Table 5.3: Intermediary actors on energy efficiency

5.4. Business model level: Organising for Impact

In what follows the business models of the cases are analysed discussing their value propositions, their products or services, their overall value architectures, and their individual mechanisms of value capture.

Value proposition: When it comes to the value offered, some of the cooperatives stress control and empowerment more than others (C1, C2, C4, C5, C6, C7). The community gains ownership and takes benefit of the capacity at its region; as an interviewee (i2) pointed: *"you see these windmills? They produce your electricity".* The overall value proposition does not significantly diverge across cases: their focus is on natural and social sustainability and the support of local economy.

Compared to the project developers in the sample, the value propositions of the energy cooperatives include a wider variety of social features, like enjoyment-fun (C1), transparency (C5) self-determination (C6) or community cohesion (C7). As one interviewee (C7) said "*[we are] doing it on our own because it is nice, [and] because we can do it better: more efficiently and cheaper [than the dominant energy companies]*" (i3).

The financial benefits are put forward as a value by all the organisations in the sample: "When you have some savings [on your bank account], you get nothing; you get maybe something like 1%. We calculated the Internal Rate of Return [i.e. of investing in a cooperative share] at 3-5%" (i6).

The other initiatives (D and E) mainly focus on decreased energy costs and energy prosumption. Some also focus on the positive environmental impact (D2, E1, E2), others on comfort (D3) while they all stress their reliability in either advice (E1, E2) or complete service (D2, D3). As one interviewee from E1 mentioned *"we coordinate trust, we create trust… people are activated"* (i11).

Product or Service: All cooperatives but one in the sample focus on electricity production. C7 offers self-produced heat to their membership and other clients in the neighbourhood. In several cases (C1, C2, C4 in part, C5, C6) the electricity produced is not being consumed by their co-investing members. Using the premium tariff scheme, some solar initiatives (C1, C2, C4), as well as all wind initiatives (C5, C6) offer their membership the satisfaction of increasing RES production; the electricity, commonly together with the Guarantee of Origin (GoO), is sold to an energy company through a Power Purchase Agreement (PPA). Often, these solar initiatives enable e.g. schools and offices to consume renewable electricity from their rooftop. C1, in particular, does so through a solar panel leasing system. In the case of the wind cooperatives (C5, C6), their product is sold to energy companies, while their members receive a financial return.

The other solar cooperatives (C3 and C4 in part), using the tax relief scheme, enable their membership to consume their self-produced electricity. Because of this arrangement, these cooperatives have found a partner energy company with a sales permit. Hence, next to self-produced electricity, they offer their membership green gas with a special price arrangement.

Furthermore, two of the most professionalised energy cooperatives in our sample, also offer advice as a service (against a fee). C4, for instance, advices on project development

and/or energy saving while C7 engages in professional publications around the topic of heat.

The crowdfunding wind company D1 turns its customers into prosumers by making them contract customers of a specific energy company. D1 has been among the first initiatives establishing such an arrangement. The private companies D2 and D3 offer a package of energy services including efficiency measures and generation, together with financing advice (D2) or just solar on rooftops where needed combined with roofing and financing (D3). As for the intermediary organisations, they provide advice only, focusing on energy efficiency (E1), or on both conservation and generation (E2).

Value architecture: The support schemes the initiatives choose to use have a direct influence on their internal organisation and the partnerships they build for pursuing their function. In our sample the premium tariff scheme is the most popular. Only cases C3 and C4 (in part) have chosen to use the tax relief regulation, while a third one (C2) plans to use the arrangement in its future projects. Cases C1, C2, C4 (in part), C5, C6 (and C7 on solar) have chosen to work with the premium tariff scheme, which explains their inability to directly provide their membership with their self-produced renewable electricity. For this, the cooperatives would have to depend on the dominant energy utilities.

It is for this reason that cooperative movement in the Netherlands founded its own cooperatively owned and managed companies. In the sample C2 collaborates with OM, formerly known as Duurzame Energie Unie[10] (DE Unie; i.e. the Sustainable Energy Union) and C4 was among the initiators of Noordelijk Lokaal Duurzaam[11] (NLD; i.e. Northern Local Sustainable). These two cooperative structures comprise of cooperatives or local clusters of cooperatives, in the case of the latter. Being member of OM or NLD enables a cooperative to offer its membership and other clients, renewable electricity and gas for prices comparable to other renewable energy companies operating on the Dutch market. In fact, the cooperative companies, apart from their members and other private actors, have also started to supply renewable energy to official institutions like local municipalities. Although in 2017 attempts for collaboration took place, the two organisations function independently from each other.

[10] In 2013 the cooperatives TexelEnergie and Windunie, in collaboration with Urgenda, a Dutch foundation aiming at a fast transition towards a sustainable society, founded DE Unie in order to fill the lack of a supplier serving the interests of local renewable energy cooperatives. In 2015 Eneco, one of the most sustainable energy utilities in the Netherlands, joined forces with DE Unie in order to support the latter with questions on technical, financial and legal matters. As of late 2017 the organisation is affiliated with 35 members around the country, out of which 32 cooperatives. Among them one of our selected cases: C2.

[11] About one year after the emergence of DE Unie, NLD emerged as an initiative of the provincial umbrella organisations of sustainable energy initiatives in the North of the country. It involves the GREK (Groningen Enegieke Koepel) for Groningen, the Drentse KEI (Koepel Energie-Initiativen) for Drenthe and the Ús Koöperaasje (Fryslân) for Friesland. In total these organisations represent around 75 local cooperatives. One of our cases, C4 was involved in setting up NLD. The cooperatives are not directly members of the NLD but only through their provincial umbrella organisations.

Nonetheless, not all cooperatives collaborate with these structures. In fact, the partnerships established vary not only across the cases but also within the cases at the level of project. With the exception of C7, which provides independently its locally produced heat as its small scale of operation does not require a special permit (ACM, 2018), for the provision of their energy the other cooperatives partner either with cooperative based energy companies (C2, C4) or with commercial energy companies with a sales permit (C1, C3, C5, C6). Interestingly, C5 for its latest project (Windpark Krammer) managed to arrange a direct PPA with big multinational corporations in order to directly, without the involvement of any other company, provide them with electricity.

Significant partners for all cooperatives are the grid operators. Additionally, especially for solar projects, central partners are the local governments which may also provide them with financial support. On the latter, while the support of their membership is primary for all cooperatives, the scale of investment of wind cooperatives (C5, C6) necessitates the collaboration with financial institutions. Furthermore, in line with their ambition to boost the local economy, most initiatives collaborate with local installers.

From the other organisations, the two developers (D1, D3) work with the premium tariff scheme, although D3 is indifferent to the support scheme. D2 that developed projects at individual level, worked mainly with the support of the net metering regulation for electricity, and subsidies for other technologies, like heat pumps. For its projects until 2017 D1 collaborated with a specific energy company, while through the ESCO model of D2 and D3, the organisations provide themselves energy to their clients. Apart from the necessary support of the grid operators, both developers and intermediary organisations stress the importance of collaborating with or linking to (certified) local installers for the realisation of their projects, and the local governments for the inquiry of possible financial support. The intermediary organisations have close collaboration with local governments.

Value capture: The cooperatives manage to avoid to great extent debt financing by banks thanks to the local support they enjoy. They mainly work with members' contributions and/or project-specific shares, as equity financing. Furthermore, the solar and heat initiatives receive financial support from the local municipalities and/or their provinces (C1, C2, C3, C4, C7). Wind cooperatives, nevertheless, due to the scale of investment often need external funds, in the form of debt or equity financing. In some cases, they get loans by financial institutions, while in others they co-develop wind parks with other commercial or cooperative parties (C5, C6).

The support scheme selected per project demarcates the value streams (financial funds, energy, etc.). C1 uses the premium tariff scheme for leasing solar to third parties offering a fixed ROI to its members, while allowing them to receive renewable energy from the energy company it collaborates with. C2 and C4 (in some of its projects) use the premium tariff in order to produce energy for the users of the buildings where the solar installations are placed, while offering a Return on their members' Investment (ROI) as well as the opportunity to receive renewable energy. Then, C3 and C4 (in other projects) use energy tax relief arrangement, in order to allow their members to consume their self-produced electricity, at a lower cost. For every customer they bring to the energy companies, the cooperatives receive a certain annual funding for their operation. Yet, C3 decided to redirect this benefit to its members. When it comes to the wind cooperatives

C5 and C6 use premium tariff and only provide financial benefits to their members. The renewable energy together with the GoO are sold to the energy companies. All in all, some cooperatives offer their members a fixed ROI (C1, C2), while others often offer a (lower) energy price (C3, C7). Some cooperatives promise a range of ROI (C4, C5, C6) whose final amount is decided by the members' General Assembly. The pay-back period varies per project.

The single-project cooperative entirely run by volunteers (C3) specifically arranged its business model in order to avoid the need for staff, explicitly aiming to break-even. All the others, including the other one fully run by volunteers (C2), have already a portfolio of projects and re-distribute their profits to their members or use it in new projects (C5). Some cooperatives only employ a couple of part-time employees (C6, C7), while others have professionalised to the extent that employ eight (C5) or nine (C4) people. Some remuneration was made possible for two board members of C1 through the support of a network operator, which wanted to assess the impact of professionalisation on the progress of the energy transition.

Regarding the other organisations, D1 received the premium tariff, D2 developed projects for its individual clients with the net metering regulation, and D3 used either schemes. For the latter two, also the support schemes for energy efficiency measures from national and/or local sources are relevant. The private companies D2 and D3 offer their customers a variety of financing options for the suggested measures (e.g. on bill-payment, loan by banks). This means that until the ownership of the energy installations moves back to the clients, it is shared between the companies and the banks. Overall, finding projects (fields for wind turbines and/or roofs for solar) is very critical for the operation of the developers (D1, D2, D3), as they employ salaried staff. While D2 issued bankruptcy, D1 may continue its operation, even without a new project since 2014, thanks to a low fixed annual fee it receives per wind share sold for managing its emerging cooperatives. In total D1 has sold 61.656 wind shares.

As for the intermediate organisations, E1 was originally part of a network operator, but now builds on the in-kind contributions of its board members and the subsidies it manages to acquire for partly compensating one freelancer. These subsidies come especially from local governments. On the other hand, E2 offers advice but is not involved in the financial streams around the specific installations. The organisation continues its operation thanks to the funds provided by a (second) network operator.

In the next section I explore the impact that these organisations (aspire to) have on their institutional context through their business models.

5.5. System level: Impact of Organising

Organisational logic: This comprises the main innovation of the initiatives as opposed to the dominant system. The overarching principles endorsed by all cooperatives involve shared ownership and democratic member control. Within this frame, a variety of organisational structures emerged: from producers' wind cooperatives with a large project portfolio (C5, C6), to consumers' solar cooperatives with single projects (C2). The sample also includes local cooperatives whose model shifts towards project development for other actors, with no final ownership or fixed financial flows between the new projects and the internal organisation of the cooperative, apart from an advice fee (C4). The

initiatives have developed models of self-consumption (C2, C3, C4), third party energy production, for instance for schools (C1, C2, C4), as well as direct PPA to big industrial companies (C5).

Overall, their logic radically differs from the dominant way of organising in the energy field. As one interviewee points "the neoliberal system is dominated by monopolised big investors, but we are on the other side. We are more for local ownership, local autonomy, local energy production" (i4). This hints to the preference of doing things independently and the relevant tension of the collaboration with commercial parties (see Chapter 6).

Another tension relates to the dilemma between professionalising and keeping the connection with their support base. While some gladly say that their involvement in the board of directors "*is like a hobby that we are partly getting paid for*" (i5), others point that "*you cannot run this type of business like this [i.e. with volunteers]"* (i6). It is stressed that: *"we thought we could function as volunteers' organisation in a market where you cannot work as a volunteer's organisation. We should have professionalized by 6 years ago. We should have hired a Dutch wind project developer*" (i4). While developing a wind project is certainly more complicated, some state that also for solar "*the project leader has to be paid from the project. It is too much work, too difficult and too specialised for a volunteer"* (i6).

Having a professional status, D1 has developed a structure that enables shared ownership, prosumption, with a minor focus on democratic control. The level of involvement and competence developed is quite different in comparison to the cooperatives in the sample. In this case, the management and operation of the emerging cooperatives is taken up by the company. For cases D2, D3, as well as E1, E2, the main logic is efficient energy prosumption. The developers (D1, D2, D3), nevertheless, do not have an equally strong bond with their clientele as the cooperatives, as they operate on a commercial base. While E1 is mainly based on volunteers, E2 has the backing of the network operator in remunerating staff that support local energy cooperatives.

Technologies and Infrastructures: The main focus is on RES investment. Four of the cooperatives under study have started their operation with a focus on solar projects (C1, C2, C3, C4), two with a focus on wind (C5, C6) and one with a focus on (very low value) heat (C7). While cases C5, C6 and C7 have also invested in solar, only one of the (primarily) solar-focused cooperative has also invested in wind (C1). For the others, wind project development may fall off their scope or may not be possible due to provincial moratoriums on onshore wind in their area especially in the provinces of Utrecht (C2), North-Holland (C1, C6), or Friesland. Overall, given their focus on electricity through solar and/or wind, most initiatives depend on the current publicly-owned Dutch electricity grid including the regulations that govern grids management and the (regional) grid operators in charge. Only C7 operates independently a neighbourhood infrastructure for the transport of very low value heat.

D1, too, complains about the provincial and municipal restrictions that make new wind projects almost impossible. Transnational energy companies focus on the development of large-scale, offshore wind projects, which is, in contrast, strongly promoted by Dutch national policy. D2 and D3 mainly focus on solar technologies and energy efficiency

applications. While E1 focuses exclusively on energy conservation, E2 prioritises energy conservation, offering at the same time advice on energy generation too.

User Practices: "Prosumption" may be achieved, through the collective generation of renewable electricity or heat by the members of the cooperatives, which also involves a certain level of communication and coordination between them, but the question remains regarding further impact on their practices. While there is the assumption that becoming member of a RES cooperative people change their practices, only C5 has investigated into this topic. The interviewee (i2) points to two surveys taken with an interval of three years, whose comparison shows that the number of members who mentioned waste separation as a sustainability-oriented action that followed their involvement in the cooperative decreased, while the number of people referring to a shift to green banks or reduced meat consumption increased (Feijt, 2011; Feijt 2014). Also, while the cooperatives try to stimulate energy efficiency via different campaigns, their impact on this area is rather unclear. Similarly, they report lack of data (C2) or doubt (C5) on the impact of their attempts to increase local acceptance for wind turbines.

Likewise, while D2 and D3 focus on energy efficiency, no data was available on behavioural change. Even though both E1 and E2 do research on the issue in order to build knowledge "*about what works and what doesn't*" (i11), no information was provided.

Cultural significance: The cultural values embraced and embodied by all the different organisations fall under the overarching concept of sustainability. It is sustainability and its associated values that the organisations aim at mainstreaming and making them guiding principles for the system's function. For the cooperatives main guiding principles are shared ownership and democratic member control. For (most of) them, the intrinsic values of empowerment and independence (C1, C2, C3, C4, C6, C7), as well as the control on the local social economy (C2, C3, C6, C7) is principal. Prosumerism is a matter of going beyond energy specialists and reclaiming the issue of energy: energy *from* and *for* the community. The people involved are driven by the ambition to create and maintain the positive image of being "*local, transparent, easy, nice, honest, green and cheaper*" (i5).

As regards the developer companies in the sample, what brings them close to the cooperatives, when it comes to the system's qualitative nature, is the very concept of prosumption (D1) and the gradual transition to energy neutrality (D2, D3), which link to energy independence. For the developers D2, D3 and the intermediary organisations (E1, E2) efficiency is the main concept put forward in relation to the energy system.

Through their activities, the initiatives have a direct influence (outcome) in the direction of the impact they wish to have on the system. Nevertheless, it is difficult to evaluate how widely the values and principles introduced by the initiatives are shared in the society, or in other words, what the impact of these activities really is.

Knowledge base: What differentiates the energy cooperatives from the other initiatives is that they build on and practice the idea that ordinary people can do it themselves; they can build knowledge and expertise using networks of their members. They are based on "*competent neighbours and not expensive experts",* like in the case of C7 that has learned to operate very low value heat with a group of (retired) persons (i3). Another feature of the energy cooperatives is their focus on small-scale project development and their

interest in knowledge dissemination. C5 mentions that the wind projects developed exceed the small-scale level, and C6 begun pursuing its involvement in large scale wind parks.

The type of knowledge and expertise that all initiatives share is a mixture of technological and organisational. C1-4 have gathered a knowledge base on developing solar projects. C5 and C6 have gathered a knowledge base on (co-)developing wind projects. C6, as one of the older wind cooperatives, has collaborated with multiple younger cooperatives for the development of new and the retrofit and refurbishment of older wind parks. Since 2012, HierOpgewekt, a partner of ODE Decentraal, functions as the principal platform for knowledge exchange for the support of local sustainable energy. E1 and E2 are active in this platform too. Among the other initiatives, D3 has been involved in technological research and product development for solar roofing on different types of roofs. Given its commercial interests, it doesn't share its knowledge.

Sector Structure: Findings suggest the emergence of a decentralised, local sustainable energy sector. The cooperatives studied participate in specific networks and lobbies, like the ODE Decentraal, and other structures dedicated to organisations with specific technological focus, like the Dutch Wind Energy Association (C5, C6). The latter is a network where also D1 participates, while cases D2 and D3 seem to have their own specialised professional platforms. Overall, ODE Decentraal and especially the knowledge platform HierOpgewekt, appear to be relevant also for cases E1 and E2.

This local sustainable energy sector in the making also attempts the integration with other sectors, like agriculture. For instance, D7 in addition to its focus on sustainable heat provision, in 2009 invested in the installation of solar PVs on the roof of a local city farm. This was part of an initiative called "boerzoektbuur" (i.e. farmer looks for neighbour) that links people with available capacity for renewable energy generation (i.e. roofs, fields, etc.) with people with the financial capacity to support them. The amount invested on the solar installation is expected to be paid back in farm products over a six years period.

Policies and Political Power: The interaction between the different organisations and the framework they operate in is not one-directional. Overall, the selected cases engage in institutional work via their umbrella organisations and individually. While the role of the state is criticised from several organisations in the sample, they do not necessarily seem to share a clear vision about the kind of support they would need from it. As an interviewee pointed "*we are learning our job; we are doing and then the system adjusts"* (i5).

Uncertainty exists about the future of the net metering regulation. While there is some improvement concerning the tax relief scheme, its complexity is perceived as rather high. One interviewee notes: "*I was not aware that it was such a complex content. Not everybody can do it… Not because I want to put as on a higher level [for having done it], but because of the content. It is difficult"* (i7). It seems that people active in the field feel that their action is being obstructed by the national policies. The latter is especially true for the wind cooperatives. Due to geographic specificities, the tax relief scheme is not easily applicable for the development of wind projects. In fact, it could even be argued that while national policies give priority to (offshore) wind, local policies obstruct onshore wind and push people to small-scale solar. Illustrative is the quote (i8): "*we are not approaching the*

goals at all. This can be partly explained because of the uncertainty due to the volatile subsidy schemes, and partly because of the lack of support from the government".

5.6. Reflections and conclusion

The previous analysis illustrates the variety of business models the initiatives develop to (self-)organise to achieve their related, yet distinct purposes. All the initiatives are driven by a mission that relates to sustainability, and they all, consciously or unconsciously, influence (and get influenced by) the energy system on several dimensions.

All initiatives contribute to the reduction of CO_2 emissions through either the production of (and for some also the consumption of self-generated) renewable energy or through energy savings through energy efficiency. Among all initiatives, the energy cooperatives wish to introduce values such as transparency and self-determination, along with care for the community, as guiding principles for the energy system. These principles have not yet managed to replace more dominant principles (such as competitiveness, low-cost) that are promoted by incumbent energy companies.

The initiatives appear to have an impact on the dimention of technology, as beyond their own (small yet) growing direct contribution to the system, there is a rising involvement of incumbent energy companies in renewables. While it is unknown to what extent this involvement would have happened even without the activities of renewable energy initiatives, it is undeniable that the experimentation of bottom-up initiatives has contributed to the variety of technological solutions available today. These technologies are, nonetheless, deployed in a different way by the incumbent as opposed to the bottom-up renewable energy initiatives. This brings me to my next point.

When it comes to the organisational logic, the renewable energy initiatives establish partnerships that are in line with the principles of sustainability, transparency, and democratic control; this to the extent that pragmatic considerations (about, for instance, the management of large-scale electricity production) allow them. The principles concerning collaborative development and cooperative ownership of renewable energy projects by citizens are gaining momentum at a European level as the acknowledgment of citizen energy communities by the Clean Energy Package illustrates; this shows that the initiatives have been successful in terms of policy and political power. However, while renewable energy initiatives, such as citizen energy communities, renewable energy communities, or crowdfunding and peer-to-peer platforms are mushrooming, it is uncertain whether this increase will manage to de-legitimise and destabilise the dominant organisational logic of the major fossil-fuel companies.

All initiatives are active (to a certain extent) in awareness raising about sustainable energy production and consumption. The cooperatives and the intermediary organisations on energy efficiency put a lot of effort on engaging the local community, and may, thus, have a greater influence on the knowledge base of their members/clients, compared to the commercial project developers. The impact of the initiatives on their members/clients' practices remains unknown.

All in all, the variety of business models developed, that for some organisations vary per project, facilitates the stabilisation of renewable energy initiatives. To get a better understaning of the transformative potential of such initiatives, in Chapter 6 my focus

goes on the moments of friction of the initiatives with the dominant regime within which they operate, and the strategies they develop to overcome or avoid them.

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6. Transition without Conflict? Renewable Energy Initiatives in the Dutch Energy Transition

Abstract: In the context of the slowly progressing energy transition, a number of renewable energy initiatives have been emerging in the Netherlands. These initiatives represent alternatives to the dominant functioning of the energy system, and as such, may come into conflict with it. Transitions involve system destabilisation and conflict between the incumbent regime and the initiatives originating in niches. In order to assess the transformative potential of such initiatives, this paper addresses the question: what kind of conflicts and tensions arise from renewable energy initiatives, and what strategies do they develop to overcome or avoid them? Combined with a business model perspective, transition thinking enabled a better understanding of how the initiatives organise themselves, and where the points of friction with their institutional context emerge. We suggest that the instances of conflict may function as an indication for the state of the energy transition and the transformative potential impact of such initiatives. The instances discussed in this contribution relate to existing support schemes, technology choices, and the overall organisational networks of the emerging sector.

Keywords: energy transition; niche-regime dynamics; business model; conflict

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Proka, A., Hisschemöller, M., & Loorbach, D. (2018). Transition without conflict? Renewable energy initiatives in the Dutch energy transition. *Sustainability*, 10(6), 1721.

6.1. Introduction

Like many other countries, the Netherlands has recently witnessed the emergence of renewable energy initiatives (REIs) that aim at integrating the production and consumption of renewable energy, which is referred to as prosumption [1–4]. The country counted 392 energy cooperatives in 2017, marking an increase of about 20% compared to 2016 [5]. As of late 2017, 63,000 people were involved in the cooperative field, either as members-investors or as customers [5]. The tangible result of the movement in terms of generation capacity involves 36.6 MWp of solar (up by 53% between 2016 and 2017), and 118MW of wind power (also up by 2.7 MW within the same period); these figures are expected to double in the coming two years [5]. Looking at the numbers, the contribution of cooperatives to the national target, although growing, still appears to be negligible. The total cooperative solar capacity comprises about 1.8% of the (already low) total solar capacity installed in the country [5]. As regards wind energy, the

contribution of the cooperative movement amounts to about 2.8% of the national total [6].

Apart from this tangible contribution, cooperatives may have a wider impact on the energy transition. Whereas top-down policies and market forces push for replacing the system based on large scale fossil with one based on large scale renewables, REIs envision an alternative for the current energy system with broader implications for society. They are considered to represent a vehicle for the democratisation of the energy system [7–9].

Yet, it remains unclear what their potential transformative impact is. In exploring the transformative potential of REIs in the Netherlands, this paper takes a transition perspective. Transitions are complex, co-evolutionary processes of fundamental change [10,11]. They bring about a change of institutions, and of the formal and informal (explicit or implicit) rules of the game that shape the behaviour of its key actors (p. 14) [12]. Transitions are processes of disruptive change that entail system destabilisation, tensions and conflicts [10,11]. In system transitions, change comes about as the result of processes operating at multiple scales [10,11]. External pressures, like climate change or nuclear disasters, occur at the *landscape level*, an exogenous environment. The landscape puts pressure on the incumbent *regime*, the dominant functioning of the system. It causes tensions within the regime and enables increasingly competitive configurations in *niches* to gain importance [13,14]. To break through, innovations in the niche have to struggle against the selection pressures exercised by dominant regimes [11,15]. Concurring with Hård [16] who argued that social conflict should "*be treated as a cause of innovation, diffusion, transfer, and application-not only as a result of these processes*" (p. 409), we suggest that conflict may serve as an indicator of the state of the energy transition process, and the potential transformative impact of the initiatives in the niche. Therefore, in order to understand, and potentially support, the transformative potential of REIs, this paper addresses the question: *what kind of conflicts and tensions arise around renewable energy initiatives, and what strategies do they develop to overcome or avoid them*?

Although niche and regime contrast by definition, their interaction is not always conflictual. Some strategies take a more radical stance than others. There may be several reasons why niche-innovations avoid conflict with the regime. First of all, through actions tailored to maintain the status quo, the regime can, on the one hand, constrain the freedom of action for parties in the niche, keeping them under control; however, on the other hand it can embrace niches in so far as they are instrumental for meeting regime goals. We expect to make this observation with respect to the situation in The Netherlands, which is characterised by a very powerful energy regime as compared to those of surrounding nations. In fact, the "unfriendliness" of the Dutch context for the deployment of renewable energy technologies has been acknowledged by several scholars (e.g., [15,17]). In 2016, almost 6 percent of Dutch final energy consumption was based on renewable energy sources (RES), placing the country only ahead of Luxemburg within the European Union [18,19]. About 2 years away from the target year, the Netherlands is less than halfway to achieving its EU2020 goal [20] of attaining 14 percent of its final energy consumption from RES [18] which, in fact, it is not expected to meet [19].

Second, REIs may resist the regime's discipline, because regime policies and the overall selection environment need to be altered for them to flourish. However, previous

research shows that REIs do not necessarily have the ambition to contribute to changes in the system [9]. Actually, some groups are happy to remain small only providing local solutions to local needs [21]. We expect to find that REIs will avoid political conflict, as they prefer to remain in their niche.

Third, transition research underlines that initiatives in the niche need a strategic vision to achieve lasting results [4]. Strategic behaviour, especially the ability to deliberately enter into conflict with a powerful regime, very much depends on the presence of a strategic vision. Yet, it has been documented that the emerging community energy niche in the UK is characterised by a lack of coherence in terms of substance, along with a lack of direction and strategy [22]. In line with this, we expect to make the observation that, in the Netherlands too, the different REIs are not strategically focused on moving beyond their niche (status), to engage with a new regime.

While international climate agreements may offer direction, energy policy, concerning energy systems that may vary from one country to the next in terms of what comprises them, who the main actors are, and how they are governed, remains a national policy responsibility. In this paper, we look at the Dutch energy system with its peculiarities, yet at the same time, we hypothesise that a number of the issues we identify here will also possibly emerge in other countries.

Our contribution takes an analytical perspective on the kinds of conflict and tensions at play in the context of niche-regime interactions, which may enable the initiatives' reflexivity [23], and potentially inform more effective governance [10] within the context of transition.

This paper is structured as follows: Section 2 presents our research framework and the methodology employed. Section 3 presents 12 cases of REIs in the Netherlands. Section 4 presents three case studies on conflict and collaboration. Finally, we analyse and discuss our findings in Section 5, and offer conclusions in Section 6.

6.2. Research Framework and Methodology

6.2.1. Analytical Framework

To systematically identify the ongoing niche-regime dynamics and the potential instances of conflict, we have designed an analytical framework that combines insights on (sustainability-oriented) business models and sustainability transitions [24,25]. The business model concept functions as the vehicle for assessment of how an organisation defines and aims to realise its intended sustainable impact (e.g., [26]). We operationalise this concept into four building blocks:

A. *Value proposition*, which clarifies the kinds of benefits the organisation offers to its customers, investors and all other stakeholders (e.g., [27]). For sustainable companies such as energy cooperatives, the value proposition not only relates to immediate monetary profit, but more importantly, to realising societal benefits.
B. *Product or Service*, which the company delivers to its customers. This could be clean electricity, but also knowledge and advice (e.g., [28]).
C. *Architecture of value*, which relates to the partnerships through which value creation and delivery is accomplished (e.g., [27]). This building block relates to the strategy of the organisation to realise its value proposition.
D. *Value capture*, which relates to the cost and revenue flows that determine the monetary and non-monetary values associated with the organisation, and define its viability (e.g., [27,29,30]).

The potential of the initiatives to generate their intended impact directly relates to their ability to deal with their institutional context, as imposed by the incumbent energy regime. For actors in the niche, such as REIs, materialising sustainability potential actually means transforming this very context; this is where conflict emerges. For this part of the framework, we draw on notions developed in transition research.

Niches cannot be considered a unity. Some will perish, others will be adopted or absorbed by the regime, and only a few will eventually break-through and take part in a new sustainable regime [14,31,32]. Hence, some initiatives prefer to follow a "fit-and-conform" strategy, trying to become competitive within the given selection environment, whereas others try to "stretch-and-transform" the institutional environment to their benefit [33]. However, it has been argued that reality is much messier than these conceptual categories suggest, and that the strategies utilised are rather unclear or difficult to compartmentalise into one category or another [15]. Therefore, we avoid categorizations such as "radical" or "moderate" in our assessment of REIs within the Dutch renewable energy niche.

Our framework relies upon two notions. The first holds that niches, regardless of their size and visibility, can be considered as "embryonic regimes" [34]. This means that they are characterised by a (very) low degree of institutionalisation as compared to the dominant regime. Second, niches stand in an antagonistic relationship to the regime, but the extent of radicality may vary for the separate dimensions that feature the dominant energy regime. Destabilization and the collapse of an incumbent regime implies that the dimensions constituting a new energy regime are as yet unknown. Building on Laclau and Mouffe [35], we assume that energy transition will bring about a rearticulation of the system's dimensions [24]. For assessing niche-regime dynamics, we distinguish seven system dimensions, thereby drawing upon Smith and Raven [33], with slight modifications:

1. *Organisational logic* refers to how an organisation generates value, including organisational decision-making processes, routines and activities directed towards the achievement of organisational aims, along with issues regarding ownership and the relationships between investors, producers and users;
2. *Technologies and Infrastructures* attends to the material dimension required for societal (energy) demand;
3. *User Practices* relates to the application domain of the concept or technology, and the associated routines and norms (e.g., prosumption);
4. *Cultural significance* relates to (widely) shared values associated with the (new) energy system, including the system's representation and symbolic meanings;
5. *Knowledge base* involves scientific, as well as tacit practical knowledge related to technological or social and organisational issues;
6. *Sector Structure* refers to the organisational networks, collective efforts, and the specific interaction platforms for the coordination of common interests;
7. *Policies and Political Power* relates to the role of government and the socio-economic lobbies in influencing policy-making, e.g., on the support framework for REIs.

Whereas Smith and Raven [33] use this framework to highlight the regime options for constraining a given niche, for our analytical framework they are equally relevant for the identification of options for the niche to "attack" the regime. Furthermore, in combination with the business model logic, we may be better able to assess the ways in which each of these dimensions shapes the actual freedom of action for REIs in practice.

6.2.2. Methodology

Case Study Approach and Selection Criteria

We followed a case study approach [36,37] with the purpose of capturing a broad variety of REIs within the context of The Netherlands. From our analytical framework, it follows that the 12 selected organizations would be similar with respect to their value proposition, as all share a strong focus on sustainability. They also should collectively represent the largest variation possible with respect to their organizational structure, the technologies employed, user practices (prosumers or not), knowledge base, sector oriented networking efforts, and use of political power, reflected in their respective business models. To cover the variety of alternative business models which affect energy production and consumption, and the potentially different systemic impact of the initiatives, our case selection included energy cooperatives and private companies, as well as hybrid organisations from the network operators. The selection of energy cooperatives was driven by our wish to select cases with different geographical focuses (local–national) and membership sizes.

Data Collection

Next to a study of case-related documents, we conducted 15 semi-structured interviews with persons involved in the 12 organisations which we intended to study (directors, project managers and employees), over the period from September 2015–October 2016 (see Appendix A for the interview protocol). Our interviewees were assured confidentiality with respect to sensitive information. The information provided was complemented with information from secondary sources. The research project had access to the database of the National Community Energy Monitor [38,39]. Furthermore,

the researchers followed the organisations over time: during the period 2014–2017, the principal investigator took on the role of observer on multiple occasions. In this way, the project remained up-to-date regarding ongoing developments.

Data Analysis

The data were analysed using our conceptual framework. The analysis started with a "baseline" analysis and comparison of the organisations. With this step, we confirmed that our selection criteria regarding variety were met. The sample overview is presented in Section 3. The baseline analysis also enabled us to obtain information with respect to tensions and conflicts. This resulted in a selection of 3 case studies, presented in Section 4.

6.3. Renewable Energy Initiatives in the Netherlands: Sample Overview

Out of the 12 organisations, 7 are cooperatives (Table 6.1). The oldest, the wind cooperative Deltawind, was founded in 1989. The youngest, the solar cooperative DE Ramplaan in Haarlem, was founded in 2014. In terms of membership size, the Windvogel (Windbird) is the largest, with over 3000 members. However, this is the only cooperative in our sample with a national focus. Deltawind, a locally based organisation on the island of Goeree Overflakkee (with 49,000 inhabitants), has over 2000 members, and by far the largest operational production capacity. The local cooperatives operate either at city or neighbourhood levels (DE Ramplaan in Haarlem and Thermo Bello in Culemborg). Thermo Bello is a special case, in that whereas most cooperatives produce electricity through wind or solar, this cooperative runs a low temperature district heating system serving 220 households and office buildings.

Our sample includes three commercially operating companies (Table 6.2). The Windcentrale is a nationally operating commercial firm which establishes wind cooperatives through crowdfunding. BAS Netherrlands was an Energy Service Company (ESCO) assisting its clients in becoming energy neutral, but which went bankrupt in 2016 [40]. WeKa Daksystemen is a commercial roofer and a pioneering company offering solar roofs to municipalities, cooperatives, and the like.

Additionally, the sample was broadened with two intermediary organisations: spin-offs of two grid operators with a focus on energy efficiency and conservation (Table 6.3). These organisations were included because they involve (potentially) moderate niches. While Buurtkracht is still part of a network operator, the initiative Hoom recently evolved into a cooperative.

This sample is very diverse in many respects, but all organizations have one feature in common: their focus on sustainability.

	Zuiderlicht, Amsterdam	Eigen Wijkse Energie Cooperatie (EWEC), Wijk bij Duurstede (Province of Utrecht)	DE Ramplaan, Haarlem	Grunneger Power, Groningen	Deltawind, Goeree Overflakkee (Island in the Province South-Holland)	De Windvogel, The Netherlands (National Focus)	Thermo Bello, Culemborg (Gelderland Province)
Founded in	2013	2013	2014	2011	1989	1991	2008
Members	130	165	220	1200	2080	3300	200
Geographic focus	Amsterdam metropolitan area	Wijk bij Duurstede (town)	District in Haarlem (city)	Groningen (city)	Island Goeree Overflakkee	The Netherlands	District in Culemborg (village)
Projects	3 solar & 1 wind	2 solar	1 solar	6 solar co-owned & others developed	3 wind & 1 solar	4 wind & 3 solar	1 thermo & (1 solar)
Capacity	358 kWp	166 kWp	370 kWp	2.911 kWp	15.542 kW & 840 kWp	5.235 kW & 565 kWp	About 9000 GJ/year

Table 6.1. Renewable energy cooperatives.

	De Windcentrale	BAS Nederland	WeKa Daksystemen
Founded in	2012	2010–2016	1991
Business Model	Crowdfunding platform for wind cooperatives	ESCO towards energy neutrality	ESCO specialising in solar roofs & insulation
Clients	15,000	about 400	Unknown

Table 6.2. Project Developers.

	Cooperatie Hoom (Former Alliander)	Buurkracht (Enexis)
Founded in	2013 (end)	2013 (mid)
Engagement Phase A	42 districts	130 districts
Engagement Phase B	17 cooperatives	234 districts

Table 6.3. Intermediary actors on energy efficiency.

6.4. Findings

This section presents three case studies that shed light on the main conflicts and tensions that REIs encounter, and the strategies they develop to overcome or avoid them. These conflicts mainly relate to aspects around the given *Policy and Political power*, *Technology and Infrastructure*, as well as the *Sector structure*.

6.4.1. Support Schemes for REIs: The Case for Prosumption

A year after the sudden government decision in 2006 to end the grant scheme for producing renewable electricity the Netherlands, the Court of Audit made the observation that three companies had been able to acquire 51% of the support money (p. 26) [41]. This confirmed the suspicion among critics that subsidies for the Dutch energy transition mainly benefit large companies. New grant arrangements followed. The current Premium tariff SDE+ (Stimulating Renewable Energy production) covers the difference between the wholesale price of electricity from fossil sources and the price of electricity from RES. SDE+ targets companies, non-profit organisations, and public institutions [42]; energy cooperatives are also eligible to apply for it. Applicants face uncertainty, as SDE+ operates on a "first come, first served" basis, while the tariff increases with each stage of the tender procedure. As the actual premium tariff is paid after the plant begins its operation, this system also puts the investor-developer at financial risk.

The second scheme which has existed for a long time is net metering (Salderen). For private electricity prosumers, who mainly produce solar energy on their rooftops, energy related taxes only apply to their net electricity consumption over a yearly period. Although this mechanism is principally addressed to individual consumers, REIs have used it for collective project development for tenants in collaboration with housing associations. The tax exemption in this arrangement only applies if the electricity is produced in-house, or, in official language "behind the meter", i.e., not on other peoples' rooftops.

Since most people cannot produce their electricity requirements on their own rooftops, they need to look elsewhere. In 2008, Amsterdam scientist Anne Stijkel initiated the project "Farmer looking for Neighbour" (Boer zoekt Buur), to enable city households to produce "their own" renewable electricity on farmers' barns [43]. However, Dutch legislation prohibits the so-called "self-consumption" of the electricity produced. For Stijkel and the cofounder of the later Zuiderlicht cooperative, Pauline Westendorp, consuming your electricity produced elsewhere must be as legal as consuming the lettuce from your allotment garden. However, the Ministry of Finance, tax division, refused to allow this.

The wind cooperative Windvogel (Windbird) issued a lawsuit in 2013 to "*ensure that its members do not have to pay taxes on their remotely self-produced electricity*" [44]. The case was lost in court. Nevertheless, the cooperative continued lobbying for a tax reform. Its website cites 2014 figures, stressing that under the current system, citizens subsidize the depletion of fossil resources at up to 2.3 billion euros in energy tax, through their electricity bills, while 5.5 billion euros are transferred to fossil energy through subsidies (including tax breaks) and only 1.5 billion to renewables [42].

The lobby for prosumption had some success. The coalition agreement of the right-wing liberal and social-democrat government taking office in 2012 announced a lower energy tax for REIs. By 2014, following the National Energy Agreement [45], the so-called postal-code-area regulation (Postcoderoosregeling) went into force. This regulation provides energy tax relief to private consumers organized in a cooperative or homeowner association, who produce electricity up to the amount they consume yearly, on another rooftop than their own. The most salient constraint of this arrangement relates to the spatial area for which the tax relief applies: the postal code area where the installation (a solar roof) is situated, together with all adjacent postal code areas. While at this small scale, cooperative solar projects may be developed, wind projects are not. Additionally, there were major financial uncertainties. Since the national budget including tax rules is decided by Parliament on a yearly basis, there was no certainty that projects could realize a return on investment. During the national cooperative manifestation (HIER Opgewekt) in 2013, several REIs filed a petition asking for guaranteed tax relief for at least a 15-year period, the calculated average pay-back time of a collective solar PV project. However, a few days later, parliament supported an amendment from the Green party (GroenLinks), asking for a 10-year guarantee [46]. On top of this, uncertainties remained regarding the implementation of the rules by the tax division, and high grid connection costs.

Given the half-heartedness through which this major policy change was brought about, most REIs concluded that the tax relief would be unfeasible for them. Among the few who did make use of this scheme was DE Ramplaan in Haarlem. Its chair reflects: "*I was not aware that it was such a complex matter. Not everybody can do this… Not because I want to put us on a higher level [for having done it], but because of the content. It is so difficult*" (Interview 7).

Zuiderlicht developed its business model in order to bypass the tax issue. People involved in this producers' cooperative, collectively gain ownership of a number of solar panels leased to the buildings' owners, who then consume the electricity. The cooperative is outspoken concerning national and local policy schemes. As a board member points out: "*policies are constantly and consistently changing*" (Intv1b). He suggests that the existing energy tax scheme makes it more attractive for household owners to invest in energy, while big companies are not stimulated because their energy tax is too low. Moreover, he notes that through the SDE+ grant, money paid by small energy consumers is channelled to large companies, while the former are not able to participate (Intv1b).

Over recent years, the tax relief arrangement has been slightly adjusted. The tax return increased from 9 to 12.26€cts per kWh (after V.A.T.). The duration of support increased from 10 to 15 years, whereas the pay-back period for a cooperative solar project could be about 10 years, which is quite acceptable for energy prosumers. According to Schwencke [5], in 2017, cooperative solar energy is still, for the most part, produced with the support of the premium tariff (24.5 MWP via SDE+ vis-à-vis 8.7 MWP via energy tax relief). Yet, in 2017, more cooperative projects were developed with the energy tax relief method than with the premium tariff 114 vis-à-vis 29). Most wind projects tend to use the SDE+ scheme; however, in 2017 the first small wind turbine (10 kW) was financed through the tax relief scheme [5].

6.4.2. Technology Choice

Daltawind belongs to the first generation of energy cooperatives focusing on wind. Based on the island of Goerre-Overflakkee (south of Rotterdam), the cooperative thrives on having the support of the local community. Interestingly, only island inhabitants are allowed to become members and to invest in their projects. Their motto is: "*those who have to look at it may benefit from it*." Having established four wind projects (with a total capacity of 15,542 kW), Deltawind is currently developing, in collaboration with the cooperative Zeeuwind (Zeeland province), the biggest community-owned wind project in the country (100 MW). It sells part of its electricity to a big industrial consumer, Akzo Nobel. When the Province of South Holland allowed the development of an additional 225 MW of wind energy in the region, Deltawind, in collaboration with the energy company Eneco, established the "Windgroep Goeree-Overflakkee". This ensures collaboration between the local initiatives (Intv2).

No doubt, Deltawind has benefited from spatial planning policies allowing wind turbines to operate on and around the island. One of the unintended consequences of Deltawind's success is that the island is running out of suitable locations for turbines.

De Windvogel is also an older cooperative. Its business model focuses on acquiring and upgrading existing wind turbines. Notwithstanding its experience and membership, the cooperative has been unable to develop new wind projects for several years. To compensate for this, in 2007 the Windvogel invested in solar parks in Germany. After years of limbo, the cooperative is now involved in the development of a big wind park (windpark Zeewolde), in collaboration with Zuiderlicht and 199 other commercial wind developers and land owners.

Windcentrale began its operations in 2012. For its projects, it sells wind shares to citizens who then become owners of the wind turbine. They buy the energy by becoming a customer of the energy company, Greenchoice. In 2013 the initiative established a new crowdfunding record, generating 1.3 million euros for one wind turbine within 13 hours. Since then, the Windcentrale has purchased 10 existing wind turbines with a total capacity of around 15 MW. Given its business model, the need for Windcentrale to find turbines is immediate. Building new ones would be too time consuming, as Windcentrale is a company with paid employees: "*We need to sell wind shares and we need to have wind turbines. Sometimes we don't have a product. It's not that we can easily acquire something and sell it. For us it's difficult*" (Intv8). This initiative also struggles to develop wind projects. Windcentrale's director stresses that the "*lack of support from the government*" as well as "*volatile subsidy schemes*" are the causes for not reaching the national wind energy targets (Intv8).

Provincial regulations directly determine the status of community wind projects. One of the main examples of a province obstructing on-shore wind development in North-Holland is the case of Amsterdam Wind, a pro-wind coalition of cooperatives in Amsterdam and the Windvogel. In 2016, Amsterdam Wind submitted a license application for a 15MW wind project in Amsterdam with the province. This initiative was embraced by the Amsterdam municipality, which has the ambitious goal of reducing its CO_2 emissions to 40% below its 1990 levels by 2025. However, political opposition at

both the national and provincial levels led to regulations that made the project impossible (Intv1b). In the 2015 elections, the right-wing liberals, along with the extreme right, campaigned for a moratorium on wind energy. The new coalition decided to allow the minimum target of 685.5 MW onshore wind, as dictated by the National Energy Agreement, mainly in the northern part of the province. Projects would have to comply with provincial rules, which are tougher than the national ones. Turbines must be placed at a distance of 600 meters from the nearest dwelling. A wind project must comprise at least six turbines. Additionally, to install a new wind turbine, two old ones must be retired. While the Amsterdam Wind project would have been given the green light under national regulations, under the provincial rules it was not, because one wind turbine is located only 450 meters from houses, albeit within an industrial area. Our interviewee argued that these rules are justified when it comes to the aesthetic protection of rural scenery, but that they do not make sense in the context of Amsterdam port. The wind turbine fits the scenery, and noise is not a problem in this area. "*We could have had way much more wind energy*", but the provincial regulations block this.

One cooperative, together with the Amsterdam municipality, took the provincial authorities to court in order to challenge the regulations. Yet, the country's highest administrative court, The Council of State, ruled in the province's favour. Although Amsterdam Wind cannot meet all the requirements, the initiative, with the support of Amsterdam city, sought an exemption from provincial regulations. In 2017, North Holland placed a moratorium on wind on land, while at the same time granting permits for a number of wind farms in Amsterdam [47].

In the case of Utrecht province, where a moratorium also exists, REIs follow a less confrontational strategy. The director of the cooperative EWEC (Wijk bij Duurstede) attributes delays of implementing wind-generated power to a "*loud minority*". The municipality rejected any wind projects in the Wijk bij Duurstede area. EWEC was established in response to this local opposition. The idea was that "*we will never get an energy transition when people always say NO*". EWEC's goal is to involve "*as many members as possible to have backing*" (Intv6). To circumvent the opposition, EWEC focuses on solar, because "*people love solar projects*" (Intv6). Therefore, the choice of technologies was of strategic importance in the build-up of trust and support for the cooperative. They consider this crucial for taking "*bigger steps*" (with wind) (Intv6).

The choice of technologies thus relates to the strategic decision to avoid conflict. While "*everyone loves solar*", as one employee of Grunneger Power stated, wind is associated with lots of conflict (Intv5). Yet, in 2017, the cooperative started exploring the possibility of developing small-scale wind turbines that are not expected to raise objections from the local community.

6.4.3. Towards a Renewable Energy Sector?

This case study focuses on the collaboration within the REIs own communities. We address (1) the tensions around the collaboration of cooperatives with commercial parties; (2) the initiation of cooperatively owned energy utilities, and (3) the role of the national umbrella organisation, ODE-Decentraal.

Collaboration with Commercial Parties

The debate regarding collaboration with commercial parties on renewable energy projects has not yet been settled. Some community initiatives are very critical of such partnerships. As one interviewee points out "*commercial companies come here and say: we want to develop a solar park with you /…/ and what about the people who want to invest? For SDE+, they need to have a social component… that's not what we do. They think they can use us*" (Intv5).

In contrast, wind cooperatives like Deltawind or the Windvogel with professional staff have been collaborating with project developers to set up wind farms. In fact, cooperatives are represented in the North Sea Energy Lab, initiated by the Ministry of Economic Affairs to increase popular support for offshore wind development. In 2017, cooperatives founded the Association Participation Offshore Wind, to promote cooperative investment alliances with private consortia tendering for offshore wind projects.

Cooperative Renewable Energy Providers

To avoid the dependence on dominant energy utilities, REIs founded two energy companies to serve their membership: OM and Our Energy (Energie van Ons). From our sample, EWEC is affiliated with OM, and Grunneger Power was among the initiators of Our Energy, focusing on the Northern part of the country. In both cases, only cooperatives can be a member. It is worth mentioning that, for legal reasons, OM has a partnership with the energy utility Eneco, and Our Energy with PVNED. By becoming a member of a cooperative supplier, a cooperative offers its membership, as well as renewable electricity and gas for prices comparable to those of other energy companies operating in the Dutch market. In some instances, the cooperative companies also sell energy to municipalities.

When investigating the reasons why cooperatives did not join the cooperative supplier OM, instead choosing to enter into partnerships with a commercial company, some suggested that OM was new, and prone to making mistakes. For Deltawind, the reason was that OM requires local cooperatives to bring in their own customers, which excludes Deltawind, a production cooperative, from participation.

Initiatives from the North did not join OM because they wanted to do it "their way", i.e., without the involvement of any commercial party (Eneco) (Intv5b). This interviewee suggests that people in the North want to keep their project local. In 2017, the two cooperative energy providers tried to collaborate. However, due to issues concerning outreach and marketing strategy (among other factors), and probably cultural identity, this partnership was not realized.

Coordination within the Sector

ODE-Decentraal is the umbrella organisation responsible for political lobbying for renewable energy cooperatives. Remarkably, it started in 2011 with the active support of the Ministry of Economic Affairs (p. 15 & 17fn) [48], which for some time paid its staff. The organization merged with an older environmental organization, and is about to merge again, this time with the interest organization "Energetic Society" [49]. Our

findings suggest that many interactions between cooperatives and authorities are based on a one-to-one basis, rather than through the umbrella organization. One interviewee suggested that ODE-Decentraal "*cares about the interest of lots of different issues—so we don't expect much from them*" (Intv7). Examples like this suggest that the coordination between different initiatives, and subsequently, the strategic capacity of the cooperative field as a whole, is limited.

6.5. Analysis and Discussion

This paper focuses on the question: what kind of conflicts and tensions arise around renewable energy initiatives, and what strategies do they develop to overcome or avoid them? Using transition theory, we formulated three expectations a priori. In this section, we will analyse the extent to which the case study findings are able to confirm or contradict these expectations. We will thereby discuss the interaction between specific system dimensions in our analytical framework, and their impact on REIs' strategies.

6.5.1. Regime Constrains the Niche, Keeping It Small

We indeed find that the freedom of REIs is constrained by the behaviour of the regime. Government policies have an immediate impact on their business models. First of all, the main grant scheme for renewable energy, currently SDE+, has mostly benefited regime parties, although REIs have also successfully applied for grants. Yet, wind cooperatives using SDE+ cannot offer their customers prosumption of the produced electricity.

The issue of prosumption became a mainstream focus for politicians when initiatives took off all over the country local, demanding policy facilitation. Interestingly, the first national lobby organization for cooperatives was initiated by the Ministry. Right from the beginning, it was clear that the post-code-area arrangement was intended to target small projects, thus preventing competition between REIs and incumbent energy companies. Furthermore, cooperatives have to enter into partnerships with energy companies, since energy trade requires a permit. The small size of the anticipated projects, combined with the high costs for project realization, are still considered barriers for community energy initiatives. Successful efforts may be attributed to hard working, entrepreneurial volunteers with the ability to collaborate with municipalities and their grid operators, and to lobby MPs. The constraining and controlling mechanisms at play here relate to the *Policies and Political power* aspect of our analytical framework.

We also find that policies constrain REIs in their choice of technology, as the cases of Amsterdam Wind and EWEC exhibit. Although the national government does not appear willing to provide REIs with support regarding wind energy, this appears to primarily be an issue at provincial level. An explanation can be sought in the political coalitions in power. Since 2015, North-Holland has had a right-wing majority what is fiercely opposed to wind energy. However, this does not explain why Frisia, which does not have a right-wing majority, has banned on-shore wind, whereas the coalitions in Gelderland, and in North-Holland, take a more positive stance.

A better explanation could take into account recent national developments regarding offshore wind. In the Netherlands, offshore wind took off after 2012 (much later than, for instance, in the UK) [15]. Only recently, major investments near the Dutch coast were

facilitated by the national government. Although national targets for onshore wind also exist, it appears that the priorities of the government have shifted towards boosting offshore wind. Since offshore wind requires very large investments, complex engineering, and time-consuming procedures, this option is implemented by the consortia of big, incumbent companies. In contrast, decentralized wind on land is more likely to be implemented with citizen (cooperative) involvement. Thus, it becomes clear that the niche of REIs is also constrained through impediments falling into the *Technology and Infrastructure* category.

Furthermore, REIs are constrained along the system dimension *Knowledge base*. Our sample holds one cooperative that produces low-temperature heating, Thermo Bello in Culemborg. Founded in 2008, this is still the only REI exploiting a renewable energy-based heating system. At the moment, the dominant knowledge base in the transition to 'gasless' heating is still high temperature district heating (using natural gas or biomass), and this is held by actors operating within the regime. Local initiatives may prefer low temperature options, which are sustainable, but still "too innovative"; as such, such endeavours are largely ignored by major energy consultants [50].

So far, we conclude that the Dutch energy regime, to a large extent, constrains the business models of REIs and keeps them small. At the same time, the Dutch government recognizes the positive effects of REIs. We will further discuss this point below.

6.5.2. Dealing with Conflict

The case studies confirm the expectation that REIs tend to resist the regime's discipline, but also that they seek to avoid conflict. The main example of political conflict relates to prosumption. Typical for Dutch political culture, the issue was eventually addressed in the tradition of "green poldering". Consensus politics prevailed over effective regulation, as is illustrated by the amendment of the Green party requesting a 10-year guarantee of "post-code-area projects", whereas the REIs involved had argued for a minimum of 15 years. The wind issue gave rise to political conflicts at a regional level. In both cases, we see that issues were brought to court, which can be considered an attempt to settle the dispute in a manner that avoids a political confrontation. As the case studies show, a number of the initiatives under study tend to seek to avoid conflict. The third case study also indicates that REIs find it difficult to cooperate amongst themselves.

As a possible explanation for conflict avoiding behaviour, we suggested that REIs do not necessarily wish to contribute to system change. Research into motivations that underlie community initiatives in Dutch local food production indicate that such initiatives do not have the ambition to replace the incumbent regime [51]. However, from the REIs under investigation, only one mentioned that its task was limited to managing one particular project, and that it had no ambitions to expand; all others expressed the ambition to grow bigger.

As an alternative explanation for conflict avoidance, the Dutch polder model of decision-making relates to the system dimension *Cultural significance*. We will further discuss this below.

6.5.3. Strategic Focus

A strategy is broadly defined as an action plan designed to achieve a specific goal [52]. Thus, it involves two main components: (1) a long-term vision or target, and (2) a contingent plan or pathway to get there, supported by a specific partnership or coalition. In other words, strategy is what links the business model to the broader system dimensions that may work against, or in favour, of the niche. A strategy allows REIs to make deliberate decisions on collaboration with others, thus entering into political conflict, or avoiding it.

Although we find that the REIs under study show ambition, good will, and willingness to make a lot of effort, we tend to confirm the expectation that they fall short on strategy. As regards vision, the conflict on the post-code-area arrangement (energy tax relief) is, again, illuminating. So far, we have pointed out the deficiencies that killed off many initiatives. However, it must also be stressed that this regulation opens a window of strategic opportunity for the niche. A unique feature (at least in the Dutch context) of this arrangement is that it allows citizens to choose how to spend their (tax) money: either give it to the state or invest in their own renewable system. The cooperative movement claims that cooperatives invest in the local economy, thus keeping consumers' money in the community [7]. This is what cooperatives that take advantage of the tax exemption regulation could bring about. So far, the movement has lobbied for improving the regulation; however, our findings indicate that it has not yet achieved this goal. The same is true for another potential benefit of this regulation: it shields the niche from the commercial energy sector. The regulation states that the cooperative must enact legal and economic ownership of the energy producing facilities. Cooperatives could use this condition to their advantage when working with commercial parties. So far, however, the daily troubles with its implementation have overshadowed the possibility of envisioning policy which would advance the REI's expansion.

When it comes to the "how to get there and with whom" part of strategy, we also find ambivalence in the niche. An example is the inability to establish a united cooperative energy company. We find ambivalence amongst cooperatives regarding the development of projects with commercial parties, including other niche parties. That some wind cooperatives take a more confident stance towards commercial developers is explained by the fact that they are more experienced, and work with professional staff.

In conclusion, we observe a lack of strategic focus; however, this is not attributable to a lack of ambition amongst the REIs. Constraints for intra-niche interactions would immediately affect the system dimension *Sector structure*, where a new regime could develop.

6.5.4. In Search for Explanations

In this part of this article, we discuss two explanations for our findings. These relate to the ambivalence of the Dutch REIs vis-a-vis the regime, and the ambivalence in regime behaviour vis-a-vis the niche. This section then briefly discusses the REIs' transformative potential.

An explanation for the relative weakness of the niche relates to the huge power differences that feature the Dutch energy (sub)system. This is exemplified by the NAM,

the company exploiting the Dutch natural gas stock, which is owned by Shell and Exxon, and which shares its profits with the Dutch state. We are not aware of any other example of such a concentration of economic power (i.e., one which affects electricity production, heat and transport fuels) across the entire energy sector in a single country. This power structure coincides with a type of energy policy creation that has been typified by the term "Rule" (pp. 163–173) [53]. This type of policy making is featured by (imposed) consensus, monolithic power, and little willingness to incorporate public participation. In contrast, to the more pluralist model featured by advocacy coalitions [54], Rule lacks an organized opposition. This would explain the inability of the renewable energy sector in embryo to build strong organizations, as well as some REIs lobbying for themselves.

Since the introduction of Transition Platforms in the early 2000s, the polder model of policy development partly took over, which became salient through the National Energy Agreement in 2013. The decision-making in this type of policy is characterised by compromises between (regime) parties representing contrasting values, but who are interdependent, i.e., they cannot overrule each other. In terms of public participation, this type of policy is not very different from Rule. What is critical for explaining the position of the niche is that institutionalized power relationships are generally known, or better, have been internalized, even by critics in the REIs. This would explain the propensity for conflict avoidance; to use the English expression: if you can't beat them, join them. This may also resonate with the Gramscian concept of *war of position*, which suggests a conscious decision to avoid confrontation, instead coordinating actions to gain resources, build organisational capacity and alliances, and eventually to increase influence in civil society [55].

This observation goes beyond the actual use of power; the exercise of power to constrain is anticipated in the attitudes and behaviour of the REIs themselves. Hence, this is relevant to the dimension *Cultural significance*, as it relates to how dominant institutions frame actors' behaviours by either implicitly or explicitly giving direction. We can now understand the ambivalence in the behaviour of REIs, and their lack of strategic focus. On the one hand, within the niche, they feel free to make their own judgments and demands; on the other, once they enter the policy arena, they anticipate the informal rules of the game, thereby possibly overlooking opportunities to strengthen their position.

We also observe ambivalence on the side of the regime, which has obviously come under huge pressure. By 2012, it could no longer ignore REIs, as it became obvious that they represented a genuine citizen-based movement, rather than merely the "usual suspects", i.e., the (institutionalized) environmental NGOs and critical scientists. Assuming that ignoring all demands for prosumption would provoke a confrontation with an unpredictable outcome, the regime made a strategic move: rather than treating the REIs as the opposition, they suddenly framed them as a movement in support of government environmental policy deserving some encouragement, in the form of the post-code-area arrangement. This new frame became possible when social-democratic party PvdA-affiliated enlightened regime actors joined the new government coalition.

The argument underlying this new strategy was eloquently presented in the essay *The Energetic Society* [56] by Maarten Hajer, who was by then director of the Dutch Environmental Assessment Agency (PBL). Hajer argues for a new philosophy for

sustainability governance, building a coalition between government and the energetic society, or "*a society of articulate citizens, with an unprecedented reaction speed, learning ability and creativity.*" (p. 9) [56]. This relationship will be based on the notion that *"(t)he government does not have a monopoly on wisdom, but it is capable of focusing society's learning capacity on what it sees as the important public issues*" (p. 63) [56]. The REIs movement has possibly also embraced this publication, as is shown in the name of their new lobby organization in the making [46]. Wouldn't they benefit from a new social contract promising that the government will take them seriously for a change? Indeed, Hajer takes the energetic society very seriously, as he realizes that critical citizens can work with the government, but also against it. The main challenge is therefore: "*How can governments exploit the potential of this* energetic society *on the road to sustainability?*" (p. 10) [56]. We note that it is the government that is exploiting the energetic society, not the other way around. Although Hajer supports bottom-up processes, the division of tasks between the government and society is, on closer inspection, not that new. The government sets the goals and targets, and society will realise them. Hajer justifies this traditional division of tasks by claiming that *"(t)he government wants to take action based on a global sense of urgency, whereas citizens lack sufficient insight into the problem, the objective and the solution strategy*" (p. 25) [56].

The ambivalence in both regime and niche is reflected in *The Energetic Society.* Controlling the niche and keeping it small is justified by denying citizens' ability to make a difference in the energy transition. The relevance of the REIs is a signal to speed up the process of energy transition, and not merely their ambition to become part of a new energy regime with a (more or less) radically different content.

What do our findings imply for the transformative potential of Dutch REIs? The regime has been able to constrain them in many ways, affecting their business models and their choice of technology by using political power, institutional culture, as well as the dominant knowledge system. One feature of REIs has not been addressed by the regime: their organisational logic. The cooperative structure in particular appears not to be susceptible to regime constraints. This may be due to the fact that a cooperative is a social enterprise of entrepreneurial citizens working for sustainability; this notion cannot be easily undermined. Furthermore, the support base for prosumption in the Netherlands is still growing. A significant part of the population wants to break with the culture of passive consumerism. Hence, the transformative potential of Dutch REIs may unfold along the system dimension where divergence from the regime is most obvious: *Organizational logic* and *User practices*.

6.6. Conclusions

Can REIs make a difference in the direction and speed of the energy transition? The Netherlands, which may be characterised by an energy regime, i.e., where power is concentrated in very few hands, ranks significantly low in terms of the production of renewable energy in the EU, and the contribution of REIs therein is still marginal. Within this context, this paper addresses the question: *what kind of conflicts and tensions arise around renewable energy initiatives, and what strategies do such initiatives develop to overcome or avoid them*?

Our research finds ambivalence both at the regime and niche levels. As expected, the regime constrains the (business) opportunities for REIs. We find both conflict and conflict avoiding behaviour. Although the REIs have ambition, we do not find a clear strategy, nor a clearly-defined position vis-a-vis the regime, nor a clear view on how to overcome institutional barriers. They also have not (yet) been able to build unity via the establishment of a strong network, and by lobbying. The ambivalence on the side of the niche can be explained by the huge power gap with the regime. In fact, REIs may anticipate the use of the regime of its inherent power, and avoid immediate confrontation with it, not realising that the regime is also under extreme pressure, and that its institutions are already weakening. Instead, REIs appear to engage in a "war of position", that may allow them to build the required capacities for future confrontation. As for the regime, we find that it uses the niche to legitimise climate policy, while keeping it small at the same time. Although the niche is supported, even among enlightened regime actors there is consensus that, eventually, solutions in the energy transition will be offered by the incumbent system. The potential strength of the Dutch energy niche is the high public interest in the prosumer movement. The cooperative ownership structure of many REIs is uncontested; this bridges the gap between the shareholder, the consumer, and the producer, in a new type of energy utility. We consider this social innovation to be potentially transformative.

Furthermore, our results point towards the inevitability of conflict in the process of energy transition. In fact, the emergence of conflict may open a window of opportunity for accelerating or steering energy transition in a certain direction. Additionally, as previous research on the more advanced German energy transition concludes, on a turning point, the critical factors are primarily of institutional nature, and will thus be determined in the political arena [57]. Consequently, conflict may indeed function as the *cause* of the diffusion and application of innovation(s) [16], and its emergence may also serve as an indicator for the state of energy transition.

A final observation relates to the conceptual framework of our study, which distances itself from dichotomous thinking about radical niches whose transformative potential is counter-balanced by their radicality, and by non-radical niches that do not have transformative ambitions. Instead, our framework considers niche-regime dynamics on different dimensions, yielding conclusions with respect to the articulation of more and less radical elements featuring niches. In our view, this framework may also help niche actors in developing a long-term strategy. Our contribution may thereby increase the initiatives' reflexivity, prerequisite for learning, and may facilitate the emergence of a more transformational agenda for the energy sector, the materialisation of which also depends on strategic capacity at the niche level. Future research could explore new types of interventions that could help build this capacity, thereby increasing the prospects of regime transformation. Lastly, while the empirical focus of our research has been the Dutch energy system, we expect that a number of the issues we have discussed here will be also applicable to other political economies. Further research will offer new insights about the validity and practical usefulness of this conceptual framework, as well as how it can be used in different contexts. In fact, the application of our conceptual framework beyond the Dutch context may enable comparative analyses to be undertaken, thereby highlighting patterns across cases.

6.7. Appendix A

The interview protocol is presented below:

Motivation—Vision

1. How did the INITIATIVE begin? What is the background of its emergence? Who was the initiator?
2. What is your personal background? Did you have any specific relevant knowledge before getting involved in the INITIATIVE?

Product/service

3. What is the exact product/service that you offer?
4. Which technologies do you use? Why?
5. Have you noticed any change in member's behaviour (i.e., energy saving)? Do you have any data for this?

Value proposition

6. What is the value that you offer to your members (through your product/service i.e., problem solving/goal support)?
7. What is the value that you offer to your customers and the broader society?

Value architecture

(Internal organization)

8. How many members do you have?
9. How is ownership arranged?
10. What are your key activities (and key resources)? What role do you take in the energy system (value chain)?
11. How is the INITIATIVE organised internally? Do you have specific roles and tasks? How do you make decisions? Are there scheduled meetings with the members?

(Stakeholders)

12. Who are your key stakeholders? (How many customers do you have?)
13. Who are your key partners? (Suppliers? Retailers?) Why?
14. What kind of interaction/relationship do you have with them? (What are the specific channels through which you reach your members, customers and society?)

Value capture

15. What are the most important costs in your operation?
16. How do you make revenues?
17. Have you received any subsidy or grant?
18. Do you make any profit? How do you manage it?

Institutional work

19. Are you engaged in any initiative aiming to support the overall sector? Are you active in ODE Decentraal, etc.?
20. In what respect do you differ from the regime? What have you struggled with; has any conflict emerged? What kind of barriers/challenges have you faced?
21. What kind of actions did you take to circumvent them?
22. Where are you vulnerable? What are the weak points of your business model?

6.8. References

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7. Leading from the Niche: Insights from a Strategic Dialogue of Renewable Energy Cooperatives in the Netherlands

Abstract: Renewable energy cooperatives envision and manifest an alternative way of organising within the energy system (and beyond). Yet, despite their growth, it is uncertain whether such initiatives are able to increase and deepen their impact, leading the transition to an environmentally sustainable and socially just energy system. This paper presents insights from a strategic dialogue co-organised with the Dutch national interest group of renewable energy cooperatives "ODE Decentraal". We used transition management as action research methodology to organise the dialogue to understand and support the transformative potential of the cooperative energy movement. The dialogue helped to clarify the challenges and possibilities for scaling energy cooperatives beyond the niche, supporting at the same time the participants to reflect, strategize and develop a shared transition agenda. This contribution presents and analyses our intervention and its impact, also specifically evaluating the potential of transition management to facilitate social learning processes, reflexivity and the development of strategic actions. Our intervention confirmed the hypothesis that actors in the niche often focus too much on the competition with the regime for individual goals, thereby failing to collectively strategize and engage with incumbent regimes in a systematic way.

Keywords: energy transition; renewable energy cooperatives; stakeholder dialogue; backcasting; transition management

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Proka, A., Loorbach, D., & Hisschemöller, M. (2018). Leading from the Niche: Insights from a strategic dialogue of renewable energy cooperatives in the Netherlands. *Sustainability*, 10(11), 4106.

7.1. Introduction

The growth of renewable energy cooperatives (RECs) in the Netherlands is driven by dissatisfaction with the state of the energy market, along with financial drives and the wish to contribute to sustainability [1–3]. While only about 20 RECs were active in the country in 2010, in 2017 the field counted about 392 of them, 20% more than the year before, and the number keeps rising [4,5]. RECs envision and manifest an alternative way of organising within the energy system (and beyond), which contrasts with the energy system of our times which is predominantly centralised, market-driven, large scale, and heavily based on fossil fuels. Characterised by a "Do-it-Yourself" culture, RECs self-organise for the establishment of renewable energy projects in their local environment, thereby exploring new ways to organise energy production and consumption on a local

scale. In this way, RECs present a niche in the broader context of the ongoing energy transition.

A number of scholars from multiple perspectives have reflected on the nature and role of community energy and the significance of local RECs in the transition towards a sustainable energy system and low-carbon societies (e.g., References [1–3,6–16]. In the economic sphere, RECs may offer economic benefits to their members, while also strengthening the local economies by increasing employment and creating additional business opportunities. In the social sphere, RECs may enhance social cohesion, supporting the achievement of common goals through democratic decision-making and resource pooling. In fact, by making the *right* to renewable energy attainable, RECs activate energy citizenship and realise energy democracy. Lastly, in the environmental sphere, RECs reinforce the energy transition by increasing public acceptance of renewable energy projects and by nurturing a culture of energy conservation through awareness raising and the provision of tools for people to carry out their *duty* of responsible energy consumption.

Nonetheless, RECs have also received critique regarding their contribution to the energy transition and system change at large. First of all, on certain occasions, RECs have served to reinforce opposition to proposed facilities [15] and despite their potential to enhance social cohesion, RECs may actually also generate social friction and widen pre-existing social divides within communities [15]. In fact, RECs have been accused of only taking care of their members' interests (at the cost of society), and that, over time, they accommodate to the practices of the capitalist market in order to survive.

The *transformative potential* of RECs, the potential of having a fundamental impact upon the established regime, remains unclear. Previous research has shown that such initiatives lack a shared direction and coordination, as well as the capacity to interact in a strategic way with the dominant regime [e.g. 9,10,13,14,16]. Specifically, in the case of the Netherlands, Proka et al. [16] found that renewable energy initiatives, including but not limited to RECs, exhibit the ambition but lack a clear strategy on how to increase their impact upon the regime. In the context of a dominant regime where the power is concentrated in a few hands, the scholars register a lack of unity among the different initiatives, as well as a lack of a clear position vis-à-vis the regime [16]. In practice, this lack of coordination between them, results in higher variety of specific initiatives, but may also be seen as fragmentation in the renewable energy sector, which may undermine its prospects to grow.

Such problems in achieving diffusion beyond the niche level comprise one of the central topics of the field of sustainability transitions research. While favourable conditions at the landscape and regime-level are considered necessary, an actual transition implies that new technologies, practices and structures become mainstream. By definition, in a context that increasingly opens up to adopt mainstream alternatives, this implies that tensions will emerge at the niche-level, where change agents develop and protect these alternatives by investing (often all of their) time and energy to nurture and develop them.

Within a context of increasing systemic transformation in the energy system, a rapid decrease of prices of renewables and their subsequent diffusion, and rapidly increasing

policy commitments, investments and engagement of incumbent business, the question that arises is *whether the cooperative energy movement could develop its strategic capacity to diffuse its vision beyond the niche to proactively influence the direction and pace of the energy transition in the Netherlands.* Such an ability to mobilise people towards a common vision through the encouragement of aligning their own interests with that of a collective has been referred to as *leadership* [17] (see also References [18,19] on transformational leadership). The previous question can thus be rephrased as follows: *can the cooperative energy movement take leadership in the energy transition in the Netherlands*? This question becomes pertinent as there are realistic possibilities that regime actors seek to control the energy transition, its pace and direction by suppressing the values and principles presented by the cooperative movement (democratic, transparent, just, sustainable). On the other hand, it is also possible that the actors from the cooperative energy movement lack the strategic capacity to move beyond their day-to-day competition with the regime for individual goals, in order to engage in a more impactful way with it.

With the aim to understand, and potentially support, the transformative potential of RECs, we have organised, together with the national interest group of renewable energy cooperatives "ODE Decentraal", a dialogue for the deployment of a medium-term strategy (2018–2025) with an extension to 2030. Specifically, in developing the strategic dialogue, we sought to explore this twofold challenge: How to better understand the possibilities and challenges that actors within the niche face in their interaction with the regime, and how to facilitate the development of a strategic joint agenda for the Dutch cooperative movement. The dialogue followed a transition management approach, which is a practical governance framework that helps analyse and stimulate systemic change by facilitating scientific reflection and insight in transition dynamics, actor perceptions and strategies [20,21]. In so doing, transition management simultaneously helps the actors themselves to reflect about their own role and develop visions, strategies and interventions in their contexts [20,21].

From a transition research perspective, the process helped to deepen our understanding of the dilemmas that actors face in scaling beyond the niche and the possibilities of using transition concepts and tools to empower them. Such concepts include questions relating to the willingness and ability of niche actors to cooperate, and the possibilities to align individual goals and values or the space for collective strategizing. Our intervention specifically explored the following sub-questions:

1. What is the contribution of the cooperative movement to the energy transition at large?
2. What barriers and opportunities emerge in the attempt of moving beyond their niche?
3. What governance interventions—and by whom—can help to facilitate this?

The purpose of this paper is to present and analyse the outcomes of the strategic dialogue, also reflecting upon the ability of transition management to build reflexive and strategic capacity through social learning Here, with *social learning* we refer to a process in which people exchange and discuss knowledge and ideas about what they perceive as reality, and as a result, they get new insights, develop shared mental models, form new

relationships, and develop the capacity for collective action [22]. In fact, the time interval since the organised strategic dialogue, enables us to assess the impact of our intervention on the processes of the RECs also considering their spin-off activities.

In what follows, first comes a short history of the cooperative movement within its institutional framework in the Netherlands (Section 2), followed by a presentation of our research approach and methodology including its theoretical foundations (Section 3). We proceed with the direct outcomes of the dialogue: (a) the identity of the cooperative energy movement and its shared (quantitative) vision regarding its contribution to wider energy transition; (b) the identified barriers and opportunities for pursuing this vision; and (c) the concrete strategic vision of the movement for 2025–2030, along with the implications for governance interventions (Section 4). Section 5 reflects upon the dialogue from an action research perspective to abstract insights into (a) barriers and mechanisms to scaling transformative alternatives beyond the niche; (b) the indirect (social learning) effects of transition management processes by considering the activities undertaken by the initiatives pursuing the drafted action plan. Section 6 draws conclusions and presents possible future research avenues.

7.2. Background: The Cooperative Energy Movement and Its Institutional Context in The Netherlands

The Dutch energy regime is deeply connected to the fossil fuel industry. Since the discovery of large natural gas reserves in Slochteren in 1959, gas revenues have, directly and indirectly, been an important factor in the national budget [23]. Although the level of importance is changing, up to the present, the Dutch treasury has significantly depended on revenues from tax on energy products like natural gas, electricity and motor fuels, whose consumption are principal drivers of climate change, and the balance between raising a “green revenue” and achieving a “green result” is quite delicate [24]. This balancing act is also reflected in the country’s policymaking. The main support schemes for renewable energy production in the Netherlands involve net-metering, a premium-tariff and a more recent tax-relief arrangement. As Proka et al. [16] point out, the Dutch regime supports sustainable energy innovations in so far as they are instrumental for meeting its climate goals, but it also safeguards that its dominance is not jeopardised. Indicative of this is that while the government establishes support schemes for renewable energy, its natural gas production continues.

Since the discovery of the natural gas field, energy has been seen as an economic commodity to be exploited by the state [25]. While foreign energy intensive companies were attracted to the Netherlands because of the low energy prices, the national government sought little involvement in how energy production develops [25]. Electricity and gas provision were taken care of by regional companies owned by municipalities and/or provinces, while the gas sector enjoyed the provision of the national gas grid by the state [25]. At that time, while gas allowed for the substitution of coal, the government expected that nuclear power would be the future [25].

After the oil crisis in the 1970s, Dutch society was faced with its strong dependence on the foreign import of fossil fuels. The dominant discourse of economic growth and technological opportunities was challenged by voices of anarchism, feminism, and radical

environmentalism [25]. In the context of emerging concerns about the environment, the public discourse initially focused on the undesirability of nuclear energy (vis-à-vis nuclear waste, safety and radiation concerns), slowly shifting towards green alternatives and energy saving [25]. Within such a context, a number of bottom-up initiatives begun to emerge. Among them, the first RECs appeared in the late 1980s; the focus was on wind energy. The 1989 Electricity Act gave grid access to the RECs, also guaranteeing a standard price, and the early 1990s noted a moderate increase in the number of local initiatives. This increase was attributed to a mix of environmental concerns and the wish for local independence and income for the local community [1]. The liberalisation of the energy market in the Netherlands that followed (late 1990s and early 2000s) brought additional opportunities for the RECs, as energy suppliers could profile themselves as "green". The emerging initiatives were different from the previous wind cooperatives, as the new wave was dedicated to collectively saving, producing, and also supplying green energy [1,25]. Their motto appears to be "*energie van, voor en door ons zelf*", i.e., energy from, for and by ourselves. As major energy companies got fully privatised, the new cooperative movement embodied "*a reaction to scaling up, privatization and liberalization of the energy sector*" (p. 57) [25].

The recent developments concerning the country's gas reserves creates a window of opportunity for (another) change in the Dutch energy system. As the supplies coming from North Sea fields have declined (in 2017 the Netherlands became a net importer of natural gas) and protests against natural gas extraction have risen, the government proclaims a change of strategy [26]. Specifically, in March 2018, after more than 900 homes were damaged in early January when the province of Groningen was hit by a 3.4-magnitude earthquake, the Dutch government announced it would cut production at the Groningen gas field to 12 billion cubic meters per year by 2022, and to zero by 2030 [26]. This opens space for alternative (sustainable) energy niches to gain importance and compete for establishing their propositions on how energy production, distribution, and consumption should be organised. The cooperative energy movement embodies one of these alternative energy niches. The next section presents the research approach and methodology employed for exploring whether the cooperative energy niche can take leadership in the Dutch energy transition.

7.3. Research Approach and Methodology

7.3.1. Sustainability Transitions and Transition Management

Sustainability transitions research focuses on the processes of systemic change, like the energy transition, and how they unfold [27,28]. Transitions have been described as "*evolutionary revolutions*" that emerge over decades [29]. According to the theory, transitions come about as the result of processes at multiple levels: external changes and trends at the *landscape level*, encompassing exogenous factors like demographic, political and economic change, puts pressure on incumbent *regimes*, the dominant functioning of the system, thereby causing internal tensions, which enable the increasingly competitive alternative configurations, emerging in *niches,* to gain momentum and break through [30,31]. Innovations emerging in niches, can gain momentum by growing legitimacy and access to resources by articulating precise visions, crucial for acquiring the support of networks of (powerful) allies [32].

While transition theory does not exclude the possibility of a niche outcompeting the regime through direct confrontation and rupture, a transition typically takes off when, under the pressure of regime destabilization, proactive regime actors start to collaborate with actors from the niche (cf. [33]). This requires both sides to be able to work beyond existing networks and routines, but also to contribute to change beyond one's own community or direct environment. Therein, an orchestrating shared orientation and discourse is crucial for the coordination of all agents interested in institutional change, i.e., change of the dominant institutions [34]. The latter are understood here as "*the formal and informal (explicit or implicit) rules of the game that shape the behaviour of actors in society*" (p. 14) [35].

Transition management is a governance approach and a form of action research that uses analytical transition concepts to identify persistent problems, niche-regime dynamics and potential seeds and dynamics of transition. It provides a framework to develop transition-based governance strategies, through instruments such as transition arenas, transition scenarios, transition experiments, and transition monitoring [27]. By providing the principles for a participatory process with actors selected based on their involvement in a system and their interest to contribute to transitions, transition management stimulates reflexivity, social learning and strategic agency for transformative change [20,21].

During the process, transition researchers synthesize discussions, select core insights and ideas and facilitate the dialogue towards a shared strategic agenda. The undertaken activities involve: (a) an opening process of problem structuring and *backcasting* (see Box 7.1) for the development of a vision that generates a sense of urgency; (b) the development of coalitions, images and transition agendas that suggest a course of action; (c) the mobilisation of people to achieve this vision through the implementation of projects and experiments; and (d) a process of evaluation and monitoring [20,34,36].

Box 7.1. Participatory Backcasting

Backcasting is a participatory approach proposed for addressing issues of long-term system change. In contrast to forecasting approaches, where pathways to a future state are developed incrementally starting from the present, backcasting first identifies a future end-point radically different from the present, and, then works back to the present [37,38]. Encouraging reflection and 'out-of-the-box' thinking, backcasting is useful in investigating complex problems and addressing far-reaching changes [39,40]. Backcasting helps to visualise long-term transformations, and identify the involved pathways of high uncertainty [41]. Crucial for strategizing, this method allows for exploring the implications of alternative pathways and the values that underlie them, as well as the feasibility of the alternative developed visions, along with the required interventions for reaching them [39,42,43].

The sequence of steps leads to a shared transition agenda (direct output), and as the actors internalize and adopt this agenda as their own, the process facilitates social learning (indirect output). Such processes also help to test assumptions and uncover more details and insights vis-à-vis the initial transition analysis, as the sessions ease surfacing tacit knowledge from participants.

7.3.2. Process Design and Analysis: Operationalising the Transition Management Principles

The *transition team* started its process in September 2016 (see also Table 7.1). For designing the *transition arena*, the *transition team* had thorough strategic discussions on the problem, the context, whom to involve, and what the learning goals should be. The specific goals of this transition arena have been the creation of: (1) a shared understanding of the dynamics within the renewable energy niche and how they relate to the broader energy system; (2) a shared sense of direction and empowerment (understood here as the intrinsic motivation and the belief that one can direct specific actions towards desired ends [44]) and (3) the development of collective reflexive and strategic capacities in general. In that, the process aimed to facilitate the collective reflection on internal drivers, motivations and commonalities across different individual RECs and to support the generation of strategic ideas for future development and engagement with the energy regime. When exploring the ongoing dynamics and possibilities for supporting the transformative potential of the initiatives, the focus has been not only on technological, but also on broader institutional aspects, as identified by Proka et al. [16,45].

The broader underlying assumption for our intervention has been that a transition management process could facilitate social learning, reflection and the development of collective agendas by synergizing individual goals. It has been expected that a shared understanding of the origin, nature and dynamics of transitions in certain societal domains will empower actors to prepare and better adapt to such dynamics in order to influence their speed and direction [46]. Additionally, the transition team formulated a number of hypotheses to be explored at the arena. First of all, it was hypothesised that the actors operating within the niche are too occupied with their own activities to be able to develop the strategic capacities needed to transform the regime. We assumed that by highlighting synergies between different niches, a strategic vision could enable them to engage with the regime more effectively. In fact, in line with Raven [47], we expect that a vision can help RECs attract new actors and more resources. Nevertheless, difficulty to bridge different niches has also been anticipated.

Phase	Process steps	(Main) actor setting
1. Setting the scene	Formation of the transition team Setting up the process plan	Transition team
2. Exploring system dynamics	System and actor analysis	
3. Framing the transition challenge	Problem definition	Transition arena
4. Envisioning a sustainable system	Designing a transition vision	
5. Reconnecting long- and short-term	Developing transition pathways and a transition agenda	
6. Engaging and anchoring	Disseminating transition agenda and engaging new actors and networks	Transition network
7. Getting into action	Implementation of radical short-term actions (transition experiments) in line with the transition agenda	

Table 7.1. Overview of the transition management phases (Adapted from [36]).

Following an official invitation, persons who expressed interest to participate were interviewed about the idea of organising a strategic dialogue to assist the bottom-up energy movement. In this interview, they were also asked to suggest other potential participants. Through this snowball technique, in total 22 people were identified and invited. After the interviews and within group communication, 15 out of those 22 people committed to participation. This group consisted of representatives of RECs, cooperatively developed energy suppliers, as well as the national knowledge platform of ODE-Decentraal. In one case, the transition team had to retract an invitation, as several other invitees declared they would not be able to speak out freely and take part with an open mind in case of the participation of a representative of a commercial wind and solar project development company.

The team drafted "rules of the game", encompassing the roles and responsibilities of all parties involved. In terms of confidentiality, the process followed the Chatham House Rule: participants are free to use the information obtained in the dialogue, but they may not disclose the specific source of the information, the affiliation of the source or that of other dialogue participants. Moreover, the rules made clear that full consensus was not sought; instead, diverging arguments were welcomed. During the process, the transition team shared and shifted between the roles of process facilitator, knowledge broker, reflective and self-reflective scientist, and change agent [48].

The dialogue took place between December 2016 and mid-March 2017. Despite the fact that the original planning of the dialogue spread longer, the national elections (on 15 March) played a catalytic role for accelerating the process. Participants wanted to be

ready to use the dialogue outcomes in the negotiation process for a new government. The first meeting focused on the development of an ambitious qualitative and quantitative vision. The second meeting explored the opportunities and barriers for realising the cooperative vision through solar, wind (onshore and offshore) and sustainable heating projects. After the second meeting, dialogue participants organised an additional meeting aimed at the "translation" of the identified opportunities and barriers into policy proposals for the to-be formed new government. During the final meeting, in March, the discussion focused on elements of a strategic vision and the further development of a number of governance and policy interventions for strengthening the feasibility of attaining it. The dialogue was therefore concluded at the fifth phase of transition management, as presented in Table 1.

To facilitate the data analysis, the meetings were transcribed, and based on the transcriptions; reports were prepared and circulated among the participants for verification and additional input. Next, the findings were discussed between the authors, and analysed. At the end of the dialogue, a report was compiled for advice on the cooperative energy movement. Last but not least, an evaluation questionnaire was distributed among the participants. The evaluation involved questions about what worked well and what could work better in the dialogue, as well as questions regarding the dialogue's impact on (i) the participants' daily practices, (ii) networks and (iii) principles and values.

7.4. Outcomes of the Strategic Dialogue

7.4.1. Towards a Strategic Vision

Identity of the Cooperative Energy Movement and Its Potential Contribution

The focus of the first meeting was on reflecting about the internal dynamics within the cooperative energy sector and specifically on illuminating the vision of the initiatives about their collective future. The discussion focused on three elements, the very identity of the movement, expectations with respect to their potential contribution to and share of total Dutch energy production and consumption, and the increased social support as shown by membership figures.

Participants described their movement with the concept of energy democracy. Energy democracy was understood as a political, economic, social, and cultural concept that links the technical characteristics of the energy transition to citizen participation and democratic control. The RECs claim that by facilitating the transition to a sustainable system, they bridge the gap between investment, production and consumption of energy, while giving back to the end-users the ownership and control over the energy being a public good. End-users (e.g., citizens or companies) become (co-)owners of their energy supply. Cooperative energy projects need to be sustainable, decentralised, and transparent.

For the dialogue participants, the energy transition is about more than *just* energy: it is about a more equal distribution of resources and power. The cooperative approach integrates environmental and social concerns by tackling urgent energy issues, while pursuing systemic change. Therefore, the energy transition may help the creation of a new type of economy where the financial resources for energy stay in the community and

get re-invested according to the local needs. In this way, the renewable energy capacity installed in their environment strengthens the local communities and, in fact, the energy transition may become a vehicle for wider system change.

For this to happen, three levels for the involvement of people in a cooperative were distinguished. One level is the *transactional*, when one becomes a customer of a cooperative. Another level is the *relational*, when one gets a share or provides a loan to a cooperative for the development of a project. The third level is the *goal-oriented*, when people actually share a vision and the aspiration to meet a specific goal. It has been argued that all levels are crucial for a "*deeper and longer-term connection with members*." Although this point has been debated, in general the cooperative energy movement in the Netherlands is oriented towards combining ownership of RES with prosumption, yet this is not always possible.

This ambition for institutional change was considered the basic difference between RECs and renewable companies on a commercial basis. For the RECs, money is important for having the systemic impact they aspire. As one of the participants put it: "*the cooperatives need money to make the transition, while they (i.e., commercial initiatives) need the transition to make money*". It was argued that when the RECs pursue profit, it is "*profit-for-purpose*".

A key element of this purpose is their contribution to the energy transition through the development of renewable energy projects. By 2017, almost 1 Peta-Joule (PJ), equal to about 278,000,000 kWh, was cooperatively generated in the Netherlands, almost entirely through wind [46]. This is a negligible 0.05% of the net Dutch energy demand. Dialogue participants pointed out that the energy transition had just started and that RECs still have a "petty" image and make "baby steps". However, the initiatives have the ambition to professionalise, which will make the acceleration exponential. Participants shared their initial expectations regarding the cooperative potential in terms of renewable electricity, heating and energy savings. It turned out that these expectations considerably diverged, many being overly optimistic. The exercise led to a choice of parameters for a quantitative end vision, i.e., (1) total production of cooperative energy, (2) energy savings, (3) cooperative share in total national production and consumption, (4) cooperative share in total production of renewables, (5) cooperative share in total solar and wind, and (6) cooperative share of total energy demand by households.

Since the energy transition beyond kWhs involves people, participants in the dialogue also expressed their expectations about future membership of RECs. The majority of people are not interested in the issue of energy; as pointed by one of the participants, a great number of people "*have never changed their energy provider*". Thus, mobilising people either as members, co-workers or simply customers is considered difficult.

The views presented by the dialogue participants in terms of the cooperative renewable energy production and/or membership, varied widely. From this wide range, the transition team chose two points in time (2025 & 2030) for drafting an overarching vision for the field. This quantitative vision was consolidated at a later stage.

Quantifying the Vision

The vision was quantified through iterations between the dialogue participants and the researchers. Based on the discussions so far, the transition team drafted an ambitious quantitative vision regarding the contribution of the RECs to the Dutch energy transition. A first draft, with an ambition for 2030, was met with the response that it contained "*too many numbers*". Therefore, a second, medium-term vision was developed for 2025, which zoomed in on a few parameters, especially the one linking cooperative share of total energy demand by households. This would enable the dialogue to link numbers on energy to the issue of membership size, i.e., to link the sustainable energy targets to the broader social, economic and political targets of the cooperative energy movement.

The central question for framing the 2025 vision was: "*When will the cooperative movement in the process of upscaling have reached the point of becoming part of a renewable energy regime*"? This question was translated into two quantitative questions: (1) Which membership size would be needed to realise a breakthrough for the cooperative movement? (2) How much energy needs to be produced or saved to at least substantially meet the membership's energy demand? The political power and influence of the movement will definitively increase as the membership size grows.

By now, the joint RECs have about 50,000 members [49]. RECs work mostly together with smaller renewable energy-oriented companies, and most of their membership increase corresponds to the clientele loss of larger energy incumbents. Therefore, to determine the necessary upscaling of membership we looked into the clientele of some large energy companies in the Netherlands. RWE and Vattenfall are the biggest with 3 and 2 million household customers; Eneco (still) owned by municipalities, follows with about 2 million customers; and other medium size companies have between 150,000–500,000 private customers [50–52]. Based on this information, the vision suggested a membership size of 1 million by 2025, implying a yearly membership increase of 50%.

To meet the total household energy demand (including heat and electricity) of 1 million prosumers, about 10 billion kWh/year will be needed, which equals 36 PJ renewable electricity annually. If these people were also to switch to electric driving, energy demand will increase by one third to 47 PJ/year. Part of this demand will still be covered by utilities and part of the cooperative production would be sold to other clients (industry, other companies, sports clubs, etc.). Households may cover about half of their energy use by cooperative production, about 25 PJ (about 7 billion kWh). It is also envisioned that 200,000 members of RECs will have switched to renewable heating. It is assumed that with efficient heat pumps this will lead to energy savings up to 5 PJ (about 1.4 billion kWh).

This means that after subtraction of savings, cooperative production of renewable energy must increase from 1 PJ by now to 20 PJ in 2025 (about 5.6 billion kWh), which is about 10% of net energy consumption in the Netherlands [53]. To realise 20 PJ in 2025, cooperative production must rise 1/3 per year. This vision looks extremely ambitious for the RECs, but the number of 20 PJ is still moderate when total Dutch consumption is taken into account; in fact, this amount appears low as compared to expectations of some dialogue participants.

To determine the share of wind and solar we looked into the growth rate of cooperative production over recent years. Cooperative wind now covers about 1 PJ/year. The growth rate has been moderate, about 10–20% a year, which is for large part explained by obstructive policies of several provincial governments against on-shore wind (see also [16]). The vision assumes a more supportive stance because of pressures on the Netherlands to realise its climate targets. Therefore, for wind, an annual growth rate of 30% is envisioned sufficient to realise 9.6 PJ in 2025.

The share of cooperative solar in the Netherlands is currently 0.07 PJ, which is still negligible. However, the growth rate of solar projects is much higher than wind, between 250% and 300% per year. Estimating with an annual growth rate of 75%, cooperative solar will by 2025 cover 10.7 PJ. So, basically it is envisioned that half of the cooperative production would be sourced through wind and half through solar. Without necessarily committing to this vision, at this point, dialogue participants agreed to use it as a starting point in the actual backcasting.

7.4.2. Identification of Barriers and Opportunities

During the second meeting of the strategic dialogue, the participants discussed the possible barriers and opportunities for the cooperative deployment of renewable electricity (solar and wind) and heat in the Netherlands. The identified issues are several and interconnected. The elaborate lists of issues as identified per technology may be found in the Appendix A.

Solar & Wind Energy

Concerning barriers, the dialogue participants principally focused on issues originating in the policy domain, as well as on issues of competition with national or international commercial actors. With respect to the deployment of solar energy, although the postal code tax relief scheme ("*postcoderoos*" in Dutch), that national policy introduced in 2013, is generally perceived as complex, the main policy barrier comes from municipal regulations. In the case of wind projects, national and provincial regulations are more important. The participants stress that the existing competition is intensified by the low availability of roofs and other surfaces, due to the unwillingness of their owners to provide them; a barrier in itself. The representatives of RECs reflected upon their level of professionalization, especially in relation to (offshore) wind project development, and the collective image of the community (described as "petty" or "petite bourgeois"), and how both factors may inhibit their progress. The fact that energy is a "non-issue" for the majority of people has been described as a significant barrier; the public lacks both the interest and the awareness around the urgency of the energy transition. Indicative is that the opposition to wind projects often relates to an impression that there is already "enough" onshore wind. The role of RECs is, thus, not only to provide renewable electricity to some, but to involve and engage people on a deeper level, as argued by some of the dialogue participants.

Regarding opportunities, the situation in Groningen, brought to the fore by the recent earthquake in 2018, emerges as a catalytic factor for the transition to renewables. Beyond this, the dialogue participants discussed the expected benefits of the professionalization of the sector and the establishment of coalitions. The local municipalities have been

identified as key actors, as they could support them with several mechanisms, such as guarantees, low interest loans, or the provision of their roofs/land for project development. For the latter, partnerships with locals have been considered valuable in general. The RECs could mediate between them and electricity end-users to develop projects (and receive a financial return). Furthermore, the technological domain involves extra opportunities as the initiatives could adjust their projects for heat or e-mobility services. To give more context on the above barriers and opportunities (whose whole list is presented in Tables 7A1 and 7A2 in the Appendix A), we next zoom in on some parts of the discussion.

First of all, regarding their challenges with public authorities, the participants agreed that, especially for wind energy, "*Government is an obstacle*", as one participant pointed; often this is true at the municipal and provincial level too. In fact, RECs are not (yet) in the consciousness of aldermen or other officials. As one participant describes: "*already three years ago, I was talking to the municipality, about the fact that we could provide them with our energy. Well, that was seen as a good idea, but it took another two years … and it has not gotten through yet …*" Only in some places is this alliance present; some municipalities have already given priority to RECs for the development of wind in their area.

The professionalization of the initiatives for the development of more and bigger projects brought up elaborates discussions. While it was pointed that "*members' growth is important for us to be able to realise things* (i.e., projects) *and realising things is important to get this members' growth*", especially relevant in the case of wind projects, the dialogue participants expressed their concerns about whether the movement has the capacity to pursue them. Specifically, some participants argued that developing offshore wind demands significant financial resources and expertise that even the cooperatives with long experience in onshore wind development lack. Yet, others pointed out that this area should not be left to (multinational) commercial developers, because in this way, resources collected from every energy consumer (through the energy tax) will be channelled to powerful companies. It was actually argued that more trust should be placed on the knowledge of the local community: "*I think those fishermen know exactly where the wind is … they know those places... I think your fishermen know a lot more about the North Sea than The Hague (*where the government is located*)*."

Beyond their own capacity (or lack thereof), the discussion also touched upon the issue of public acceptance of renewables and the role of RECs in democratising the energy system. The issue arose when discussing the recent emergence of small-scale "village" wind turbines in the country. While such turbines may seem as a "friendlier" alternative, they are inefficient, which even intensifies, the issue of space, and while it was suggested that more locations may become available for them, others pointed out that resistance may actually increase due to the fact that these wind turbines would need to be positioned closer to people's vicinity. It is exactly there that the role of RECs is crucial. As pointed, being active in a cooperative "*you determine yourself as a neighbourhood where a wind turbine does or does not come … That is beautiful; that there is a cooperative that says, we are going to decide where our limit is. That is energy democracy*!"

In fact, the discussion specifically focused on the role of RECs in mobilising people for renewables, as well as on the ideal level of involvement. The question has been if the cooperative movement has solely become a vehicle for project developers to go through the permit procedure, or whether it has succeeded in establishing "*prosumption*", linking production and consumption of renewables. Nowadays, not all RECs employ a business model where the investors or owners of the sustainable installations can actually use the self-generated energy. This relates to choices made in the (recent) past and the availability of certain support schemes. In the discussion, some suggested that renewable energy production does not need to be directly connected to consumption. Instead, it was stressed that production should ensure visibility. It was argued that especially wind energy projects have an enormous capacity to mobilise people and capital for achieving substantial sustainable energy generation within sight distance. "*The interesting thing about what we are doing is that I have people (as members) who develop their roots in the region and derive pleasure from it. For me it is not about realising production out of view, because then we become exactly the same as Shell, who are also in full production*." Yet, others pointed out that visibility is not enough; for some participants it is crucial to link a project's financing with a concrete transaction. "*There is one reason why a cooperative succeeds, the same reason is why a cooperative fails: that is linking financing and transaction*", adding "*you do not invest because you receive money from the wind turbine, but because you receive power from the wind turbine … As soon as we start making it possible for people to become customers and not members, as long as one may invest without receiving electricity, then it goes wrong.*" It is explained that the involvement at a transactional level does not last long, and renewing it requires a high marketing budget, which local RECs lack. This is why the relational level is important, strengthened by a goal orientation. "*Tackling those 3 levels, the transactional, relational and goal-oriented, makes a cooperative strong.*" This is seen as "*the real strongest unique selling point*" of the initiatives. Nevertheless, some participants questioned that RECs should always pursue such deep member involvement. This links back to the discussion about the purpose of the movement. "*What is bad about having double objective? Democratisation and sustainability*?" It was argued that collaborating with an "impact investor" that consciously wants to invest in a cooperative project is not bad. "*I think that the strong focus on the ideal model is a threat for the movement*". While this tension has not been completely resolved, the working compromise was that even when the deep involvement of people appears to be the "ideal", not all RECs need to aim for it.

Lastly, among the several opportunities that were discussed for the growth of the movement and the transformation of the energy system, one related to the possibility of expanding the activities of RECs across the value chain. Starting from the fact that solar panels are usually imported from China, and wind turbines from Denmark, some dialogue participants argued that the movement could initiate its own factories in the Netherlands. Actually, for some, RECs should take care of the production, financing, as well as the installation of the renewable energy infrastructure. For this, cooperation and coordination is necessary, and as it has been pointed: "*Deltawind is not going to set up a construction company on its own, nor will the Windvogel. That risk is too high, but if we share the risk together, we may ultimately have a construction company together, which may facilitate services for our members*." However, opposition to this point also emerged

as other participants argued that the movement should not become a "*club*" that does everything alone. Instead it should seek the collaboration with other actors of the "*big society*". In relation to this, a tension that emerged involved the trade-offs regarding the possible support of local suppliers vs. taking advantage of economies of scale through partnerships with bigger suppliers.

Sustainable Heat

The discussion on the barriers and opportunities for the transition to sustainable heat differed from the discussions on energy from wind and solar, not only due to its different nature (i.e., different technologies, different kind of service, etc.), but also due to the lower level of experience of the dialogue participants with it. In what follows, we discuss some major issues. (See Table 7A3 in the Appendix A for the complete list).

Starting with the barriers, the most significant involve the preference of the public authorities for centralised top-down solutions, the lack of transparency on possible development of heat network(s) and the related costs, the technological difficulties and the increased financial costs as such (especially for rural contexts), the unclear business model, as well as the very limited experience of the cooperative with the deployment and management of heat projects. In fact, although RECs would wish to keep (full) control and responsibility over the heat networks, they acknowledged their difficulty to tackle the issue completely autonomously. Materialising heat projects through community initiatives is difficult due to the shortage of people with the required expertise. Establishing partnerships is therefore vital for advancing the heat transition. Given its experience, the role of the grid operator was seen as central; network operators have, in part, already taken the lead in the transition away from natural gas. Nonetheless, several issues hinder such a collaboration. Principal is, for instance, the lack of transparency regarding network costs, which inhibits the assessment of the affordability of different heating solutions.

On the other hand, the public gas debate, intensified by the earthquakes and the house damages in Groningen, along with the forthcoming possible dependence on the unstable Russian regime, creates a window of opportunity for radical change in the system of heat provision throughout the country. For this, sufficient non-food biomass, including waste-water and sewage sludge, is available in a large part of the country. Moreover, small-scale heat installations, as well as heat installations belonging to housing associations, do not require a special heat supply permit from the Authority for Consumers and Market, which makes them a good fit for the transition to decentralized heat projects. The downturn of the construction industry appeared as another opportunity for the RECs to advance the heat transition. The initiatives could link up with construction companies to push for energy efficiency upgrades of buildings; past experiences of housing cooperatives may be useful. For instance, the coalition could combine the provision of house renovations with that of vacation packages for their owners. Additionally, the dialogue participants suggested that building international partnerships, by collectively getting involved in the pellet factory of the Belgian cooperative Ecopower, for example, could also support the heat transition in the country.

Although several barriers and opportunities have been identified by the dialogue participants, during the dialogue, the barriers for the energy transition have not been discussed in length. Instead of a detailed analysis of the problem, the discussions principally explored different possibilities for future action. This solutions-orientation may be attributed to the characters of the specific dialogue participants but may also comprise a commonality across actors engaged in the niche. We will reflect upon this further in Section 5.

7.4.3. The Strategic Vision of the Movement and the Implications for Governance Interventions

The direct outcome of the dialogue process was a consolidated vision and an action agenda with several tactical measures for attaining it. This section presents the concrete vision for the Netherlands and some of the tactical measures of more relevance for the cooperative movement as a whole.

The Strategic Vision of the Cooperative Energy Movement

The dialogue participants converged on an ambitious vision regarding the contribution of the RECs on the Dutch energy transition. Specifically, the RECs pledge to realise 25 PJ (7 billion kWh) of sustainable energy production and savings in the Netherlands by 2025.

This may be translated to:

- Sustainable heat for 200,000 households: this equals to energy savings of more than 5 PJ (1.5 billion kWh);
- Generation of electricity through more than 10 million solar panels (of an average capacity of 300 Wp): this yields more than 10 PJ (3 billion kWh);
- Generation of electricity through 250 wind turbines (of an average capacity of 5 MW): this also yields around 10 PJ (3 billion kWh), and,
- The involvement of 1 million households in a cooperative either as an investor or as a buyer of collectively generated electricity or heat.

In April 2017, this vision was published by ODE Decentraal [54]. The vision is important because, functioning as an anchor point for strategy and communication with a broader audience, it supports the movement's collective agency. The insights into what a possible sustainable energy future could look like, and the established transition agenda, which is presented next, also creates a feeling of legitimacy for engaging with the regime and may enable the movement to take leadership in its transformation.

Action Agenda

To make a greater contribution to the sustainability of the Dutch energy supply, participants acknowledged that the RECs will have to get involved in many more and especially larger decentralised projects. At present, too little expert manpower is available for this. They recognised that the organisational structure and management capacity of the RECs is far from ideal and to improve it, the following measures have been decided: (a) a Development Fund through which the preliminary phase of (large) projects can be (pre-) financed; (b) a course for training and education for people who want to contribute to project development and management of RECs; and (c) a certification scheme for local RECs aimed to prevent proliferation and commercial misconduct.

When it comes to the policy recommendation to the authorities, the agreed action points may be located at the national and local level. First of all, at the national level, the participants call for the national government to facilitate an energy awareness campaign, which could be co-developed with civil society organisations, citizens and businesses. With regards to the existing regulations, it was suggested that the postal code tax relief scheme should shift to an "area scheme", allowing in this way for the cooperative development of more solar and wind projects (See also Proka et al. [16]). The development of wind energy, specifically, should take place collaboratively on areas where it is socially acceptable, and RECs should also be given the opportunity to (co-) exploit wind at sea. Special attention should be given to (the consequences of) the heat transition, for which the Dutch cooperative movement has presented its concrete proposition for a gas-free future in the Netherlands [55]. Specifically, the movement calls for the establishment of goals at the regional level and the deployment of energy allocation plans ("*energiebestemmingsplannen*" in Dutch) to meet them. The cooperative energy movement supports an integrated approach to energy on land and participatory development within the Environmental Vision ("*Omgevingsvisie*" in Dutch). Moreover, the need for a more decentralised sustainable energy supply and the application of energy storage options, calls for a national review of the energy transport cost structure, as well as the cost of local energy storage; therein, network operators could play a major role. Furthermore, the national government can stimulate the cooperative movement by contributing to a Development Mechanism to finance the risky development phase of larger cooperative projects for wind, solar, heat and energy saving.

At the local level, provinces can make an important contribution to the energy transition by facilitating the spatial application of decentralised energy generation. Instead of complicating the process for the RECs, by limiting, for instance, the possibilities for (replacing existing) wind turbines, the local provinces should create provincial investment funds for renewable energy to (partially) cover the risks of investments undertaken by RECs. Moreover, municipalities which own land should (preferably) provide them for cooperative development. If they are not landowners themselves, municipalities should enforce cooperative development, for instance, by stating that a developer should always work with 50% involvement of a local cooperative. By making municipal land and roofs available, the municipalities may give RECs a chance to participate in large projects. Moreover, municipalities may bring companies in contact with local RECs in their area. Discounts on municipal taxes for the companies that provide their land or roofs, for instance, could function as an encouragement for making more business roofs available for solar panels. Lastly, municipalities can also arrange that RECs borrow money at the lowest possible interest rate from the country's promotional bank of and for local authorities and public sector institutions.

The developed vision and transition agenda should not be seen as an end in itself (prediction of the collective future of the community of RECs) but as a means to influence this future. The dialogue participants have come up with several ideas that could directly improve their current situation. However, the timing of the dialogue (close to the national elections) resulted in much of the attention of the participants to be directed to short-term measures, mostly towards the to-be-formed national government. Therefore, it could be argued that the representatives of RECs only partially managed to distant

themselves from the present to look at the broader picture of the energy transition. The drafted agenda, nevertheless, needs not to be 'implemented' as a blueprint, but it may be adopted in bits and pieces by the dialogue participants and a mobilised network of change actors. Next, we reflect upon these findings and our overall research process.

7.5. Insights into Empowering Transformative Leadership from the Niche

Our intervention aimed to foster leadership aimed at the sustainable transformation of the energy system by facilitating the development of reflexive and strategic capacities through social learning. Here we reflect on this goal from an action research perspective. First, we discuss the direct and indirect (social learning) effects of our research, and then we reflect upon the role of transition management therein.

To identify the main effects of the dialogue on the participants and the development of the cooperative renewable energy niche, we go back to our strategic dialogue goals, which may function as an evaluation framework. Overall, the dialogue resulted in a shared understanding about the past, present and future of the cooperative movement in the context of the energy transition. Our empirical involvement confirms our assumption that so far the initiatives have been too busy pursuing their own individual goals to be able to develop collective strategic capacities. In fact, the dialogue process concluded with the co-organising and participating umbrella organisation ODE Decentraal publishing the movement's ambition accompanied by a list of specific measures to attain it [54], as well as a statement about the cooperative contribution to the heat transition in particular [55]. The former document consolidates the problem framing, with ideas for short- and long-term actions necessary for the transition to a sustainable energy system democratically operated and managed. In that, this document is an attempt to address the identified in the strategic dialogue institutional and organisational lock-in mechanisms.

Specifically, the identified lock-in mechanisms are located both in the institutional and organisational sphere. First of all, policy is mostly protecting the incumbents and its change is slow, both at the local and national level. At the local level, where the interaction with the initiatives is more direct, the established cultural beliefs and cognitive routines (of aldermen) appear to be inhibiting, as RECs are most often not acknowledged as legitimate partners in the energy transition. In fact, the image of RECs seems to limit the diffusion of the cooperative model in the energy domain, and this may relate to the fact that the level of engagement that the initiatives promote contrasts with the current lifestyles. Lastly, apart from lack of economies of scale, organisational lock-ins appear to be significant too. To be precise, the overall level of professionalization, the lack of experience with certain sectors (offshore wind and heat), as well as the difficulty to deepen and broaden their networks, are factors that undermine the development of the sector.

In their evaluation of the dialogue process, some of the participants pointed out that the narrative gives them a sense of direction and helps them to orient their actions and choices more strategically. Yet, for others, the process was too inward-looking; as one participant argued the dialogue process was "*a lot about what we want, and find important, rather than what people, who do not have that same drive*", and indeed the

participants did not manage to sufficiently distance themselves from their personal positions to identify all the bottlenecks for the transition and how they could pragmatically be addressed. Although this may be attributed to the idealistic features of the actors involved in the cooperative energy field, it may also come as a result of the specific dialogue design. We will get back to this when discussing our research methodology.

The strategic dialogue has supported raising the awareness among the dialogue participants regarding the identity of the cooperative energy movement in the Netherlands and the plurality of approaches within it. The cooperative energy movement integrates principles regarding the environmental aspects of sustainability (i.e., green energy) but also social aspects, like active citizenship and self-determination. While these values seem to be easily combined, certain tensions emerge when practically applying them. Specifically, while all actors aspire towards the transition to a "green" energy system, and may also cherish the possibilities for the democratisation of the energy system that the cooperative approach brings, no unanimity exists about the idea of using the energy transition as a vehicle for reclaiming people's power and re-establishing a social economy. This tension relates to the discussion about the movement's unique quality summarised in the words "Van, Voor, en Door" i.e., energy of the people, for the people and by the people. For some, "*the challenge is not to further professionalise our project development power, but to organise solidarity within the area we operate (and to receive pre-financing*)". Yet, while some voices stress the importance of aiming for deep involvement of membership at all three levels—the economic (transaction), social (relational) and environmental (sustainability-oriented)—arguing that this unique value can offer an attractive perspective to Dutch consumers, no consensus about it has been reached. Instead, what was established is a basic understanding and respect for the different approaches which may be employed in parallel. In fact, it is coordination that the movement needs, not unity. In a form of cultural pluralism, the different RECs may co-exist with each other, considering the particularities of the sub-groups, as enriching to the overall qualities of the movement; and indeed, as the cooperative movement will need to address in the near future a broader group of people with various desires and interests, this multitude of values and approaches may be beneficial.

Another impact of the dialogue relates to empowerment. The process enabled the actors to feel legitimate and able to contribute to the energy transition, also by taking new roles. This resulted in several spin-off activities: The creation of an administrative program for the RECs; the establishment of an association for the participation of RECs in offshore wind; the bundling of the different lobby and knowledge development organisations of the field; some organised attempts for inquiring funds for the professionalization of the cooperative energy sector; the establishment of a local solidarity fund, as well as the development of wind maps and the first steps to include them in local Environmental Plans. The maturing of the cooperative field was also exhibited, when, a year after our dialogue process, the ministry announced the measures it was planning to take to support the energy transition. Overall, the announced measures were aligned with the wishes of the cooperative movement. Yet, the suggestion for a parallel increase of the natural gas tax and decrease of the electricity tax, aimed at shifting consumption from one to the other, received negative reactions from several individual RECs which argued that this

measure will kill the movement as it is making the development of projects with the tax-relief arrangement extremely risky, if not unfeasible. Nevertheless, the umbrella organisation ODE-Decentraal officially acknowledged the possible positive impulse of the measure on the overall transition, pointing out that actions will be taken to reduce the nuisance that the tax adjustment brings to the movement [56]. At this point, it should be clarified that we cannot be certain about the level of impact of our intervention on the above; in fact, we do not know if the same activities would have taken place even without the organised strategic dialogue.

Lastly, we wish to reflect on transition management as an action research methodology, and the ability of the research process to facilitate developing leadership. Our role was to design and facilitate the dialogue process, to quantify the cooperative vision and to compile all the reflections and governance propositions in a report oriented towards the empowerment of the cooperative movement. Interestingly, despite the fact that our invitation was originally directed towards multiple actors from the bottom-up, (the majority of) the invited actors from the cooperative energy movement preferred to discuss strategy among peers only, excluding other parties. This may confirm our hypothesis regarding the difficulty of bridging different niches. However, such a decision by the participants may have been influenced by our approach which, by involving a lot of representatives of RECs from the beginning, was leaned too much towards the cooperative energy niche. By avoiding broadening the meetings to additional participants, an opportunity was lost for the creation of new networks beyond the cooperative energy niche, something that had been expected to strengthen the prospects of a regime transformation. Actually, by excluding other actors, the dialogue participants missed the opportunity to discuss their ideas with people with different perspectives, which could better prepare them for the interaction with the regime. Nevertheless, the existing networks began to deepen through the creation of trust and mutual respect. This inward orientation may also indicate that, despite the emergence of some structures (e.g., for knowledge dissemination or energy supply), the cooperative movement in the Netherlands is still in its infancy. Coordination among peers may therefore be a legitimate first step before the engagement in broader strategic discussions.

Although certainly not perfect, the followed process offered multiple insights into the renewable energy cooperative movement, while also supporting its development. The dialogue participants fully endorsed the quantitative vision drafted through the dialogue process. In fact, their umbrella organisation ODE Decentraal, co-organising the strategic dialogue, shared it widely. At the same time, it should be stressed that while the timing of the elections may have helped mobilising more people to participate in the dialogue and share their knowledge and experience, the conditions may have hindered the ability of people to think strategically on a longer time-horizon. Furthermore, we argue that the role of transition management in bringing tensions to light is significant. As a framework that facilitates reflection, transition management can contribute in surfacing existing tensions, which can be valuable for helping to avoid a possible future escalation. In this, the role of facilitation is crucial. Facilitation should help create understanding and respect of the different positions, setting the foundations for coordination of action between different approaches. On a different note, looking at the last meeting of the dialogue, we may also recognise our responsibility in not having facilitated the dialogue participants

in linking the numerous activities envisioned to a certain timeline. This may in fact be a rather difficult effort as it involves negotiation of priorities.

7.6. Conclusions

Our contribution has facilitated the cooperative energy movement to develop an overarching orientation towards the cooperative ownership and control of renewable energy infrastructure and the shift to conscious energy prosumption. The challenges are many, but so are the different opportunities presented for the movement to take advantage of. The dominant energy regime in the Netherlands, comprised by only a few parties responsible for the electricity, heating and transport solutions, has been trying to find ways to remain in power. In such a context, while functioning under absolute unity contradicts with the very nature of direct-action initiatives, and may even compromise the prospects of their spreading, coordination among the RECs is critical. Therein, the contribution of our strategic dialogue is important as the detailed action plan drafted appears to have already enabled the initiatives to operate in alignment with their collective strategic vision.

Transition management proved to be a useful approach to create a direct impact by helping to develop reflective and strategic capacities and create a more nuanced understanding of the challenges and difficulties of moving beyond the niche. Our experiences illustrate that it is possible to combine direct societal impact with a research agenda on advancing sustainability transitions. The positive societal impact of the dialogue process has been the creation of a narrative, the deepening of the network, and a sense of direction, also empowering towards more transformative action. Future research could expand the focus of this intervention by pursuing a broader stakeholder dialogue, also involving other actors, and possible partners of the cooperative energy field. Further research could also assess the prospects and value of establishing a collaborative business model between RECs and hybrid actors such as the network operators.

By engaging in such a dialogue as researchers, this also highlights tensions around normativity and prescriptivity in research. Our experience is that through the dialogue we were able to get more in-depth empirical insights and a better understanding of a number of theoretical ideas and assumptions. Future research could compare and contrast the observations presented here (on both research content and process) with insights from different research approaches on the study of RECs, thereby enriching such observations and possibly also developing the research approach.

7.7. Appendix A

Table 7A1. Identified barriers and opportunities for solar energy.

Barriers	Opportunities
Policies and political power	**Policies and political power**
Municipality level: • Lack of supportive municipal policies • Municipal procurement rules focus on lowest price National/international level: • Lack of govt. ambition for 2030 • Lack of flexibility of tariffs • Risk of ending Premium tariff scheme (Stimulating Renewable Energy production, "*Stimulering van Duurzame Energieproductie*" in Dutch (SDE+)) • Risk of limiting SDE+ scheme to large projects	Municipality level: • Procurement rules: price–quality balance • Guarantees • Affordable loans by local govt. funding agency • Active ground ("*Actief grondbeleid*" in Dutch) /roof • Risk funds National/international level: • Separate category in SDE + for RECs • Tax system permits • Alignment with political parties • Link to EU Emission Trading Scheme for CO_2 • Sustainable energy as a public task
Technology and infrastructure	**Technology and infrastructure**
Physical environment: • Low availability of roofs due to low willingness of owners to provide them • Possible negative impact on network stability	Physical environment: • Focus on roofs • Blockage on onshore wind Technological development and innovation: • Stronger, cheaper, integrated: e.g., solar roof tiles/windows, floating panels, boilers for cooling • Energy storage, local energy system management

Table 7A1. *Ctd.*

Sector structure	**Sector structure**
Competition: • Competition from larger commercial players (professional trusts) • Lack of portfolio • Increased cost due to focus on quality • Avoidance of risk capital & liability • Avoidance of venture capital • Competition with agricultural land and other functions	Certification of RECs Alliances: domestic and international, "multi-stakeholder organisations" Integration of a sustainable system: (1) Horizontal integration: • Wind, solar connection with heat for buffering • Linking to other functions (car, house) • Services delivery to companies (2) Vertical integration: • Expansion of activities across value chain: solar panel manufacturing, installer, construction, bank, collective purchase, etc. • Employment opportunities
Organisational logic	**Organisational logic**
• Difficulty to engage members and involve new Opposition: • Not-in-my-back-yard (NIMBY) attitude • Resistance to large-scale projects Image: • Petty image (petite-bourgeois) • Internal disagreements • Low diversity of people	People mobilisation (engagement & involvement): • (1) Transactional; (2) Relational; (3) Goal oriented • Learning through local networks • Strategy: (1) focus on community more than energy, (2) ownership of Energy infrastructure, Data and Money • Communication through social media "*Sun yield*" as a pension
	Landscape level Urgency due to Groningen earthquakes

Table 7A2. Identified barriers and opportunities for wind energy.

Barriers	Opportunities
Policies and political power • Government as an obstacle • Long waiting list for locations	**Policies and political power:** • Daring decision making • Exclusive support from municipalities • Local energy projects for regional (spatial) development
Technology and Infrastructure High costs	**Technology and Infrastructure** • Technological development and innovation: e.g., large-scale solar in combination with wind • Smaller wind turbines
	Sector structure • Expansion of activities across value chain • Quota in offshore wind deployment (e.g., 50% cooperative)
Organisational logic Internal resources • Low expertise, (few) volunteers • Difficult mobilisation of people Role—image • Risk of being seen only as an investment group Business case • Too heavy to involve membership • Insufficient capital among residents	**Organisational logic** Professionalization Use of the positive synergy between wind projects and people mobilisation People mobilization through focus on low energy costs Legitimacy • Tipping point when above 1.000 members • Exemplar projects for more status • Municipalities as customers
Knowledge base • Lack of (in-sector) knowledge on offshore wind • Lack of public awareness & interest: energy as a "non-issue", limited belief in techn. feasibility of RES, feeling of abundance of wind turbines on land	
	Landscape level Urgency due to Groningen earthquakes

Table 7A3. Barriers and opportunities for sustainable heat.

Barriers	Opportunities
Policy and political power • Priority given to top-down planning instead of a bottom-up democratic process • General requirement of a heat supply permit from Authority for Consumers and Markets • Lack of protection against the heat law	**Policy and political power** Municipalities: • Energy plan, Energy zoning plan • Environmental/ ambient plan ("*omgevingsplan*" in Dutch) • Allowing customisation per neighbourhood/ postal code Small-scale installations and/or installations belonging to (housing) owners association do not require heat supply permit from the Authority for Consumers and Markets
Technology and Infrastructure Difficulty of energy saving	**Technology and Infrastructure** Technical development and innovation: • Variation local sources: pellets, manure, residual heat (also fossil), green gas through current gas infrastructure • National availability of non-food-competitive biomass, like sewage and sewage sludge • Thermal heating energy storage • Possibility for very small-scale heat networks • Possible use excess electricity for heating Collective heat solutions are easier than individual
Sector structure Dubious role of network operator • Lack of clarity about the installation of heating networks across the country	**Sector structure** Alliances: • Cooperation with experienced network operators • Cooperation of RECs and fund for early phase development • Partnership with Belgian cooperative Ecopower vis-à-vis acquiring shares of their pellet factory

Table 7A3. *Ctd.*

Organisational logic	**Organisational logic**
• Unclear business model • Little choice: package approach (monopoly) • Lack of people: impossibility of fast increase of membership • Petty image (petite-bourgeois)	Business model • Offer more control to tenants • Collective arrangement is easier than individual • Improved financial return for energy saving Idleness of building/construction industry opens space for action for RECs
Knowledge base	**Knowledge base**
Awareness • Low awareness about necessity and feasibility of transition • Luck of awareness about the issue of heat and the potential of its cooperative management Impediment in thinking: • Priority given to top-down planning instead of bottom-up democratic process • Public fear of the "unknown" • "*Trias energetica*" (i.e. sustainable energy in three steps: (a) reduce energy loss; (b) maximise use of sustainable sources; (c) make efficient use of fossil-fuel based energy sources) as a barrier	Learning from housing corporations' experience: e.g., renovation in 2 weeks, offering people holidays
Landscape level	**Landscape level**
Vast majority of people are not in line with the bottom-up development of heating solutions	• Urgency due to Groningen earthquakes • Anti-gas movement Off the gas ("*Van het gas af*" in Dutch) • International dependency on Russia

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7.9. Appendix B

Recommendations put forward in the context of the Strategic Dialogue of Renewable Energy Cooperatives in the Netherlands

(Adapted from Proka et al, 2017)

Cooperative energy sector internal

1. Establishment of a Development Fund to (pre)finance the preliminary phase of (large) projects.
2. Development of training and education programs on cooperative management and project development.
3. Introduction of a certification scheme to prevent sprawl and commercial abuse of local energy cooperatives.

Government

The cooperative movement makes some recommendations to the cabinet. The Energy Commissioner is central to the recommendations to the new cabinet. Following the example of the Delta Commissioner in the 1950s, this figure should be empowered to make proposals to the cabinet and chamber to significantly increase the pace of the energy transition. The Energy Commissioner [12]should have the resources (support and budget) to get things going. His tasks must include facilitating the energy cooperatives. ODE-Decentraal will consult with him about a coherent policy package. It is recognized that fiscal neutrality is pursued as much as possible. This means that the facilitation of the cooperative movement ultimately does not have to cost central government more than it yields. A coherent policy package could encompass the following:

1. The national government needs to facilitate a social awareness campaign in which civil society organizations, citizens and companies are speaking alongside the national government.

2. The national government needs to clarify all the necessary options for making the energy supply more sustainable; this means that administrative cooperation should take place for the development of onshore wind projects. where this can be socially supported. Local and provincial standards that aim to block citizens' wind initiatives should be prevented by the government wherever possible.

3. Energy cooperatives should be given the opportunity to (co-) exploit wind at sea.

4. Environmental taxes help the energy transition in the prospect of participation and action from the citizens. An action perspective means that those involved (citizens and companies) can avoid or limit cost increases. The tax regulation mechanism ('verlaagd tarief' i.e. reduced rate), introduced by the previous cabinet, is an example of a scheme

[12] In 2020 there are multiple energy commissaries. While this idea took off informally, it did not make it to an institutional position.

in which those involved can choose how to use their own money. This scheme is still underutilized and could be improved in several ways: (1) increasing the tax bracket for private individuals (see point 6) may lead to (2) more consumers (companies) using it, (3) broadening the 'postal code area' to a 'geographic area' can enable the cooperative development of more local wind projects. The Energy Commissioner should ensure that unnecessary restrictions are removed. In the long term, the scheme might replace subsidized rate schemes, including parts of the SDE +.

5. Special attention should be given to the (consequences) of the heat transition. The cooperative movement participates in the Green Deal Gas-free Areas and has drawn up a document to shape its offer to the Netherlands. It is in line with the idea of setting targets at regional level and drawing up so-called energy zoning plans. The energy transition must be linked to the Environmental Act: an integrated approach to energy on land and develop participative within the Environmental Vision. Qualifying Energy Cooperatives must be designated as a party to this.

6. For households, the heat transition means that they may consume more than 10,000 kWh per year. The increase in electric transport will also lead to an increase in electricity consumption. To stimulate the heat transition, an increase in the first bracket of the energy tax is necessary, coupled with an extension of the 'reduced rate' scheme (under point 5). An investigation into the costs of the heat transition for private homeowners could prompt additional measures.

7. The need for a more decentralized sustainable energy supply and improvement of energy storage options should prompt national reflection on the structure of transport costs. Grid operators could play a major role in a national reconsideration of the pricing of transport costs for end users as well as the costs of local energy storage.

8. Central government can stimulate the cooperative movement by contributing to a Development Mechanism that pre-finances the risky development phase of larger cooperative projects for wind, solar, heat and energy saving. An amount of 250 million euros (an allocation of 10% of the INVESTNL budget of 2.5 billion) is envisioned.

9. Barriers to energy cooperatives from obtaining innovation subsidies for EU or TKI projects should be removed.

Provinces

Provinces can make an important contribution by facilitating the spatial adaptability of decentralized energy generation. However, some provinces are sabotaging the energy transition by limiting opportunities for (replacement of existing) wind turbines. It is crucial for the cooperative energy movement to reverse this opposition. Provincial investment funds for sustainable energy can be used to (partially) cover the risks of investments by energy cooperatives.

Local authorities

Local authorities with own land positions could open them to cooperative development. Furthermore, local authorities could incentivise the cooperative development of solar projects on other roofs through policies that require 50% local participation in RES project development. Active land and roof policy to offer cooperatives an opportunity to

participate in large projects. Many municipalities can be more active in making municipal roofs available. Local authorities can also try to connect companies with energy cooperatives. A discount on local taxes could make more company roofs available for solar panels. Municipalities can also arrange that members of energy cooperatives can borrow money via the BNG at the lowest possible interest rate to invest in sustainable energy generation.

Grid operators

Grid operators are important partners of the cooperative movement, nonetheless, there is still much room for improvement in their cooperation. Energy cooperatives would benefit from more transparency from grid operators regarding costs and tariffs. Grid operators could play a major role in a national reconsideration of the pricing of transport costs for end-users as well as the costs of local energy storage.

Pension funds

Pension funds and other institutional investors can make a major contribution to the energy transition. Possible contributions could involve particularly the infrastructure and home insulation required for enabling the heat transition. The cooperative movement explicitly wishes to engage in a dialogue with the pension funds to investigate the possibilities for cooperation.

Commercial developers

Developers are occasionally perceived by a number of cooperatives as competitors who inhibit the movement from developing projects where local acceptance is lacking. At the same time. the movement's enormous ambition makes a collaboration with developers interesting.

European partners

REScoopEU and other initiatives in other EU countries are allies for the movement in the Netherlands. A lot can be learned from the Flemish Ecopower, with which increased collaboration could be possible.

Knowledge institutions

Knowledge and expertise are important for the cooperative movement. Connecting with changes in education can be an opportunity for this. This can go hand in hand with strengthening existing institutions from the movement.

Environmental organizations

Environmental organizations already have experience with marketing and campaigning. In collaboration with them, the movement can learn how to better mobilize more people.

Youth energy initiatives

A synergy exists between the cooperative movement that wants to reach more people and youth energy initiatives that would like to be involved in the movement (e.g. Sustainable Energy Youth Network, Young Energy Specialists and Development Co-operation). Young people can play a greater role in the movement and its development.

8. When top-down meets bottom-up: is there a collaborative business model for local energy storage?

Abstract: As the energy transition progresses, energy storage becomes increasingly important for safeguarding a reliable energy provision. At the same time, energy storage systems are used to increase the self-consumption of decentralised generation and are expected to result in lower electricity bills for the energy prosumers. Drawing on sustainability transitions and management literature, this contribution focuses on a neighbourhood battery with the aim to explore to what extent a collaboration between a network operator and renewable energy initiatives on local energy storage could help increase the impact of the latter in the energy transition. The concept of a neighbourhood battery involves strategic decisions, and perhaps a strategic innovation, whose transformative potential depends to a large extent on the perceptions and actions of those involved. This paper explores the opportunities and constraints for a collaborative business model for the neighbourhood battery in the Netherlands, as well as the challenges and tensions that emerge for the main parties involved. The perspectives of the network operator were compared with those of renewable energy initiatives in the country, including the Energy Service Company involved in the pilot and, in parts, with the perspectives of the involved end-users. This contribution registers a misalignment of interests and expectations which complicates the deployment of the neighbourhood battery concept. Recognizing the critical role of network operators, the conditions that may enable the emergence of collaborative business models for local energy storage are also discussed.

Keywords: collaborative business model, energy storage, energy transition, strategic innovation, community energy storage

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Proka, A., Hisschemöller, M., & Loorbach, D., (2020). When top-down meets bottom-up: is there a collaborative business model for local energy storage? *Energy Research & Social Science, 69, 101606*

8.1. Introduction

While the total of renewable sources in the energy mix of the Netherlands in 2018 only amounted to 7.4% [1], this percentage is expected to substantially grow in the future according to the country's (inter)national commitments and plans. The anticipated (potentially accelerated) diffusion of renewables will necessitate alternative structures

and modes of organising for safeguarding the reliable provision of sustainable energy. Due to their intermittent and fluctuating (yet predictable) nature, the wide diffusion of renewables will stress the functioning of the electricity grid. Energy storage, which helps balancing the grid and also enables sector integration, is set as a priority area in the European Green Deal for ensuring the EU's objective for climate neutrality by 2050 [57].

In the Netherlands, as in the EU, securing the reliability of the grid is the main task of the grid operator. Safeguarding grid capacity and operation is considered a public task, enabling proper functioning of the electricity market. Integrating energy storage into the existing energy infrastructure allows balancing the fluctuating renewables and thereby supports the reliability of the grid [2]. Pumped hydro storage (PHS) is the oldest and more mature kind of energy storage, using natural or technical reservoirs for electricity storage and grid balancing at a relatively large scale. It already provides more than 50 GW storage capacity in operation in the EU [3]. More recently, other technologies for electricity storage have drawn attention, including batteries that typically apply for storage at a smaller scale [3]. Apart from securing a smooth grid operation, small-scale energy storage is supposed to potentially offer additional values to local communities, such as enabling them to engage in electricity trading, thereby increasing people's engagement in community activities and public awareness of energy and environmental issues [4]. It is, therefore, claimed that local energy storage not only can support the technological side of the energy transition but could also support the social side of it by addressing issues like democracy, transparency, ownership that accommodate the needs and expectations of citizens and local communities [5].

Yet, despite its promising theoretical potential, there are numerous practical and technical barriers. These involve management issues, ownership rights, and taxation and grid fees [6]. If such hurdles to integrating local storage are not addressed, they may prevent a wider deployment of energy storage in Europe. While its potential has been discussed for long, only recently some actors began experimenting with alternative storage systems and various ownership models. As regulators are working on defining the legislative landscape, the merits of alternative storage systems and their Business Models (BMs) are being investigated through demonstration and pilot projects.

One such pilot in the Netherlands involves the "*neighbourhood battery*" project. The project has been an initiative of Liander, part of grid operator Alliander, responsible for the local gas and electricity networks in various parts of the Netherlands. Liander's overall position and role in the energy transition is unclear because it is an actor embedded within a centralised and (so far) mainly fossil fuel-based energy regime, as well as an enabler of a competing, emerging distributed, renewables-based regime. Its actual role is thus increasingly hybrid. As the grid, can be an instrument that may increase the power of certain actors while undermining the influence of others, thereby contributing in the shaping of the power balance in the field, the role of the network operator is *per se* dubious. Focusing on the German energy transition, Blanchet (2015) argues that the role of the network operator is of *"divergent interpretations*" and a matter of conflicting visions of local energy transitions [7] (p.251).

In the case of the Netherlands, Liander has always focused on ensuring reliability, affordability and accessibility to energy [8]. Yet, acknowledging the new challenges

caused by an increase (and anticipating accelerating increase) of renewables in the Dutch energy mix, Liander also got involved in innovation around decentralised renewable energy. On the one hand, with its involvement in energy storage, network operator Alliander may want to strengthen its role in the energy transition. On the other hand, the organisation has used the neighbourhood battery to initiate collaboration with a local renewable energy provider and to communicate with the residents producing the electricity to be stored. This would suggest that local energy storage may function as a vehicle for organisational change and the deployment of a Collaborative Business Model (CBM) between the established regime and emerging renewable energy initiatives. For the realisation of this potential, the neighbourhood battery would need to evolve from a concept to a solid CBM that guarantees a fair value exchange[13] between the parties involved.

This paper analyses the case of the neighbourhood battery with the aim to study the discourses related to the potential impact of local energy storage on the position of parties operating in both the energy regime, in this case, a grid operator, and parties operating in niches, such as local energy initiatives. Thereby, this paper explores to what extent *collaboration between a grid operator and renewable energy initiatives on local energy storage could help increase the impact of renewable energy initiatives in the energy transition.*

The concept of a neighbourhood battery involves strategic decisions, and perhaps a strategic innovation, whose transformative potential depends to a large extent on the perceptions and actions of those involved. For this reason, this paper explores two specific questions:

1. What are the opportunities and constraints for a collaborative business model for the neighbourhood battery in the Netherlands?
2. What kind of tensions and challenges emerge for the main parties involved, the network operator and the local renewable energy initiative?

To address these questions this contribution explores and compares the perspectives of different actors in the case, i.e. network operator Liander, several Dutch renewable energy initiatives (REIs), including the Energy Service Company (ESCO) involved in the pilot, and end-users of the pilot. We analyse and discuss these perspectives in the context of institutional constraints for both the grid operator and local initiatives from end-users of the electricity stored. Section 2 presents the analytical framework and research methodology. Section 3 discusses the background of (local) energy storage as it is given by the literature on the topic: its expected benefits, its relation with community REIs, the legal framework around it, along with possible ownership models for it. Section 4 presents the findings as regards the societal costs and benefits as identified by the interviewees, the identified barriers and some first ideas on how a CBM for local energy

[13] Note that here, we understand value as a benefit or gain for a person or a community.

storage could look like. Section 5 discusses the contrasting perspectives on the concept of the neighbourhood battery. Finally, in Section 6 we reflect about our findings and their significance in relation to the institutional context presented in Section 3, and then, we conclude.

8.2. Analytical framework & methodology

8.2.1. Analytical framework

The deployment of the neighbourhood battery concept and the realisation of its potential requires the establishment of a CBM to find a new way to arrange costs and benefits. Our focus is on the value flows involved (value proposition and value capture), on the particular products/services that may be offered, as well as the overall architecture of value; all these BM elements may have an impact on the system and its transformation [8-10]. To study this impact, this paper takes a broad orientation on value, allowing the consideration of financial, social and environmental values in line with Sustainable Business Models (SBM) literature [9-13].

To systematically study how the neighbourhood battery concept under study (may) affect(s) the system, specifically vis-à-vis the diffusion of decentralised renewable energy, and to identify the barriers and opportunities for the establishment of such a CBM, we combine a BM perspective with a broader systems approach, which is offered by the theory of sustainability transitions. Starting hypothesis is that such diffusion of renewable energy necessitates the emergence of structures and practices, like the ones involved in the neighbourhood battery concept, namely, active participation of end-users and their collaboration with established actors in the energy domain. Sustainability transitions research [14] identifies dominant cultures, structures and practices (a regime) that provide stability to societal systems. But such regimes (in this case the Dutch centralised, fossil-based regime of energy provision organised through the market and energy policies providing energy to consumers) are also path-dependent and resistant to transformative change [15]. A transition is a process in which such a regime is simultaneously confronted with increasing external societal pressures (landscape), emerging competition from alternatives (niches) and increasing internal tensions and crises leading to large-scale disruptions and non-linear change [16-19].

Regimes develop path-dependently through optimisation and incremental innovation [14]. Yet, aligned with shifts in the broader societal context, new radical alternatives develop and emerge, which inevitably bring regimes to increased stress, crises, destabilisation and systemic reconfiguration [14]. These iterative interrelated processes of construction and destruction are illustrated in the X-curve (Figure 8.1), which has been introduced as a tool to discuss the dynamics and roles different actors take in the context of sustainability transitions [14].

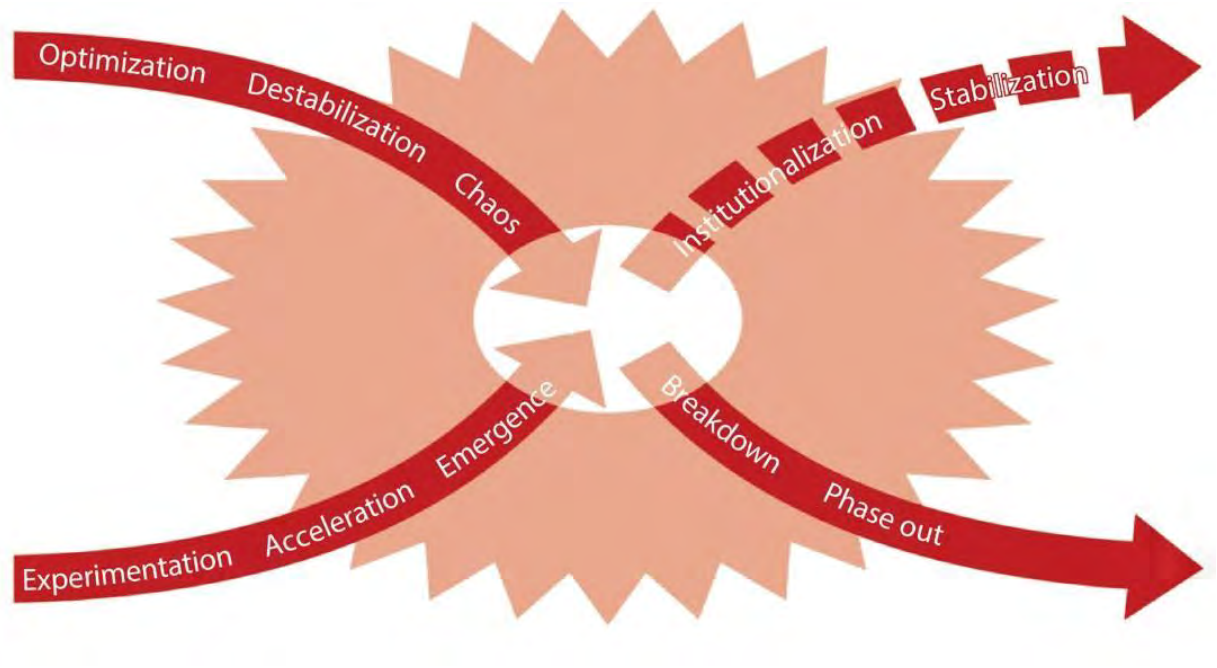

Figure 8.1: The X-curve (Source: [34])

For a more detailed mapping of the co-evolutionary dynamics between an innovation and its institutional context, we revisit the work of Smith and Raven [20]. Following Kern et al. [21], our framework specifically builds on Fuenfschilling and Truffer [22] who suggest considering niches as *"embryonic regimes".* As such, niches may mature and break through, but they may also be absorbed or dissolved by regime pressures [20]. Subsequently, niches can be understood as encapsulating the conditions for the emergence of potential future regimes, which may differ or conflict with the dominant regimes in a number of dimensions. These dimensions are used for the analysis of the interplay between innovations and their institutional context [23].

1. **Technologies and Infrastructures**: the material dimension required for the societal function including all technologies and physical infrastructures;
2. **User Practices**: the application domain of the concept or technology, and the associated new routines and norms of the users;
3. **Cultural Significance**: the intrinsic values (valuable "in themselves") associated with the societal function, which may be widely accepted as guiding principles, including the system's representation and symbolic meanings;
4. **Knowledge base**: involving scientific and tacit, practical knowledge associated with the societal function;
5. **Sector Structure:** the organisational networks and partnerships, the particular sector capabilities, along with the interaction platforms for coordination and negotiation within the sector;
6. **Policies and Political Power**: the political power exercised to influence or maintain the regulations, including the support framework, and
7. **Organisational logic**: the specific logic of how an organisation generates value, including organisational decision-making processes, routines and activities directed towards the achievement of organisational aims, along with issues regarding ownership and the relationships between investors, producers and users.

A systems' perspective enables the study of innovations within their context and sheds light to the emerging instances of friction, which could be considered indicators of emerging transition dynamics. While in the experimentation phase alternatives to the regime are typically marginalised, costly and underdeveloped, as time proceeds some alternatives might mature and diffuse in co-evolution with increasing regime destabilisation (e.g. [24]). One of the key questions within transitions research is then how such alternatives interact with elements from the regime and are mainstreamed: do they become captured by the regime or support regime transformation? One way to start exploring this issue of niche-regime interaction and its effects is to identify different dimensions of interaction and explore whether these interactions are transformative or not.

Given the power dynamics and imbalances between niches and regimes, the transition perspective would suggest that in earlier phases, niches like the neighbourhood battery will only support optimisation or be confined to pilots and experiments. During later phases of the transition, a reversed phenomenon may be noticed: given a destabilising regime, different actors may reposition themselves [25] and link to innovations emerging in the niche to form new coalitions, structures and practices that could lead to capture as well as transformation [26].

The neighbourhood battery is a typical example of such a niche innovation emerging in the context of a destabilising energy regime. It exhibits the potential to contribute to the transformation of the energy system through the support of the diffusion of renewable energy projects; as local energy projects grow in numbers and size, the introduction of local energy storage may be necessary for ensuring network stability and power quality, among others. At the same time, it may also contribute to optimising the status quo. The details of the concept's implementation (that is the how and under what conditions) will illustrate its value, exemplifying in this way the benefits of collaboration between the network operator and the REIs. This is the reason why this paper scrutinises the role of the network operator in the deployment of the neighbourhood battery concept.

8.2.2. Methodology

Data sources and collection

This research followed a single case study approach [27-28] of an energy storage pilot, the Neighbourhood Battery, which provides an example of a collaboration between a Distribution System Operator (DSO), an ESCO and energy consumers. The placement of the first author within the pilot unit of the Dutch DSO Alliander enabled a closer understanding of the neighbourhood battery concept and the creation of the rapport necessary for the research within the organisation.

Academic and professional publications on decentralised energy storage and its deployment were reviewed to build background knowledge around the topic and to identify crucial issues therein. Case-study research included participant observation in meetings of the organisation involved in the pilot. Next, 17 semi-structured interviews were carried out (April-July 2017), which with the permission of the interviewees were recorded. The people interviewed were: a) employees from various departments and positions within the network operator; b) the director of the local ESCO Tegenstroom;

and c) directors of renewable energy cooperatives that could express interest in the concept of the Neighbourhood Battery in the future. Additionally, the first author contributed and got access to a first survey on the end-users perspectives about benefits and concerns regarding the pilot.

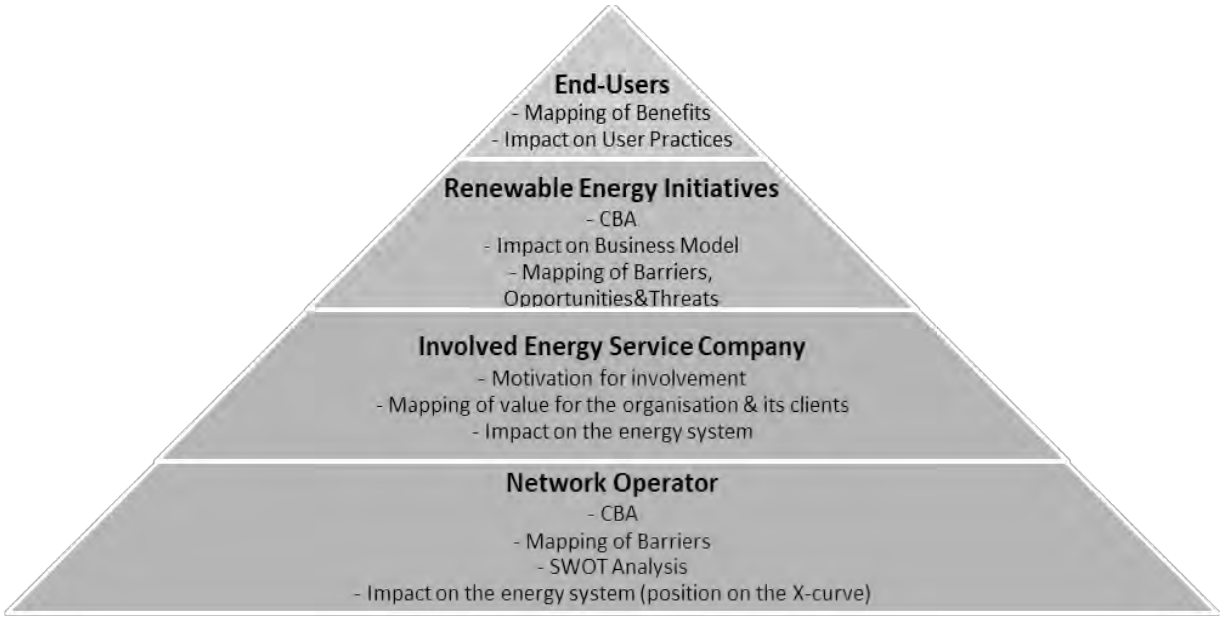

Figure 8.2: The research process

Within Alliander's environment, the research encompassed four areas: first, the concept's societal costs and benefits (i.e. value and disvalue); second, the barriers for the deployment of the concept; third the Strengths and Weaknesses of the company's internal environment vis-à-vis the concept's deployment, along with the related perceived Opportunities and Threats (i.e. SWOT analysis); and forth, the position of the project on the X-curve. For the latter, after a brief explanation, the interviewees were also asked to justify their choice. As based on academic insights on complex systems change, positioning an actor on the X-curve is always subjective, the focus here was on mapping the different perceptions of Alliander's employees regarding the pilot's contribution to the energy transition.

To better understand how the pilot works in practice, the ESCO operating the battery was contacted. This interview focused on the motivations for the involvement in the pilot, the value of the neighbourhood battery for the organisation and its clients and the project's potential impact on the energy system.

Several interviews explored the possible interaction of the concept with the BMs and strategies of REIs. Additionally, after communication with Tegenstroom, the first author was given access to the first survey on the end-users and their perspective on the neighbourhood battery. Prepared in collaboration with the DSO, Tegenstroom and the researcher's feedback (the first author provided input to the questionnaire), the survey was conducted by the local ESCO; about 58% of the pilot participants (N=19) filled the questionnaire in. Unfortunately, due to delays in the pilot, the survey took place before

the interaction of the end-users with the neighbourhood battery was fully established through the Home Energy Management System (HEMS).

Across the different stages, this research involved the participation of different employees of the network operator in interviews and meetings (co-)organised by the first author. This was made possible thanks to the official collaboration between the researcher and the organisation. The specific goal of this collaboration was (i) the exploration of the impact of the neighbourhood battery on the diffusion of decentralised renewables and the energy transition as a whole and (ii) the identification of all the central questions and insights that emerge in the context of the energy transition. It was agreed that such questions and insights would be discussed with the network operator in order to facilitate the reflection of the latter about the project and its overall role, something that can enable the organisation to respond strategically in the ongoing energy transition. In that, the research approach is close to what is described as action research [29-30]. Through collaboration with actors from the field, the research aimed to produce scientifically and socially relevant knowledge, supporting transformative action and the creation of new social relations [31].

Data analysis.

Summaries of the interviews conducted (including transcribed quotes of higher interest) were made by the first author, which were then coded and analysed per topic and perspective. The perspectives of the sub-groups of interviewees were compared within and across the different groups. Respecting the interviewees' anonymity, the research findings were compiled in a report, which was circulated for comments across the interviewees. The external validity of the findings was tested through discussions with multiple (energy) experts in a number of professional and academic settings, like workshops and conferences.

Limitations

Given the exploratory nature of this research, possible relations between concepts were sought to be explored rather than explained [27-28]. Hence, our small sample was considered suitable for our purpose. By assisting the reflection among the actors approached regarding their ongoing actions and respective position on the energy system, and a possible shift of any of these due to the introduction of a neighbourhood battery on the energy system this research aspired to contribute to transformative action. Yet, as no meetings between all stakeholder groups were organised during the research period, this research did not result in the creation of new social relations, although some inspiration for that may have been provided.

Furthermore, other limitations of this research involve, on the one hand, the time constraints regarding the duration of the first author's placement within the DSO, and on the other, her ability (or lack thereof) to immerse in the culture of the people and the organisation under investigation.

8.3. Research background: energy storage

Advocates of electricity storage argue that this may improve the working conditions and the stress-resistance of the electricity grid, making it more secure, reliable and responsive [2]. Storage systems meet tasks like frequency control, capacity or voltage support, emerging as promising assets for grid services [32]. This is especially true for battery storage systems that exhibit a fast response, quick deployment time, and high scalability [32]. Batteries enable the shift of electricity towards off-peak times, reducing grid congestion and energy losses. Consequently, it might lead to a lower need for investment in grid expansion and upgrades [2].

At the same time, energy storage can be used to increase the local self-consumption of decentralised generation. Increasing the consumption of their locally produced electricity, the owners of solar PV can reduce their demand from the electricity grid, and thus, their electricity bills. In fact, combined with a battery system, the actual self-consumption of electricity produced by a household solar system may increase from about 30% to around 60-70% [33]**.** In areas with high electricity prices, and supportive regulatory frameworks in place, like in Germany, or in areas with an excess of solar resources and relatively low grid feed-in remuneration, like in Australia, significant battery storage in connection with new PV installations takes place [32]. In Germany, for instance, every second newly installed residential PV system is combined with an energy storage system [34]. Such conditions are not present in the Netherlands but might in the near future as the diffusion of renewables accelerates, and energy prices are predicted to rise and government support schemes are developed.

Furthermore, the combination of energy storage and a HEMS in "smart home" concepts, is associated with optimising energy use and maximizing efficiency [35]. Research suggests that living in a smart home environment that could help reduce energy consumption and cut energy costs (with the support of smart meters, variable tariffs, smart devices, home automation, etc.) is met with positive reactions from the consumers [36]. Yet, some consumers are anxious about privacy, security, and, database transparency, as well as smart-meter capabilities in two-way communication with utilities [37]. Moreover, while in-home displays and persuasive feedback models may support sifting attitudes and behaviours to save energy [35], people find it difficult to change their lifestyles to save money [38].

Lombardi and Schwabe [39] having studied different scenarios through simulation models, argue that when battery owners share the service of their batteries with other users, the net value of the system almost doubles. When a battery is shared within a community, its levelized cost, i.e. the average total cost of building and operating it, per unit of total electricity generated over its assumed lifetime, drops by 37% for communities of up to 100 homes, as shown in a projected 2020 scenario in the UK [40]. Community energy storage also demonstrates higher financial returns than household storage [41]. Besides increasing affordability, also considering an initial investment for the installation, integrating energy storage into community energy systems supports the communities' energy security, efficiency, resilience and helps developing cooperation among neighbours [4-5].

Nonetheless, batteries come at a cost. While the discussion on the public media often focuses on the sharp decrease of their financial cost (e.g. [42]), scholars have been assessing the environmental and social costs of the production and usage of batteries [43-45]. Batteries can be inefficient, and their production from scarce natural resources can have high energy and environmental impacts, due to the recycling issues they face [44-45]. McManus [45] argues that when it comes to the materials required in battery production, the lithium ion batteries are the most important contributors to greenhouse gases and metal depletion, while the nickel metal hydride batteries have a more significant cumulative energy demand. It is argued that while batteries involve many finite resources for their production, it is unlikely that minerals such as lithium will run out in the near future due to our use of batteries [45] However, researchers stress that while on a global scale the availability of lithium for batteries is significant, the same does not hold for the EU27 that may get dependent on politically sensitive areas [46]. At the same time, the production of batteries involves risk of human rights violations in the supply chain in particular counties of extraction [47]. Therefore, the broader impact of mining, including its social aspects, underlines the need for increasing both recycling and material recovery [47].

To date very few local, citizen-led, REIs engage with local energy storage as the concept is still in its infancy [5]. The different configurations that have emerged in the few demonstration projects worldwide involve (i) shared residential energy storage, (ii) shared local energy storage and shared virtual energy storage [5] as shown in Table 8.1.

Storage type	Description
Shared residential energy storage	Network of residential energy storage of size up to 20 kWh installed behind the meter and EV batteries in consumer premises which can be shared among the community members of a specific location via the local physical grid.
Shared local energy storage	Energy storage of size tens to hundreds of kWh installed in front of the meter and behind the transformer in the local neighbourhoods with community ownership and governance as well as shared via the local physical grid.
Shared virtual energy storage	Network of decentralised stationary and mobility-oriented energy storage installed at different locations with independent ownership and governance which can be aggregated and virtually shared at national and international level via the main grid based on the market design and regulation. The size of the individual energy storage units is identical to that of residential energy storage or local energy storage. The range of virtual energy storage depends on the capability of the digital networking platform.

Table 8.1: Different configurations of community energy storage system (Adapted from [5])

When it comes to the organisation of shared local energy storage, end-users may (a) directly purchase a storage system to connect with their generation capacity, or (b) a third party may act as an aggregator to purchase a storage system for the management of their generation capacity [4]. When the management of a battery is done by an independent operator, the return on investment has been found to increase (at least slightly), and additional investment incentives emerge, because of higher workload, more flexibility and increased income opportunities [39]. Studies in Europe and the US have already demonstrated that the provision of a single service (e.g. kWh) is not sufficient to make storage schemes cost-effective; services such as frequency stabilisation and voltage stabilisation have a much higher commercial value [3]. Interestingly though, the Dutch DSOs, suggest that no large payments for flexibility should be expected from them, as generally, flexibility has "*relatively a limited scope and limited net benefits*" for the network operators [48] (p.39).

This statement illustrates the challenges around the market deployment of energy storage, which involves accessing and monetising multiple value streams, safeguarding that all parties involved can clearly see its value and pay accordingly for the benefits it offers [49]. While ownership models are fundamental for the deployment of energy storage, no consensus exists nowadays over the actors that should be given the ability to own and control storage devices. Yet, clear ownership rights are central for the owner/operator to evaluate the cost/revenue balance over the lifetime of the asset for one to be able to build a business case upfront for the asset's construction [49]. If the estimated return is too low, uncertain, or spread across too many sources, the business case becomes unreliable, resulting in less attractive concept deployment [49].

Due to their access to information about electricity demand and supply, and their resulting ability to sell sufficient balancing and ancillary services at the optimal time, network operators are thought to be at the best position to optimise the use of storage technologies to balance the system (see also Table 8.2). However, although not substantiated by recent experience in Italy and Belgium, their involvement in owning and operating batteries brings concerns about a possible distortion of the competition in the generation and supply markets [49].

Model	Description
DNO contracted	The Distribution Network Operator (DNO) owns and has full operational control over the storage asset. Before the storage asset is built, long-term contracts are agreed for the asset's commercial control in certain periods of time.
Contracted services	The DNO offers long-term contracts for services at specific locations with commercial control in certain periods of time.
Charging incentives	The DNO sets the DUoS tariff to create signals that incentivise peak shaving to reflect the value of network reinforcement.
DNO merchant	The DNO owns and has full operational control over the storage asset.
'DSO' role	The DNO owns and has full operational control over the storage asset. In addition, the DNO is given a regulatory role in balancing and controlling aggregated demand and generation, taking on an active role as a Distribution System Operator (DSO).

Table 8.2: Proposed business model specifications for DNO ownership and operation of storage assets (Source: [50]).

Actually, under the current energy law in the Netherlands, the use of energy storage by a DSO is merely permitted if the installation is only used by the DSO itself: no shared use is allowed. Connecting a battery to a solar PV and deploying it in an energy market violates the Group Prohibition (Article 10b of the Electricity Act) and the Prohibition of Competition (Article 17, first paragraph, E-Law) [51].

The recently adopted at EU level Clean Energy package (which was under negotiation during the period of the placement in the network operator) prohibits the DSO to own, develop, manage or operate energy storage facilities, unless specific conditions are fulfilled (see Table 8.3).

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on common rules for the internal market in electricity and amending Directive 2012/27/EU (recast) - Article 36: Ownership of storage facilities by distribution system operators
1. Distribution system operators shall not own, develop, manage or operate energy storage facilities. 2. By way of derogation from paragraph 1, Member States may allow distribution system operators to own, develop, manage or operate storage facilities, where they are fully integrated network components and the regulatory authority has granted its approval, or where all the following conditions are fulfilled: (a) other parties, following an open, transparent and non-discriminatory tendering procedure that is subject to review and approval by the regulatory authority have not been awarded a right to own, develop, manage or operate storage facilities, or could not deliver those services at a reasonable cost and in a timely manner; (b) such facilities are necessary for the distribution system operators to fulfil their obligations under this Directive for the efficient, reliable and secure operation of the distribution system and the facilities are not used to buy or sell electricity in the electricity markets; and (c) the regulatory authority has assessed the necessity of such derogation and has carried out an assessment of the tendering procedure, including the conditions of the tendering procedure, and has granted its approval. 3. The regulatory authorities shall perform, at regular intervals or at least every five years, a public consultation in order to assess the potential availability and interest in investing in such facilities. Where the public consultation as assessed by the regulatory authority, indicates that third parties are able to own, develop, operate or manage such facilities in a cost-effective manner, the regulatory authority shall ensure that the distribution system operators' activities in this regard are phased-out within 18 months. As part of the conditions of that procedure, regulatory authorities may allow the distribution system operators to receive reasonable compensation, in particular to recover the residual value of their investment in the energy storage facilities. 4. Paragraph 3 shall not apply to fully integrated network components or for the usual depreciation period of new battery storage facilities with a final investment decision until ... [the date of entry into force of this Directive], provided that such battery storage facilities are: (a) connected to the grid at the latest two years thereafter; (b) integrated into the distribution system; (c) used only for the reactive instantaneous restoration of network security in the case of network contingencies where such restoration measure starts immediately and ends when regular re-dispatch can solve the issue; and (d) not used to buy or sell electricity in the electricity markets, including balancing.

Table 8.3: EU Policy landscape (source: [52])

Instead, the Directive clarifies that third parties are the preferred actors to own, develop, operate and manage energy storage, as long as they can do it timely and in a cost-effective manner. Additionally, the Directive clarifies that consumers and citizen energy initiatives should be able to consume, to store, and to sell self-generated electricity to the market, and to participate in all electricity markets by providing flexibility to the system. For the system's operational security, Transmission System Operators (TSOs) are urged to procure balancing services subject to transparent, non-discriminatory and market-based procedures. And in fact, the Directive also underlines that regulatory authorities and TSOs should establish the technical requirements for participation in those markets in close cooperation with all market participants.

8.4. The neighbourhood battery from different perspectives

8.4.1 Case description.

Between the first quarter of 2017 and the end of 2018, a pilot neighbourhood battery with a capacity of 140kWh (125kW inverter), was tested on 280 solar panels installed on a social housing project by Tegenstroom, an ESCO initiated by Haarlemmermeer municipality. Liander has not made the information on the undertaken investment costs for the battery available to the public[14].

The pilot allowed DSO Liander to study the battery's behaviour and the reaction of the network. In parallel, 35 customers of Tegenstroom (renting 8 solar PVs each) were offered to maximise their self-consumption, as their excess electricity was stored in the battery until needed; each of these participants got access to a capacity of 3kWh in the battery. During the pilot period, the project participants received a discount of about €15 per month on their cost of renting their solar panels from the ESCO (50%). The participants also got access to a HEMS appliance, which they could keep after the termination of the pilot. Liander owns the battery, its management system, and the land where the battery is located. Access to the energy-related data was arranged in coordination with Tegenstroom, and a company, which created the ICT-tool assisting end-users in optimising their self-consumption by increasing awareness about consumption behaviour.

Next, the main identified societal benefits and societal costs of the neighbourhood battery are summarised (4.2). Building on that, the system dimensions listed in 2.1 are used to describe the value architecture and the main barriers and opportunities that arise from the tensions between actors in the niche and those in the regime (4.3) and how these might translate into a CBM.

[14] Nonetheless, national media suggest a cost of about €100.000: https://www.volkskrant.nl/nieuws-achtergrond/met-zijn-allen-aan-de-buurtbatterijhuurders-experimenteren-met-lokale-stroomopslag~b64da337/

8.4.2 The values related to the neighbourhood battery concept

Societal benefits.

Apart from the perspectives articulated by interviewees from Liander, and initiators of several Dutch REIs, this section also reports on how the end-users involved in the battery-project view possible societal benefits. Table 8.4 highlights the perspectives from both the grid operator and the interviewees from various REIs on benefits that potentially follow from the neighbourhood battery.

Network operator perspective	**Renewable energy initiatives perspective**
Energy security	Energy transition support and acceleration
Power quality	Autonomy/ Independence
Improved connection with clients & public	Financial benefits
Financial advantages through energy markets access - Reduced energy cost (incl. tax) for end-users - Increased ROI for 3rd parties	Image
Autonomy/ Independence	Energy security
Social cohesion	Lower network costs
Energy awareness	
Relative benefits compared to household-level batteries:	
Lower financial cost for network operator / Avoidance of investment for end-users	Higher efficiency
Less material	Higher cost-effectiveness
Higher efficiencies	Higher capacities
Less hassle for society	Easier for the network operator
Safer solution	Less administration required
No cost in residential space	

Table 8.4: Identified societal benefits of (local) energy storage

From the perspective of the network operator the societal benefits can be grouped in three categories: a) benefits for the DSO or, a public company; b) benefits for a commercial party, like an energy cooperative; and c) benefits for the end-users.

As for the network operator, the benefits mentioned involve the (possible) avoidance of a *future* problem for the DSO; in a system characterised by higher diffusion of renewables and increased energy consumption, flexibility is seen as valuable for grid support. Energy storage offers extra capacity that may be used for balancing possible congestion and for controlling voltage on the grid. Energy storage is thus expected to improve power quality. Thereby, it may allow Liander to either avoid or postpone the investment in cables for low-voltage systems. Liander interviewees argued that local energy storage in "stressed" areas is possibly a cheaper solution than grid reinforcement, provided that grid reinforcement will be needed anyway. Additionally, it was argued that the neighbourhood battery may also enable Liander to improve its relations with its clients and the public overall. Although the main advantage is possibly not observed by the end-users, the battery contributes to energy security and power quality, which is a public interest provided by the DSO.

As for the commercial party, in this case, the ESCO Tegenstroom, the value offered relates to the opportunity to enter the energy capacity- and frequency markets. The ESCO or the end-users engaged in decentralised renewable energy production can use the neighbourhood battery as an option to get involved in electricity trading. Access to the battery may also enable a precautionary stance against very low (or negative) prices for the energy generated.

For the end-user, benefits from the neighbourhood battery would relate to issues like increased energy autonomy, as they now use more of their "own" green electricity. Interviewees on the side of Liander also expect the battery to raise energy consciousness and social cohesion.

Liander interviewees also pointed out a number of relative benefits as compared to household-level batteries, such as lower costs for both network operator and end-users, less environmental impact by saving (scarce and expensive) materials, higher efficiencies, less hassle for the public as well as less impact on scarce public space.

Interviewees from several REIs expressed difficulties with articulating a community perspective. In general, they acknowledge that integration of energy storage into decentralised energy systems may offer several opportunities to local communities, like energy resilience or increased affordability [4]. Yet, since its diffusion in the Netherlands has been rather minor, their reactions offer general insights that are also ambiguous. From the REIs perspective, the principal value of energy storage would relate to supporting the energy transition. By securing the network, the initiatives would be encouraged to proceed with investing in renewable projects. Storage facilities are expected to function as a backbone to the sustainable energy system of the future since it will take away the "*what if the wind doesn't blow*" argument.

Being supportive of the *future* energy system, energy storage is also seen as crucial for materialising the initiatives' vision for energy autonomy, ownership and control. On a

different note, although the REIs "*already have a good image"* (Initiative 3), the addition of a battery to their system is also thought as having a positive impact on their image.

Moreover, REIs expect financial benefits. Beyond being assisted to "stabilise" their energy price, with the addition of energy storage REIs are also enabled to take part in energy trading, which may increase their Return on Investment on renewable energy generation. REIs could engage in trading either through the energy utilities they currently collaborate with or on their own. Furthermore, the REIs anticipate that local energy storage will, eventually, result in lower network costs, which may result in lower energy bills for everyone. It was even suggested that members of local REIs would be "*willing to pay a bit more for using their own local energy*" (I2) that a battery would support.

As regards the neighbourhood battery vis-à-vis household batteries, the REIs interviewees prefer the former. They expect a neighbourhood battery to be more efficient, more cost-effective, offering more capacity, while also being "*better*" for the grid operator. Yet, in their opinion, its realisation requires quite some organisation. However, household-level energy storage would involve too little capacity and too much administration, which is a hassle for organisations dependent on working with volunteers.

Worth mentioning is that a survey carried out by Liander after the installation of the neighbourhood battery sheds some light on the ideas on values (societal benefits) identified by consumers involved in the battery project. A large majority, 84% of the respondents, expected to pay less for their energy, which could be related to the fact that they received a discount because of their participation in the battery project. Regarding their energy related behaviour, a large majority, 90%, mentioned that they monitor more often the production of their solar PVs. However, over two-third, 68%, did not take any additional energy-saving measures since. Lastly, contrary to the expectations of the network operator, the survey does not show evidence for a change in the interaction pattern between neighbours due to the battery project: 74% of the respondents pointed out not to engage in more discussions with other neighbours. We cannot conclude from this finding, as we do not have information with respect to the communication of the project and how it was presented in advance.

Societal costs

Table 8.5 gives an overview of the societal costs (disvalues) identified by interviewees from Liander and REIs:

Network operator perspective	Renewable energy initiatives perspective
Material costs	Material costs
Possible environmental damage due to the difficulty of recycling	Environmental damage due to the impossibility of recycling
Space & aesthetics	Space & Appearance costs
Loss of tax income for the state	Maintenance costs
Emission of soft low-frequency noise	Emission of soft low-frequency noise
Safety concerns	Safety concerns
"Socialisation of costs" at the local environment	Potential (societal) costs across value chain

Table 8.5: Identified societal costs of (local) energy storage

The employees of Alliander mostly pinpointed to material issues related to technology and infrastructure. The information on the undertaken investment costs for the battery to store 140kWh is not public. Nonetheless, Alliander employees consider the battery concept as still "*pricy*" with unclear reduction of CO_2 emissions across the asset's life-cycle. Some interviewees also pointed to environmental costs related to battery storage, such as issues of waste, safety, the emission of soft low-frequency noise and, especially for the densely populated Dutch cities, the issue of scarce space. Aesthetics are also important, as an employee of the organisation pointed out that local governments do not want to sell their land to the organisation "*because they make it look ugly"* (Employee 7). Interestingly, interviewees pointed out that higher energy self-consumption would have the negative impact of a decline in tax income for the state, which will result in higher network costs for the non-prosumers who do not share in the possible benefits of local energy storage.

The REIs interviewees mostly pointed to environmental costs, including the (perceived) impossibility of recycling batteries. The initiatives stress the importance of the overall quality of the batteries, in relation to both safety and characteristics such as capacity and speed to load and/or unload. They consider the environmental performance of the technology as crucial, together with the issue of maintenance. Some brought up the issue of social sustainability and the worrisome conditions in countries of extraction/production of the material of the batteries. The issue of noise was mentioned but considered of less importance.

When discussing social costs with the REIs interviewees, some were unable to mention any. One interviewee mentioned that in view of their goal for self-sufficiency, "*one important step is storage… so I can't think of any social costs*" (I2). Cost, nevertheless, functioned as a *silent* decisive factor, although not initially expressed, the current high

costs of the technology was mentioned as a barrier for the development of local energy storage.

Interestingly, two opposing attitudes emerged concerning the decision-making process about community energy storage and its deployment by local REIs. While some of the interviewees suggested that the preferable solution should be decided by the people locally, others pointed that proper communication and adequate cost-benefit distribution among partners could address possible resistance by the locals on issues like aesthetics or noise.

8.4.3. Value architecture

Interviewees were asked about barriers and opportunities. Alliander's employees were also consulted about the strengths and weaknesses of their organisation and how they relate to the deployment of the neighbourhood battery. Then, interviewees were invited to share their ideas regarding the possibilities of deploying such a CBM.

Barriers

The first step in the architecture of value is to identify, for each of the distinguished system dimensions, the barriers for the deployment of the neighbourhood battery concept, as discussed by the employees of the network operator, and the interviewees from the REIs. Table 8.6 summarises our findings.

	Network operator perspective	Renewable energy initiatives perspective
Policies & Political Power	• Legislation	• Lack of additional value (today) • Taxation issues • Permits issues
Organisational logic & Sector structure*	• Vagueness in roles & responsibilities • Lack of social business case: financial transaction as a bottleneck • Uncertainty about energy price development • Difficulty of collaboration with local governments	• Uncertainty about roles & responsibilities (ownership, control, maintenance) • Unclear cost-benefit distribution (across value chain)
Knowledge base	• Lack of knowledge vis-à-vis the development of CBMs • Uncertainty about energy price development • Lack of / low societal interest • Limited consumer knowledge & associated concerns	• Lack of knowledge vis-à-vis batteries' maintenance • Lack of public awareness around energy
User practices	• Safety issues & Health concerns (radiation) • Consumer preference for household batteries • Privacy issues (linked to smart meter)	• Lack of space & place • Aesthetics
Cultural significance	• "Pricy technology" • "Ugly installations"	• "Ugly installations" • "Ethics issue" regarding social risks in countries of production • Lack of full control of energy delivery
Technology & Infrastructure	• Relative high financial cost • Lack of / ambiguous CO_2 reduction potential across life-cycle	• Low cost/benefit ratio • Lack of full control of energy delivery • Emission of low-frequency noise

Table 8.6: Barriers, mentioned by interviewees, for the implementation of the neighbourhood battery

Policies & Political Power

For both the network operator and the REIS, the main barriers relate to the policy domain. The current legislation strongly restricts the competence of the DSO as regards ownership and operation of a local storage facility. REIs interviewees argued that the current net-metering ("Saldering") and tax relief regulations ("Postcoderoos") do not make energy storage an attractive solution for the end-user. This is because the end-users are exempted from paying energy tax over renewable energy which they have produced themselves on their rooftop or within their immediate living environment (postal code area arrangement). They uttered concerns since Dutch government has announced to repeal these regulations in the near future, whereas there is uncertainty as to whether they will be replaced by other measures enabling citizens to invest in "their own" renewable energy. However, the abolishment of current regulation would make it more attractive for citizens to invest in local energy storage. REIs interviewees also fear restrictive regulation and bureaucratic hassle, if they would have to apply for specific permits in case, they want to operate an energy storage facility in the future. In fact, for the neighbourhood battery itself, the newness of the concept made it quite difficult for Liander to acquire a permit from the municipality concerning the pilot. No rules exist for the civil servants responsible to make a decision.

Organisational logic & Sector structure

Liander interviewees made some critical comments about the organisational weaknesses of the DSO vis-à-vis its ability to develop and support innovations. Used to pursue long-term investments with 40 years of assets cycles, Liander was depicted as cables "*cookies-factory*", lacking structure and people with the required expertise to pursue innovative storage options. The organisation would lack people with the technical skills necessary to manage battery safety and possible environmental risks, as well as the skills to interact with customers. More importantly, the interviews documented a certain gap between innovation and operation, explained by the lack of a supporting structure coupled with real incentives for the managers to embrace innovation; this was underlined as "*the biggest issue for this company*" (E8). Overall, the company is portrayed as too slow and bureaucratic, with a lack of ability to absorb changes in its daily operation.

When asked about the position of the neighbourhood battery on the X-curve and its significance for the transition, most of the interviewees placed the project on the experimentation phase, as the pilot specifically involves testing completely different technologies, which require different ways of thinking and organising around the societal function of energy provision. Some interviewees argued that the project is slowly moving to the acceleration phase, which involves the emergence of new networks and partnerships. For some others though, the neighbourhood battery fitted under the optimisation phase, as the network operator is thought to only be using the concept to improve its own position and the processes that it is already involved in. Lastly, it has also been argued that the neighbourhood battery concept cuts simultaneously across both the experimentation and the optimisation phase: it is a new technology and overall process that, under certain conditions, may still support Alliander in its main purposes.

The lack of transparency, connected to the organisational culture, has also been pointed as critical for hampering the development of innovations like the neighbourhood battery. Liander interviewees mention that their company is scared of sharing information with the outside world, possibly because of the need to maintain the image of a "*very very reliable grid*" (E9). The focus on security and reliability, in turn, results in a lack of attitude for collaborative problem solving with the participation of other stakeholders.

It was suggested that the company is able to collaborate with other actors only when the latter follow the company's plans and ideas. For this, Liander does not necessarily want to own the battery, but it has to be in control in order to avoid possible system failures. As argued, the organisation's role is to maintain the network "*stable and trustworthy*", and thus, giving market parties access to the battery to trade could only be possible, if this would not obstruct its core business. Some interviewees pointed out that not being involved in the business of managing rage facility would be preferable as long as the grid operator will "*make the rules so that the third party can come and do it"* (E9). Thus, instead of collaboratively designing and carrying out a shared value creation for local energy storage, the ideal situation for the network operator would be: "*we will collaborate, but we will tell you what to do*" (E9). Interviewees add that the organisation appears to lack a clear vision on local energy storage and, because of this, might face difficulties in designing the guiding principles necessary for coordinating its different departments in the deployment of innovation projects like the neighbourhood battery.

From the discussion above it follows, that for the Alliander interviewees, while the organisation is considered to have the "intention to collaborate with a third party", collaboration might undermine Liander's main task to maintain full network stability. Its specific problem-solving capacities may, therefore, become inhibiting for the development of a CBM for local energy storage if the organisation wants to top-down set the rules of the game.

For them, a second barrier follows from this. For the deployment of the neighbourhood battery concept there is much uncertainty with respect to the future roles and responsibilities of the actors involved. This directly relates to the lack of clarity around the financial transactions involved in the (still) lacking social business case. The divided ownership and control, and the question who has the right for a "first ride" on the asset are in conflict with the focus of the network operator on complete control of system assets for full network stability.

The uncertainty about roles and responsibilities is also central for the local REIs, who are supposed to operate as a third party. Who owns, who controls and who maintains the battery system? Financing such a concept that involves different partners is seen as very complex and the lack of relevant knowledge is evident. Crucial for the REIs is also the overall cost-benefit distribution across the entire value chain: starting from the regions where delivering the raw materials for the battery to the specific location where the battery is going to be installed. On the latter, the interviewees from the local REIs argued that rational arguments combined with *sufficient* financial benefits will be necessary for the deployment of a CBM for the neighbourhood battery; it was suggested that *"anything that has to do with making the energy system better is interesting - as long as there is a business case behind it*" (I5).

Knowledge base

Future technological breakthroughs that are potentially more efficient and financially preferable for the DSO and could outcompete decentralised energy storage through batteries were considered as possible threats. Linked to the technology, the consumer knowledge base was also seen as problematic for the deployment of the concept. Specifically, Alliander's employees focused on the existence of a low societal interest in the topic of energy storage, linked to issues about safety and health concerns (possible radiation), or privacy (regarding the smart meters connected to them). REIs interviewees pointed to lack of public knowledge by stating that "*people are not aware that nowadays we are using the grid as a big battery*" (I2&I5).

REIs interviewees also mentioned the maintenance cost of batteries due to lack of relevant expertise Other barriers related to the newness of the concept and the level of control of the battery and the technical unfeasibility to direct specific kWhs from a specific source to specific end-users, if this would be required.

User practices

When it comes to possible threats for the deployment of the neighbourhood battery, the people involved in the REIs pointed to low social acceptance because of "general mistrust in new technology", resulting from, for instance, malfunctioning or safety-risks. Furthermore, consumers could shift to private storage systems, if this would bring lower cost or getting off-grid. Also, the communication between Alliander and the consumer could provide a barrier.

Cultural significance and Technology & Infrastructure

A lot of statements cited above relate to the novelty of the technology. Many interviewees have argued that this will create uncertainties, but it has the potential to also affect the current culture within the three stakeholder groups involved. This is especially true for the grid operator, which was depicted as cables "*cookies-factory*", lacking structure as well as people with the required expertise to pursue innovative storage options. No doubt, that innovative storage options will bring about changes in the culture within the organisation of the network operator. In case of a CBM, the neighbourhood battery is expected to also change the culture in the energy system at large. REIs may need to expand their activities into the field of energy trading, which may provoke resistance within the energy communities as well as among end-users who may get involved into a new type of responsibility they have not chosen for. However, since REIs in the Netherlands are supposed to engage in partnerships with existing energy companies who can do the trading for them, the cultural shift may be less significant than it seems.

Opportunities

Policies & Political Power

From the network operator perspective, the main barriers for the future deployment of the concept of local energy storage relate to the policy domain, which is also supposed to offer a major a central opportunity. Interviewees expect that overcapacity on the grid will decrease by the closing down of coal-fired electricity plants, starting by 2020. A decrease

in overcapacity will put pressure on the grid operator and energy companies with responsibility for grid management, to treat the electricity transported in a more economical way, which would be an incentive for expansion of storage capacity. These interviewees also pointed to the net-metering regulation and the energy tax relief scheme which are supposed to phase out after 2023, or significantly change by 2020. The general progress in the Energy transition also comprises an opportunity for the concept in itself, since the increased share of renewable energy may demand more batteries as the backbone of the electricity grid.

From the perspective of the REIs, the focus has been also on policy, specifically on the possible phasing out of the net-metering regulation and the energy tax relief scheme. Obviously, such measures would undermine the vulnerable BM of the REIs, but at this point, local energy storage presented by the neighbourhood battery could function as their Guardian angel. After all, energy storage would enlarge their opportunity to benefit from their "own" locally produced electricity. Hence, together with the overall progress of the energy transition, the neighbourhood battery could emerge as a critical opportunity.

The policy framework for electricity storage, as discussed in Chapter 3, offers yet another opportunity for the REIs. Batteries comprise a tool for them to enter the energy trade market since grid operators trade is a no-go area. The REIs imagine that by managing the neighbourhood battery, their current suppliers or other commercial parties will enable them to benefit from energy trade. At the same time, they do not exclude the possibility of engaging in energy trading themselves, transitioning in parallel towards becoming Programme Responsible Parties (PRPs)[15]. Therefore, the possible development of the REIs embodies another opportunity for the deployment of the concept.

Organisational logic

With its assets "*literally connected to society*" Alliander is portrayed as a pioneering and visionary organisation, with plenty of ideas, energy, funds, creativity and intention to work together with other actors. Its problem-solving capabilities and its knowledge and experience with managing energy systems were also mentioned as its crucial strength for the development of the battery. While some might see the network operator as being "*naughty*" and looking for the boundaries of the law, as pointed by one of its employees (E6), the organisation is actively involved in looking for solutions that support the energy transition. Yet, when the external environment allows, it is unclear whether the organisation would be able and willing to develop and maintain a project like the neighbourhood battery.

[15] Program responsible parties develop and provide to the system operator programmes for production, transport and consumption of electricity. They are then expected to act in accordance with these programs and if they fail to do so they face penalties.

Technology & Infrastructure

The majority of other opportunities raised by employees of the network operator relate to technology and infrastructure. The focus went on the expected decrease of the energy storage cost (only up to a level, since the neighbourhood battery competes with home batteries), or a possible increase of the market energy prices in the future. Technological developments such as the emergence of smaller and more efficient batteries (keeping in mind the competition with household energy storage), or social developments as the emergence of the need for energy independence while remaining on-grid, were also mentioned. The possibility of using the decentralised batteries for "*Bottom-up black start*" in case of emergency, was added as another opportunity. This refers to the use of energy storage to restore the system after a black-out [53] (p.33). Lastly, the black-out fear factor was thought as another opportunity for the deployment of energy storage; specifically, it was argued that a less stable system could actually function as a facilitator for the deployment of energy storage systems (E5).

Towards a collaborative business model for local energy storage?

The employees of the network operator did not elaborate on a CBM on local energy storage. As pointed out by one interviewee, this lack of a concrete idea about a possible CBM is due to the fact that the organisation is not interested in capitalising this market opportunity. Nonetheless, during the pilot phase, some exploratory discussions between Alliander and some REIs were taking place. It was suggested that the network operator would be more interested in designing the rules for a third party to come, organise, and operate the local energy storage.

On the other hand, the lack of concrete ideas from REIs on the possible influence of a neighbourhood battery (or, in fact, any other configuration of energy storage) on their BMs may be explained by their lack of experience on the topic. During the interviews, the REIs principally focused on the benefits that energy storage involves for them, namely the opportunity to increase their self-consumption, together with stabilising the financial return from it.

For some, the main advantage of the battery is that it would allow them to continue with their current project plans, leaving their BM structure intact. Conversely, others argued in favour of developing completely new BMs, focusing on making full use of the potential benefits that energy storage entails, such as the provision of ancillary services to the network operator.

Specifically, on the development of a CBM, some suggested, for instance, to only discharge the battery during off-peak hours. The saved costs from such services to the network operator could be then split between the DSO and the REIs, thereby allowing the latter to pay back the battery to the former and gain full ownership of it. Others pointed out that local energy storage could actually enable REIs such as renewable energy cooperatives or cooperation between them, to become PRPs. While the former proposition involves the assumption that the battery is (initially) owned by the network operator, the assumption behind the latter proposition is that the ownership and control of the battery belongs to the REIs. Most interviewees from REIs, nevertheless, questioned this idea

regarding the acquisition of energy storage assets because the initiatives lack the required technical expertise, especially for their maintenance.

The explorative interviews suggest that the concept of the neighbourhood battery could be a competitive energy storage option for local REIs, with or without the involvement of a third party for the ownership of the battery. Yet, while the higher capacity and efficiency it offers, also translating in better cost-effectiveness, are considered desirable, the REIs approached expressed the impression that more effort would be necessary for the deployment of such a CBM and, thus, the need for proper communication and adequate cost-benefit distribution among the parties involved was stressed.

It worth noting that a report from DNV-GL Energy (2018) suggests that at the current prices of battery technology, the neighbourhood battery concept is feasible at specific locations [53]. It discusses a scenario where a technical need for congestion management, namely 10MW power for 1.5 hours, present during 15 identified peek-weeks, can be serviced by a Li-Ion neighbourhood battery (10 MW/25 MWh). It is suggested that with a cost of 350 €/kWh, a business case appears to be feasible, through the uncertain revenues from services to the grid. The report underlines the principal role of the DSO for the concept's implementation.

8.5. Contrasting perspectives on a collaborative business model

As the energy transition is accelerating, it is still largely unclear which pathways will be taken and how actors and elements from incumbent regimes and emerging niches will reconfigure towards future energy regimes. The case of the neighbourhood battery illustrates the tensions and uncertainties when niche and regime encounter each other, while they both seek for their own position. This is illustrated by the ambivalence among the interviewees from both DSO and the REIs with regards to all BM elements presented in section 2. First of all, for a CBM clarity is required with respect to the values involved, and the cost-benefit distribution. In the case of the neighbourhood battery, this is far from self-evident. This section discusses and contrasts the different perspectives, thereby focusing on the implications of institutional constraints for the prospects of battery storage as social innovation.

Concerning the values involved, the employees of the DSO exhibited a wider perspective as compared to the interviewees from the REIs, as they mention issues of relevance for the DSO itself, third parties and the end-users. However, the most important benefits mentioned by Liander interviewees are not necessarily considered as such by others, as these values are also inherent to the current system, i.e. energy security and power quality. Still, the REIs interviewees acknowledge the (future) relevance of these values. The REIs interviewees comprehend that a more secure and cheaper network will help them realise values of their own, ranging from the feeling of energy autonomy to financial benefits, but it would not necessarily imply a new modus operandi for REIs themselves. Instead, the main values mentioned by both Liander employees and REIs imply a trade-off to be made by the grid operator between different means for carrying out its primary societal task, to maintain energy security in the most cost-effective way.

For a DSO like Liander, grid reinforcement would probably fit in best with its current organisational logic, lacking structure and people with the required expertise to pursue

innovative storage options. A related barrier is that, for a neighbourhood battery, the DSO must collaborate with other parties in realizing a societal goal that by definition is the responsibility of the grid operator. Interestingly, institutional constraints imposed on the DSO by Dutch and European regulation[16] could provide a barrier for implementing small-scale battery storage options, because they would add significant organisational complexity to the grid operation task, producing uncertainties that could affect the system. With this in mind, a grid operator would be incentivised not to engage in battery storage activities, even if this would prove to be a more cost-effective option than grid reinforcement.

As regards the disvalues of neighbourhood battery storage, representatives of both REIs and Liander stressed sustainability issues of battery technology across the value chain, especially referring to the ecological and societal impact of mining and hazardous waste because of difficulty of recycling. Both also pointed to local environmental impacts, such as safety risks, low-frequency noise and loss of (urban) landscape quality because of battery containers.

All in all, although expectations concerning the neighbourhood battery slightly differ among the parties involved, we do not yet observe strong incentives for the grid operator to proceed with the neighbourhood battery. It is widely assumed that a neighbourhood battery comprises *relative* benefits for those who are currently considering options for energy storage already, household storage in particular. However, in case of inaction on the side of the grid operator, these benefits will not be materialised. Even more, there is a likelihood that in case of inaction practices will emerge outside the realm of DSO control that may negatively affect the system. So, the grid operator faces a dilemma: taking action may lead to uncertainties, challenges to the established organisational logic and loss of control because of the involvement of third parties, whereas inaction may, in the end, have an even worse impact.

Second, there is the related issue that grid operators, performing as public actors vis-a-vis market parties primarily driven by private interests, would like to leave a clear mark on the transition, but, instead, are faced with developments that decrease their weight. In the Netherlands, the privatization of former government (provinces, municipalities) owned energy companies, merging into big transnational companies, led at the beginning of the 21st century to regulation that forced the private companies to renounce their grid divisions, which had to remain public. Over the last 15 years, attempts of grid operators, Alliander in particular, to take a more proactive role have failed. REIs have welcomed the organisation as an ally in their struggle for energy independence. As was confirmed by some interviewees, the neighbourhood battery could provide an opportunity for the operator to manifest itself as a public player.

[16] Through its transposition in the Dutch context in the coming future.

A CBM together with community energy initiatives for the Neighbourhood Battery would imply both a technological and a social innovation. To realise this, the possible conflict of interests of the grid operator and the REIs must be given attention. The latter requires negotiation of the cost-benefit distribution and clarification of the roles and responsibilities of the parties involved. The major institutional constraint thereby is that, under normal conditions, the grid operator is not allowed to manage the battery, since an important element in battery management is energy trading. Whereas grid operators are not allowed to trade, REIs are.

As mentioned by several interviewees, trading will enable REIs to strengthen their position in the energy transition and compensate for the loss of income that will follow from abandoning current tax reduction schemes in the Netherlands. It is not self-evident that REIs and their membership have a primary interest in trading, as their motivation may differ [54]. So-called self-consumption at neighbourhood level will, also in a situation with new regulation (net-billing instead of net-metering), mean that no tax has to be paid over the electricity that is consumed by the producer. Whereas a neighbourhood battery can mitigate the 'import' of electricity and the taxation costs for consumers, trading will tend to make this positive impact of the battery undone. Furthermore, the battery is meant to reduce network operation costs. If end-users through a cooperative would become owner or manager of the battery, they will provide services to the DSO and are expected to receive a payment in return; although this may look nice, it is anyway the end-users that pay for network costs. However, it can be argued that a neighbourhood battery contributes to mitigating network costs, as long as the electricity stored will be consumed by the local producers. Hence, even if there would be a business case for a neighbourhood battery, it is uncertain as to whether this will be a collaborative business case for DSO and end-users.

Our observations strengthen the need for absolute transparency with respect to the distribution of alleged costs and benefits of a neighbourhood battery. Both REIs and DSO need to be reflexive to connect the project to the developments occurring at the broader context of the energy transition and address institutional constraints taking into account the primary value of local energy storage. If the neighbourhood battery is an innovation meant to secure the integration of renewables into the transport system and adapt this system to the challenges created by the energy transition, energy trading may turn out unnecessary, even in conflict with the very purpose of the undertaking. At that point, objections against a strong involvement of the DSO may very well become irrelevant.

8.6. Discussion and conclusions

The purpose of this paper has been to examine the potential impact of the neighbourhood battery on the contribution of REIs to the Dutch energy transition, and the opportunities and constraints for developing a CBM around it. To this end, the different values (and disvalues) that the concept might create as well as a possible allocation among the stakeholders involved were investigated. In this, the dynamics between this innovation and the dominant regime were analysed, focusing on the barriers and opportunities for its implementation, and paying special attention to the role of the network operator therein.

Overall, concurring with other scholars (e.g. [4, 5]), this paper provides evidence that the perceived benefits of the neighbourhood battery concept differ among the parties involved, and their expectations are not necessarily aligned. The interviews with the different stakeholders did not result in the discovery of such a CBM and only managed to map some preliminary ideas about it.

Even though the network operators are (in principle) not allowed to own and maintain storage facilities, their role in the deployment of a CBM for local energy storage is critical. Overall, transparency and clarity regarding the trade-offs that the organisation would be willing to make are crucial for establishing the trust necessary for the collaborative deployment of the neighbourhood battery. The network operator would need to prepare for this collaboration pursuing several changes in its organisational culture, structure and practices. The organisation would benefit from a shift beyond its "*cooperation intent*" culture towards a truly collaborative professional attitude, supported by the institutionalisation of the associated structures and practices (i.e. pilot units that do not dissolve without translating the acquired lessons in the soft and hard elements of the organisation).

Given the current legislative framework that does not allow the DSO to own and maintain local energy storage facilities, one could expect that for the deployment of a BM that involves local energy storage, REIs will collaborate with specialised ESCOs acting as aggregators, and/or they will professionalise to the extent that they become aggregators. The ultimate effect of local energy storage, such as a neighbourhood battery, on the energy transition and the impact REIs will be determined by the broader conditions on a multitude of system dimensions. In some dimensions, the collaboration with the DSO is critical, and in others, the support from other regime actors would be necessary.

The introduced Clean Energy package (2019), which was under negotiation at the time of the research, provides the rights for consumers and citizen energy initiatives to consume, store, and sell their self-generated electricity while giving them access to all electricity markets [52]. This regulation may catalyse the deployment of the neighbourhood battery concept, yet its real impact will only be visible after its transposition by the Dutch regulator (due in June 2021). Mechanisms as net-metering may have contributed towards the uptake of solar PVs but are counter-productive for the adoption of energy storage; the speed of its deployment depends on their phase-out. Local energy storage might benefit from new legislation and tariffs structures, such as time-of-use tariffs and location-based net-metering [5]. The ownership model of the local grid also affects the uptake of local energy storage and its operation [5].

The possibility of active participation of the "user" in the energy system and market directly at the level of consumer, where one is able to choose whether to use, store, share or trade the locally generated electricity will be critical for the deployment of local energy storage. In fact, this comprises the major change at the level of consumer practices, together with the requirement for coordination among all the actors involved. Digitalisation will also help facilitate the ease of market participation for electricity consumers as well as renewable energy communities. The establishment of a neighbourhood battery would also require the provision of information to increase awareness, reduce risk perceptions and ease concerns. Especially the use of blockchain-

based technologies, may facilitate peer-to-peer exchange bringing trust and security for those involved while creating legitimate or less legitimate concerns for those who are not part of the system. The emergence of local energy storage depends on the maturation process, which also involves the social shaping of the concept [5].

The interplay between all these factors will determine the emergence of local energy storage and the value that REIs can gain through it. The coordination between the different stakeholders can result in new CBMs entailing new roles and responsibilities for those involved. Therefore, depending on the particular BM established, the collaboration between REIs and the DSO could help increase the initiatives' impact. In a model where the battery is owned and managed by a third party, for instance, a party which takes the responsibility of developing the HEMS, along with the access in the flexibility market, the collaborating REIs could benefit from the local balancing of their intermitted renewables, which may enable them to optimise their energy use [50] by limiting curtailment of energy; the DNV-GL report distinguishes various possible products and services from the neighbourhood battery to various clients [53]. Moreover, community engagement and energy awareness might also increase, as end-users could become more active in the energy field, reacting to the different incentives provided by the intermediary organisation (in accordance to the signals provided by the DSO). The involvement in such systems may also help end-users and REIs increase their knowledge about the energy system, thereby possibly also increasing their commitment to act as energy ambassadors for more renewable energy projects as well as more responsible energy consumption (see also [56]). At the same time, it is also possible that the introduction of storage systems and their combination with automation may result in bringing the user back to its passive status due to the total complexity.

To conclude, our contribution adds to the literature on SBM [9-13], regarding questions such as how and what values are created and shared among the different actors in sustainability-oriented CBMs, what challenges emerge in establishing these, and what is the role of such CBM in sustainability transitions. Our findings also shed light on the role of hybrid actors, like network operators, in the energy transition [7], and the niche-regime dynamics that play out in a predevelopment phase. Future research could examine how hybrid actors could be supported in facilitating sustainability transitions. Lastly, network operators like Alliander could be considered as "*regime-based transition intermediaries*" [55] as they are part of the established prevailed institutions yet inclined to work towards transformative change. From this perspective, future research could also explore the changes in intermediation over the course of transitions.

8.7. References

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Before concluding…

"Certainties (as in "foregone conclusions") are mistakes.
The right thing to do is to ask yourself every time in the chaos,
and in the chaos to find an edge (to move on)"

Periklis Korovesis

Shift of position: from (action) research on the energy transition to institutional entrepreneurship for the energy transition

The last years of writing this thesis, my role shifted from doing (action-)research to getting more involved in the "action" of the energy transition, this time from the side of an intermediary organisation. For this, I moved to Brussels to engage in the energy transition of European islands. There, I joined a group of committed people who were beginning their collaboration on a newly launched Initiative of the European Commission; I joined the Clean Energy for EU Islands Secretariat. The Secretariat was created to facilitate the clean energy transition on EU islands from the bottom up. In that, our team developed a methodology to assist the development of Transition Agendas for the energy transition of the islands with the active engagement of all the involved stakeholders.

Joining the Clean Energy for EU Islands Secretariat, I had the opportunity to not only share and implement my knowledge on the energy transition, on the different business models of renewable energy initiatives, as well as on Transition Management and how to apply in in the energy field, but also, remaining curious and reflexive, I had the opportunity to learn more. In this, the *academic virtue of doubt* has been precious.

Though my research, I have learned a lot about the importance of ambition and commitment, but also that of reflection and strategy-setting; all these are crucial for the energy transition. Ambition is necessary not only to initiate action, but also to inspire and maintain the interest and participation of a wider group of people. Beyond ambition, commitment is crucial because the energy transition is a complex issue that involves power struggles and confrontation, victories and defeats, as well as compromises. The energy transition involves time-consuming processes of negotiation. The actors involved need to reflect on their own and each other's positions, and they need to engage in thorough discussions and exchange (around costs and benefits) in order to reach an agreement on the strategy for the way forward. My research has also highlighted the effort required and the value of establishing partnerships with actors one may not be

entirely aligned. As the energy transition is a socio-technical challenge, trade-offs and compromise appears to be an inherit part of the whole process.

Through my research the importance of a stable, committed core group of people for the success of an initiative became clear. This is something that we also stress with the Clean Energy for EU Islands Secretariat. Such a committed group drives the islands' energy transition process. This group of frontrunners is responsible for expanding the network and enriching it with a variety of actors from civil society, academia, business and local/regional authorities. In the context of the islands' smaller communities, it becomes clear that collaboration among all the involved actors is crucial for the shift from a strategizing mode to the implementation of renewable energy projects. And in this, as it was also underlined during the strategic dialogue of the renewable energy cooperatives in the Netherlands, the alignment of the different perspectives should be "flexible", that means that it should allow different practices (e.g. profit-oriented projects/initiatives together with zero-profit ones).

As last, I would like to also note that when engaging in a collaborative process, such as participatory action-research, that involves reflection and strategizing for the future, a shared ownership of the process is crucial. In the case of the Strategic dialogue (Chapter 7), the original research plan had to be adapted for the renewable energy cooperatives to sincerely engage in the process, and thus, increase their benefit from it. Similarly, in the case of the collaborative process of islands' energy planning, the approach for the development of Clean Energy Transition Agendas needs to be adapted to the local context for it to be fruitful, i.e. to result in renewable energy projects with and for the island communities. In some cases, the islands decided to involve everyone in the development of their Agendas, while in others they selected and involved those "willing" and active across the different stakeholder groups. A process design open to adaptations to the local context is a key for the success of the overall approach.

All in all, during the last phase of writing my focus shifted to the island context with its specificities, and how island communities can become the frontrunners in the energy transition of the EU and beyond. In this, I am glad to have been putting my energy at the service of a sustainable and just energy transition from the bottom-up. While fuelling my academic doubt with more material, this experience has offered me the opportunity to revisit my research hypotheses and reflect on the overall conceptual and empirical development of my thesis journey. It led to enriched conclusions and even more commitment to bring theory to practice, knowledge into action and regimes into transition.

Next stop, or better next launch, the European Citizen Energy Academy. The opportunity to support citizen energy communities to diversify their operation and develop new business models while taking on board the principle of gender-justice to increase and deepen their transformative potential emerged at the perfect moment.

9. Reflections and conclusions

"You never change things by fighting the existing reality.
To change something, build a new model that makes the existing model obsolete."

Buckminster Fuller

In this thesis, I have studied the (self-)organisation of renewable energy initiatives, exploring their role and impact on the energy transition. More specifically, I have investigated how renewable energy initiatives operate in the context of incumbent energy regimes in the Netherlands, how they cooperate with their peers, and whether and how they coordinate their action to increase their impact on the regime. Furthermore, I have explored how collaboration with progressive, hybrid actors in the regime, particularly network operators, could help renewable energy initiatives increase their impact.

Here, I revisit the main results from my study of renewable energy initiatives in the Netherlands and discuss these in light of current debates on how business model innovation can assist in sustainability transitions. I also reflect on what it means that renewable energy initiatives transform our energy system and explore how to strengthen their potential transformative impact. But first, I start this last chapter by reflecting upon the transition paradoxes that are inherent to research on transformative innovation.

9.2. Transition paradoxes

Researching (desired) transitions in the future is exploring into uncertainty: whether or not an initiative is transformative and to what extent in the end is only to be assessed in hindsight, when a transition has taken place, as I have elaborated in Chapter 3 and Chapter 4. By conceptualizing how initiatives engaged with their regime-context in transitions, I have tried to develop a framework that will help to at least identify the potential and possible ways for transformative impact and how this could be increased. In this process, I came across a number of paradoxes that seem to be inherent to how initiatives in the context of transitions emerge, develop and interact.

At the core of my research lies the assumption that an initiative that bears transformative potential will sooner or later face friction with elements of the dominant regime; the higher the transformative potential, the higher the friction. While this friction can help contribute to regime destabilisation and thus a possible regime shift, it is also possible that actors within the regime are able to push back the transformative pressure, reinforce their positions, leading to a more persistent lock-in. This means that the potentially

transformative initiatives, may have a negative influence on the tempo and/or prospects of the transition. On the other hand, initiatives that do not engage with the regime and stay away from causing frictions with existing structures, interest and cultures, might develop and achieve their operational goals more easily, yet they fail to contribute to wider systemic change. The paradox here is that the more friction an initiative causes, the more transformative potential it has, but then also the chances that it is diffused or derailed are much higher.

Second, in their attempt to influence the regime and increase their impact on it, initiatives will need to clarify their vision and coordinate their actions finding a way to align their individual strategies for the common cause; fragmentation makes achieving progress harder. The paradox here lies on the fact that most of these initiatives (e.g. within the cooperative energy movement, but also beyond it) value self-determination and may not be eager to adapt their action according to others' opinions, as it became clear in the strategic dialogue organised in the context of this thesis and described in Chapter 7. While all initiatives disagree and differentiate themselves from the dominant culture, structure and practices in the energy field, they do not necessarily share the same vision on the preferred future; the greater this divergence of perspective, the more challenging the coordination.

Third, in their attempt to increase their impact, some of the renewable energy initiatives may wish to collaborate with hybrid actors connected to the established regime. Nevertheless, the identification of the actors to collaborate with may not come without tensions. Even if these actors are acknowledged as progressive, the collaboration with them will also involve compromises. For the initiatives that have shaped their identity in opposition to the dominant regime, it may seem rather paradoxical that to increase their impact, they will need to make compromises with parts of the very regime they wish to alter. Many people may claim that no compromises are needed because different approaches can co-exist. Yet, as we have explored in Chapter 6, tensions and conflicts, inherent in transition processes, need to be addressed for the transformative impacts of the initiatives to materialise. At the same time, some initiatives may not want to replace the dominant regime but complement it and eventually influence its transformation.

Lastly, while some renewable energy initiatives may be symbiotic with the dominant regime institutions, others, sooner or later, come into conflict with these institutions and try to either "*Fit and conform*" or "*Stretch and transform*" (Smith & Raven, 2012). The interesting thing about the latter is that they engage in this process oriented at a regime transformation, even though actors operating within the regime will only support them in so far they maintain power and control over them. It is, therefore, somehow oxymoronic that the initiatives operating within the niche seek for and expect the support from the regime. But it is in this ambiguous context that transitions are made: the interactions between transforming old and emerging new that create novelty and the transition.

All these observations touch upon matters that appear to be paradoxical, and even somewhat ironic, yet, they lie at the heart of what makes a transition. Bringing everything together, the main conclusion of my research could be described as follows:

Organising for power change involves the commitment to a core of sustainability values and principles, reflected in a set of structures and practices, which safeguards the transformative character of an initiative, allowing, at the same time, the flexibility to pursue the compromises necessary for its growth and expansion.

The number of these core values that are out of negotiation, on the one hand, and the will for compromise, on the other, should strike a balance between a minimum which would invite the support of the regime and a maximum which would force its control and containment.

In what follows, I address the main research question and sub-questions discussing the main insights from all previous chapters. The first two questions are explored in the two conceptual chapters (Chapter 3 and 4). The other four questions are explored in the case studies. Then I synthesize these findings and get back to the main research question.

9.2. Revisiting the research questions

The main research question of this thesis has been:

How can we understand the role and impact of renewable energy initiatives in the context of broader systemic changes in the energy domain and how can this impact be increased?

Building on (sustainable) business models and sustainability transitions literature, this thesis has developed a conceptual tool to study the interaction of an initiative with its context and evaluate its impact. Conceptualising the value creation mechanism of an initiative in its context, it enables a systematic analysis of the impact of renewable energy initiatives on the energy transition. The term "*transformative business model*" is used to describe a value creation process that shapes its context by embodying alternative culture, structures and practices, thereby building alternative to the dominant institutions. While the introduced framework can be used to evaluate and reflect about how to improve the transformative potential of an initiative and/or its business model, for an initiative or a business model to qualify as transformative more evidence for the intended transformation is needed. In other words, while the *transformative potential* of an initiative can be analysed in terms of its current contribution and ambition to contribute to the transformation, the *transformative character* of an initiative can only be established in hindsight.

I used the framework of transformative business models to systematically examine the impact of renewable energy initiatives on the energy transition; that is, the sustained changes on societal system level, that come as intended and unintended result of their activity (Clark et al., 2004). As illustrated by the case studies of this thesis, this framework facilitated the exploration of the systemic impact of the (self-)organisation of renewable energy initiatives by illuminating the range of their contributions to system change, and by highlighting points of friction with the dominant regime as well as opportunities for their growth. Specifically, to assess the impact of renewable energy initiatives, I used two levels of analysis. First, the business model level, which involves an initiative's value proposition, the concrete product or service it offers, and the necessary value architecture and value capture to sustain its operation, covered the scrutiny of its narrative and (to the extent possible) actual practice. Then, on a second level, this analysis

is complemented with the exploration of the interplay of this value creation (i.e. the (dis)values created during the process and as an end-product), with the ongoing developments on system dimensions, such as technology and infrastructure, organisational logic, user practices, or broader cultural significance. Across these system dimensions opportunities or barriers may exist for the manifestation of the potential transformative impact of renewable energy initiatives.

This contribution supports a fine-grained assessment of the role and impact of renewable energy initiatives that goes beyond a distinction between initiatives that try to fit their operation into the existing institutional context, and those that organise and engage in institutional work aimed at improving the conditions they face (Smith and Raven, 2012). Building on Fuenfschilling and Truffer (2014), my analytical framework considers the same dimensions for niche and regime context and in this way enables the assessment of initiatives that may be proactively challenging the regime on certain dimensions, while being more moderate on others. By analysing the initiatives' actions through a multi-dimensional lens, which spells out the areas one should consider, our understanding of their role and impact improves, along with our ability to suggest methods for improving this impact. Specifically, as I recap next, the framework involves 7 distinct system dimensions that one initiative can influence through its (self)organisation.

9.2.1. How can we conceptualize the impacts of renewable energy initiatives in the context of incumbent energy regimes?

The impact of renewable energy initiatives can be understood as the sustained effect of the activities of such initiatives on the regime, that is the established regulations, the dominant technologies, the popular beliefs and practices, among others. Renewable energy initiatives, consciously or unconsciously, influence the system they operate in through their operation and distinct value creation, and at the same time they get influenced by the system. The initiatives can create value (and disvalue) through their products and services, through their narratives, through their structures and processes of value creation.

In the assessment of the impacts of renewable energy initiatives, I look at their (self-) organisation as an articulated *theory-in-use*. This involves the narrative and the numeric level of how organizations work and sustain themselves capturing part of the value they create (see Magretta, 2002; Osterwalder & Pigneur, 2010; Argyris & Shon, 1974). Therein, I take a broad value orientation, which allows the consideration of social, environmental and financial values. Through their business models, renewable energy initiatives challenge and, occasionally, manage to alter the system. Yet, as innovations, renewable energy initiatives and their business models often face pressures from the dominant cognitive and regulatory structures and the associated rules (Geels and Schot, 2010).

To better understand the wider systemic impact of renewable energy initiatives, one needs to study the interplay of the (self-)organisation of these initiatives with the ongoing dynamics at a system level. Drawing on Fuenfschilling and Truffer (2014) who suggest that niches can be considered as embryonic regimes, I have argued that the initiatives' niche context involves the same dimensions as the regime, as the initiatives often develop

in opposition to certain features of it; for example, in relation to technology and infrastructure, user practices, knowledge base, or organisational logic. The (self-)organisation of the initiatives involves a type of institutional work, which creates new and also disrupts some of the existing institutions (see also Fuenfschilling and Truffer, 2016). The analytical framework is described and discussed in the conceptual Chapters 3 and 4.

In this thesis, the business model concept has been used to study how local initiatives understand and organise their contribution to the energy transition. Business models may function as catalysts for system-wide transitions that involve political processes and necessitate elegant manoeuvring both in the narrative and the practical level. Through their (self-)organising, renewable energy initiatives introduce alternative to the dominant values, such as transparency, citizen involvement and democratic decision-making, to the energy system. The different strategies the initiatives develop vary in outcome in terms of their impact on the energy system and its sustainable transformation, and my conceptual framework has assisted me in analysing the effect of one initiative in comparison to that of another in seven distinct dimensions.

My framework enabled me to distinguish, for instance, between initiatives that both affect (in a similar manner) the system at the level of organisational logic, in terms of ownership structure or partnerships, but have significantly different impact on the level of peoples' knowledge or practices. In this way, the framework helps identify the areas that initiatives get closer to *institutionalising* some elements of their alternative (self-)organisation, and these areas that would require more effort. In that, beyond dichotomous thinking about radical niche-innovations whose transformative potential is counter-balanced by their radicality and moderate niche-innovations that lack transformative ambitions, the introduced framework facilitates a more fine-grained understanding of the systemic value of the initiatives' (self-)organisation. This brings me to the next research question.

9.2.2. How can a transformative business model perspective help understand the impact of renewable energy initiatives?

A business model perspective can support an initiative to strategize and coordinate its action to reach more people, leverage resources and increase its desired impact. A transformative business model perspective connects the business model concept with a strategy to impact the seven system dimensions. This enables the assessment of whether and how to organise for power change by reflecting on how this desired impact relates with sustainability principles, such as transparency, prevention of harm, or justice. Chapter 4 concludes that the transformative business model perspective supports the investigation of the impact of the (self-)organisation of renewable energy initiatives on the incumbent regimes by facilitating a systematic assessment of the value they create, including the associated structures and practices, and how these co-evolve with the broader energy system and the ongoing dynamics therein.

The transformative business model perspective is a tool for reflection. In the context of the energy transition, questions such as: "*how does/could an organisation contribute with*

its product and overall business model to institutionalising renewable energy and/or energy-saving technologies and infrastructures? How does/could it contribute to establishing an alternative sector structure? How does/could it inspire alternative user practices aligned with energy consciousness and responsibility?" could be explored and addressed by organisations and initiatives aiming to increase their systemic impact. Such an assessment may enable learning and the materialisation of a more transformative agenda. This reflection and self-assessment may result in more, and more deeply transformative business models in the field. Yet, for a business model (and/or an initiative) to be characterised as transformative, evidence for the intended transformation is required; in other words, the envisioned changes need to take place and sustain. The real transformative potential may, thus, remain unknown and can only be adequately determined in hindsight.

9.2.3. How do renewable energy initiatives (self-)organise and legitimise their existence through their business model?

Using the framework, Chapter 5 illustrates the variety of business models that renewable energy initiatives develop in the Netherlands through the presentation of 12 cases. After a short discussion of the concept of impact, the chapter analyses the business models of the initiatives, their "organising for impact", and then it moves on with the analysis of the impact of this organising on the different system dimensions.

Such initiatives (self-)organise and legitimise their existence promoting sustainable energy while stressing different principles of sustainability. Some focus their value proposition on energy autonomy and self-determination, others on financial benefits from energy prosumption and energy efficiency, or social benefits like increased house comfort. Across cases the overall value proposition does not significantly diverge: the initiatives engage in the area of environmental and social sustainability that supports the local economy.

The initiatives' existence is also legitimised through the (desired) impact of their organising. As Chapter 5 describes, the initiatives under study, consciously or unconsciously impact the energy system within which they operate, while they are also being influenced by it. Technology and infrastructures is a dimension that all initiatives actively challenge through their operation with (decentralised) renewable energy sources. The different initiatives also converge in challenging the dominant Organisational logic along with the Sector structure.

Through their operation renewable energy cooperatives, commercial ESCOs, crowdfunding-sourced developer organisations all involve an alternative configuration of (part of) the energy system. The initiatives exercise their political power, interact with their members/clients' knowledge base and practices in a different way/level each. While some initiatives demonstrate interest in influencing the knowledge base and practices of the people they engage with, like in the case of several renewable energy cooperatives, the same does not hold for the cases of the project developers. Furthermore, not all initiatives are equally active in policy advocacy. This research mapped and analysed various modes of organising, as well as several possible ways to impact the energy

regime, which all legitimise the existence of renewable energy initiatives. It is important to note that the business models deployed by the initiatives reflect their assumptions regarding the freedom (or space) the actors and institutions of the dominant regime provide them with for their operation.

9.2.4. What kind of conflicts and tensions arise when renewable energy initiatives interact with the energy regime? What strategies do they develop to overcome or avoid these?

Chapter 6 analyses the conflict that renewable energy initiatives encounter when impacting the regime. The identified challenges mainly relate to the policy schemes and the issue of taxation, the choice of technology, and the (political) organisation of the initiatives, and particularly the partnerships they build. We find both conflict and conflict avoiding behaviour. While the initiatives are all ambitious in their own way, a clear strategy or a clearly defined position vis-à-vis the regime is lacking along with a clear view on how to overcome institutional barriers. At the time of the research the initiatives had not (yet) been able to unite via the establishment of a strong network, and by lobbying. The ambivalence regarding the pursuit of conflict on the side of the niche can be explained by the huge power gap with the regime. The initiatives seem to engage in a Gramscian "*war of position*" that may allow them to build the required capacities for future confrontation (Levy & Egan, 2003). Possibly not realising or undermining the extreme pressure that the regime faces, and the weakening of its institutions, the different initiatives may avoid direct confrontation with it.

A link between the maturity of a niche and the emergence of conflict with the regime appears to exist. We suggest that the emergence of conflict in the energy transition is inevitable, and in fact, this emergence of conflict may open a window of opportunity for accelerating or steering energy transition in a certain direction. As research on the more advanced German energy transition concludes, on a turning point, the critical factors are primarily of institutional nature, and will thus be determined in the political arena (Schmid et al., 2016).

A regime shift requires structural changes at the regime level; empowered niches, which challenge the regime, under certain conditions may gradually transform or replace it (Geels and Schot, 2007). As the final outcome of conflict depends not only on the condition of the regime and the niche, but also on the dynamics on the landscape, confrontation with the regime should be pursued sparingly and used in a strategic manner in order to create room for action and manoeuvring. It could be hypothesised that abuse of this strategy may bring opposite results. If the regime and broader landscape conditions allow, frequent recurrence of conflict induced by organisations operating in the niche may result in intensified control from the regime, thereby limiting the possibility of niche expansion and regime shift (see the issues around wind development in Amsterdam and Utrecht as described in Chapter 6). The final impact of the renewable energy initiatives on the regime greatly depend on their strategic capacity. For this reason, this strategic capacity of the niche was also explored.

9.2.5. How can the cooperative energy movement coordinate its actions in order to increase its impact on the Dutch energy transition?

Chapter 7 reports on a strategic dialogue organised together with and for the umbrella organisation of renewable energy cooperatives in the Netherlands. Our intervention confirmed the hypothesis that actors at the niche level often focus too much on the competition with regime actors to advance individual interests, thereby failing to collectively strategize and engage with incumbent regimes in a systematic way; the strategic discussions within the sector of renewable energy cooperatives had so far been few.

The development of a shared vision is important as it supports the creation of a collective identity and it guides the actors' collective agency, functioning as an anchor point for strategizing and communicating with a broader audience. The insights into a possible sustainable energy future, the role of the cooperative energy sector therein, as well as the established strategic agenda may help create a feeling of legitimacy for engaging with the regime and may enable the movement to take leadership in its transformation.

Among the different actions identified to upscale the initiatives' impact on the regime was a possible expansion of the movement activities across the value chain. Yet this idea was opposed by some actors, who argued that, instead of doing everything on its own, the movement should seek the collaboration with other societal actors. This disagreement in developing a collective strategy, underlines that functioning under absolute unity contradicts with the nature of direct-action initiatives like the renewable energy cooperatives (second identified paradox). Seeking such complete alignment is paradoxical as it contradicts the very nature of these initiatives and may even compromise the prospects of their diffusion. Instead, the cooperative sector is advised to allow for different approaches to emerge, which may please different audiences. Coordination among the different approaches then becomes critical.

The initiatives' transformative impact can be supported by a translocal diffusion of their innovation at a niche level, combined with a parallel development of hybrid pathways between niche and regime (see Loorbach et al., 2020). This requires dedicated actors to focus on translating and replicating the "good practices" and organisational structures of the locally rooted initiatives in other contexts, maintaining the connection to global networks and discourses. The initiatives should consider building bridges and exploring trade-offs and points of compromise with the "enlightened" actors within and beyond the regime, so that their transformative values and practices can be embedded at higher institutional levels (Gorissen et al., 2017). At the same time, becoming more political the actors oriented towards transformative change can increase their impact. Joining a translocal network helps to build advocacy coalitions and develop a critical mass and a political voice to lobby for a change of rules and regulations, and the access to (new) resources for the network and its members (Loorbach et al., 2020).

9.2.6. How can collaboration with actors from the regime help increase the impact of renewable energy initiatives in the energy transition?

To explore how collaboration with actors in the regime could help increase the impact of Renewable Energy Initiatives, in Chapter 8, the focus has been on the potential impact of the neighbourhood battery on the Dutch energy transition, and the opportunities and constraints for developing a Collaborative Business Model around it. The different values (and disvalues) that the concept might create have been analysed, as well as their possible allocation among the stakeholders involved along with the dynamics between this innovation and the dominant regime, namely the barriers and opportunities for the concept's implementation. Special attention was paid on the role of the network operator therein.

The existence of such a collaborative business model was not confirmed and only preliminary ideas about it were mapped. Concurring with other scholars (e.g. Parra et al., 2017; Koirala et al., 2019) evidence was found that the perceived benefits of the concept differ among the parties involved, and their expectations are not necessarily aligned.

While currently not allowed to own and maintain storage facilities, the role of network operators in the deployment of a Collaborative Business Model for local energy storage is critical. Changes in their organisational culture, structure and practices would be necessary for the collaborative deployment of such a business model. The friction with the contemporary dominant culture, structures and practices puts the concepts implementation on hold. However, this friction may also exhibit the concept's transformative potential. This potential remains, nevertheless, unknown and can only be determined in hindsight.

The impact of the renewable energy initiatives on the energy transition could be amplified through a Collaborative Business Model, yet, the outcome depends on the particular model established. For instance, the involvement in such systems may help end-users and renewable energy initiatives increase their knowledge about the energy system, thereby possibly increasing their commitment to act as energy ambassadors for new energy projects. At the same time, it is also likely that introducing storage systems along with automation may result in bringing the user back to its passive status due to the total complexity.

Negotiation, trade-offs and compromise on both niche and regime side are typical central processes of hybrid transition pathways. Also, actors associated with the regime historically initially resist change, and then, following shocks from the landscape and tensions from the niche level, become more willing to consider the adoption of some sustainable innovations. While such developments offer a window of opportunity for regime change, the direction of this regime change is not certain, as competition between alternative novelties often takes place on issues like legitimacy, resources and attention. Collaboration with "enlightened" actors within the regime, may, thus, support the materialisation of the transformative potential of sustainable innovations.

9.2.7. Discussion

All in all, the role and transformative impact of renewable energy initiatives in the energy transition in the Netherlands starts to become visible, at least in some dimensions. This research shows that the impact of renewable energy initiatives increases as they shift from the attempt to arrange their own organisation, to the coordination of their action with their peers and eventually, to the collaboration with actors from the regime. Conflict has been introduced as a specific indicator for the potential of an initiative to transform the regime, but we have shown that the ability of an initiative to make certain compromises and establish collaboration with progressive actors from the regime may also be indicative of its transformative potential. Therefore, in the context of system change the ability and willingness of initiatives to engage in conflict but also make compromises are essential. While both strategies can be pursued by individual organisations, the alteration of these strategies may be more successful if pursed in an orchestrated way by a collective.

Beyond the fact that the number of renewable energy cooperatives has significantly increased during the past years (up to 582 coops in 2019), along with the number of people involved (85.000 across the country), its collective impact on the system in terms of installed capacity of renewable energy technologies has also been increasing exponentially. In 2019, for instance, the installed solar capacity at the hands of citizens rose to 119 MWp and that of wind to 193 MW, marking 60% increase in collective solar and 22% increase in the collective wind (Schwencke, 2019); this contribution is nonetheless still tiny in terms of the total: 2% solar and 6% wind, respectively. Preliminary data from 2020 show that the collective solar capacity rose to around 166 MWp (41% higher than in 2019) and that of wind to 229.9 MW (19% higher than in 2019), and that despite the pandemic (Schwencke. 2021). This illustrates a small, yet growing impact on the regime's technology and infrastructure.

This also suggests a slow shift at the level of values: the *culture* around and significance of renewable energy technologies and their organisation. As the number of renewable energy initiatives grows and the discussion concerning the impact of fossil fuels on the environment and the society intensifies, reaching even the level of the court of justice, fossil fuels begin to lose legitimacy.

The impact of renewable energy initiatives on the *policy landscape* is reflected by the national target for 50% local ownership of renewable energy projects by 2030, as well as by the additional financial measures introduced to support the development of renewable energy cooperatives[17]. The 50% local ownership target is not legally binding.

[17] In 2020 the Netherlands features 2 new mechanisms for financial support to the renewable energy cooperatives: a) 2.5 mio /year allocated for local advocacy and support for municipalities to embed community energy participation in regional RES projects, and b) 15 mio allocated for a Development fund financed by the Ministry of Economic Affairs and the Dutch Provinces for renewable energy cooperatives managed by an autonomous fund, executed by Energie Samen (RVO, 2019).

Yet, it may still incentivise market parties to collaborate with community-level initiatives. The Development fund, a scheme that the renewable energy cooperatives have been striving for more than 6 years, will function as a revolving fund: the cooperatives gain access to finance during their initial stages of project development and return it through their revenue from RES projects.

Regarding the *organisational logic*, the variety of business models identified comprise certain evidence of the initiatives' influence on the system. The principle of self-consumption of renewable energy produced individually or by a collective is becoming mainstream, initially at the level of culture and slowly (yet steadily) also at the level of practices. The importance of climate action, environmental protection, citizen participation in energy planning, among others, have been gaining attention on the public discourse leading to a new Green Deal at EU level (EU Commission, 2019). This may be partly attributed to the successful efforts of renewable energy initiatives too.

While at an institutional level one now can produce renewable energy to use it, store it, share it or also trade it, the *practices* of the consumer have not so far changed significantly. Little evidence was found on the participation of renewable energy initiatives in the flexibility markets; this is to be explored in the future. Beyond access to the markets, my research also found limited evidence for energy savings, enabled via technological innovation and targeted awareness-raising. The impact of prosumption on energy savings deserves more attention.

The *sector* has also shown evidence of professionalisation. The specific interaction platforms for coordination between initiatives of the same kind, namely renewable energy cooperatives, seem to have increased their institutionalisation and establishment in the energy field. The increasing participation in the annual meeting of HierOpgewekt demonstrates this institutionalisation. Chapter 7 provides evidence that (part of) the sector can negotiate with actors who may not share the exact same interests with them, i.e. commercial developers, and manage to develop projects that benefit the local communities.

Within the cooperative energy sector, beyond *knowledge* exchange and networking, research and monitoring of the renewable energy sector take place. Platform organisations facilitate this function in a rather systematic way. Although this thesis provides some insights on the actions undertaken by such platform and umbrella organisations, more research would be necessary to clarify the impact of these on enriching the knowledge base of the initiatives. More research would be necessary, for instance, to explain the skills and capacities these organisations help create.

A sustainable energy niche is in the phase of emergence and it shows some first signs of institutionalisation. The question that emerges is whether this niche will manage to realise its transformative potential to lead a shift towards a just, democratic and renewable energy-based system or whether it will get locked-in to a sub-optimal pathway. Since it is impossible to make a forecast for the future, next I make recommendations to improve this potential.

There are several ways for an initiative to increase its impact on the dominant energy-related institutions. From strategic partnerships to policy advocacy or engagement with

its membership/ clientele. These alternative strategies will be elaborated in the next section.

9.3. Lessons and recommendations for facilitating transformative business models for the energy transition

Engineers and entrepreneurs, with the support of policy makers and engaged citizens, helped to dramatically lower the cost of power generation from wind and sun. From this point onward, creativity and business model innovation will be necessary, yet it may not be enough for a socially just transition to renewable energy sources.

The central hypothesis of my research has been that niches feature an antagonistic relationship with the regime: the initiatives in the niche develop in opposition to the dominant institutions and aim to gain power and transform or replace them. To move beyond the niche, renewable energy initiatives need to shift from cooperation (between peers) to coordination: coordination with peers and other same-minded actors. Eventually, difficult decisions regarding the prospects of collaborating with strategic actors from the regime may also be necessary.

Nevertheless, deciding upon this issue may not involve the same difficulty for all types of initiatives. Some initiatives may not wish to transform the regime, but instead, they may wish to safeguard the integration of their contribution into a future (more) sustainable energy regime. Hall et al. (2019) point that some prosumer niches simply wish to establish a business model that can compete in a relatively unchanged energy market, while others wish to change these market rules to favour the business models of their business models over the current regime dominated by corporate utilities. My research findings also support this observation.

The same holds for all the renewable energy initiatives I studied. It can be argued that the initiatives may either try to "fit and conform", or try to challenge, "stretch and transform", not only the market logic, but also the dominant practices, the dominant structures, etc (Smith and Raven, 2012). My research has focused on how the initiatives (self-)organise and what stance they take regarding the regime in the identified system dimensions. Initiatives may, for instance, be grouped together according to their revenue model and broader organisational logic, yet they may differ from each other in terms of the (user) practises they involve; the variety of approaches is wide.

Diversity, which is inherently associated with the local nature of renewable energy initiatives, is important in the context of sustainability transitions as it can support niche building and development. Such social innovations codevelop with the culture and structures within which they emerge and are constantly being negotiated and reshaped (Avelino, 2017). Loorbach et al. (2016) suggest that "*social innovators can increase the transformative potential of their social innovations by smartly playing into the societal game changers of their times, while simultaneously connecting to political (calls for) system innovation, as well as linking up with multilayered narratives of change in both mainstream and grassroots movements*." Through institutional work some of these diverse approaches may become transformative.

Coordination between such initiatives may be difficult; as shown by the strategic dialogue we held (Chapter 7). The development of a vision and an associated strategy for attaining it could have been more complex in case the original idea of involving actors from different types of renewable energy organisations (such as crowdfunding platforms and commercial wind project developers) had been pursued. It should be stressed that a complete alignment cannot be pursued and may not even be beneficial for the energy transition. The variety of approaches may appeal to different people; some people may be more willing to invest in a crowdfunding scheme of a developer than the cooperative of their neighbourhood and vice versa, some initiatives may receive more support from the government than others, etc.

The interaction with the Dutch state, which, as described in this thesis, is rather strongly associated with the fossil-fuel based energy regime, has been quite challenging for some of the initiatives. Indicative is the fact that the statistics on renewable energy sources in the European Union position the Netherlands in the worst place across the EU. Yet, as Eric Olin Wright puts it, the state comprises an arena of struggle, where competing forces in civil society meet, and as such it is a site of compromise and domination (Wright, 2010). Throughout these years the regulatory framework has featured mechanisms supportive for the development of renewable energy, in general, and to a certain extent community energy, in particular. Especially the postal code area regulation (postcoderoos) is an example of a regulation that stretches the framework to benefit prosumption and the cooperative energy movement. This is because cooperatives or resident's associations are the only legal form that can benefit from the tax incentive. These unique rights give a concrete revenue advantage to community energy initiatives that a corporate or private company cannot access (see also Hall et al., 2019). It may, thus, be argued that the cooperative energy sector has marked some victories in these struggles.

The acknowledgment and support in 2019 Clean Energy package of active energy citizens and communities as stakeholders in Europe's energy market has been one of its most important elements. Ensuring proportionate and non-discriminatory treatment for renewable energy initiatives like Citizen and Renewable Energy Cooperatives will enable them to operate on a level-playing field in the market. For the creation of this value for the distribution and transmission network infrastructure, renewable energy initiatives need to be effectively remunerated through, for instance, reduced network charges. Such actors request differentiated rules and flexibility to support them ("stretch and transform"). The provision of alternative means of complying with the same obligations as other market actors, a reduced or simplified burden (with adjusted standards or easier administrative procedures) and capacity building, administrative support and technical advice/assistance regarding licensing, registration, finance by the regulator or a public body will be crucial for their growth and expansion. To this end, the political engagement of the actors oriented towards transformative change is considered beneficial too. Joining a translocal network helps the creation of advocacy coalitions which are crucial for leveraging the power necessary to influence policy making.

Local authorities and renewable energy initiatives are natural allies in the energy transition. Regulatory capacity building and tools to access finance and technical expertise should be provided to them. To support renewable energy cooperatives, local

authorities can include criteria around citizen participation and public acceptance. Another way for local authorities to support and collaborate with renewable energy initiatives is through public procurement. EU Public Procurement legislation allows public authorities to use environmental and social criteria in tendering for products and services around energy; economic incentives based on value to energy system and society can be developed.

The European Investment Bank is another institute that can support the impact of renewable energy initiatives, through the provision of technical assistance to energy communities and local authorities so they can aggregate smaller projects, including simplified administrative procedures and hands-on support from the EIB.

Last, it is recommended that renewable energy initiatives are open to collaboration with actors, which may be associated with the regime; possible linkages as well as the prospects of developing collaborative projects should be explored. In fact, the energy transition requires multiple skills and sorts of expertise and, thus, complementarity and synergies should be investigated.

9.4. Strengths and limitations of this research

9.4.1. Summary of main contributions

Theoretical insights

This thesis contributes to the literature of sustainability transitions, and also (sustainability-oriented) business model and questions like: how to better understand particular processes or dimensions of transitions (e.g. Fuenfschilling and Truffer 2014, 2016); how organizations contribute to (or slow down) transitions; how changes in the organizational dimension affect broader institutional, political, and societal change; what is the potential of organizational innovations, and can business model innovation assist in sustainability transitions (e.g. Huijben et al. 2016; Wainstein and Bumpus 2016); and to what extent do business models allow for sustainable system innovations (Boons & Lüdeke-Freund, 2013).

Specifically, my theoretical framework enabled a systematic assessment of the multidimensional impact of renewable energy initiatives on the energy transition. As incumbents strive to maintain their hegemonic position, renewable energy initiatives that hold a transformative potential, i.e. initiatives embodying and reproducing alternative to the dominant institutions, reach, eventually, moments of friction with their context. The conceptual framework directs our attention to these frictions as an analytical focus for the energy transition, as such frictions may create opportunities for the progress of the energy transition through, for instance, new partnerships followed by repositioning of actors.

Empirical insights

This thesis helps understand the development of the (self-)organisation of renewable energy initiatives and the challenges they face in i) their individual organisations, ii) their efforts for coordination among peers, and iii) the collaboration with hybrid actors associated with the regime. Here I have described and analysed how the initiatives develop organisational structures and practices, alternative to the dominant energy

regime, and how they, sooner or later, seek the cooperation and coordination with their peers to develop their own as well as the collective structures and practices in face of the constrains put from the regime.

This research had initially registered little internal coordination and the aversion of the initiatives to engage in confrontation with the regime. In the strategic dialogue, described and analysed in Chapter 7, the participants, actors within the cooperative energy niche, developed a strategy with actions aimed at the improvement of their internal organisation as a sector, and on establishing and improving collaboration with actors such as local authorities and network operators, who could help them move beyond their niche. Lastly, my research has shed light on the niche-regime dynamics that play out in a predevelopment phase and the role of hybrid actors such as network operators, also characterised as "*regime-based transition intermediaries*" (Kivimaa et al., 2019), in the energy transition.

Methodological insights

This thesis was developed thanks to the valuable contributions of several (renewable) energy professionals and practitioners, who helped me test and experiment with my preliminary hypotheses. The results from my first year's research fed the strategic dialogue organised with and for the renewable energy cooperatives. During this dialogue I explored whether Transition Management can help increase the transformative impact of the initiatives by facilitating reflection regarding the movements collective impact. By creating the room for reflection, our intervention supported creative and strategic thinking and the empowerment of the actors involved.

After this dialogue, stakeholder perspectives were explored and contrasted in a participatory research context in relation to the prospects of the collaborative development of local energy storage (Chapter 8). In this context, the added value of collaborating with (hybrid) actors for the energy transition was also investigated. The research was developed in collaboration with the network operator, which meant that I participated in meetings, organised discussions and pursued interviews in and beyond the organisation, with the dual role of researcher and intern located at the department of the organisation focusing on the neighbourhood battery. This dual role required reflexivity for my personal role and position; I was balancing between my role as a reflective scientist, a knowledge broker, and a change agent wishing to contribute to the energy transition (Wittmayer and Schapke, 2014).

9.4.2. Limitations

While I believe that this contribution has improved our understanding of how renewable energy initiatives (self-)organise, coordinate their action and interaction with peers and the regime, as well as what the impact of this (self-)organisations is (and could be) on the energy transition, I acknowledge that the research has its limitations.

The impact of renewable energy initiatives on the energy transition has been explored via analysis of mostly qualitative data, from interviews with energy stakeholders, meetings, as well as private and public documents of the involved initiatives. As the data collected comprise representation of individual or group's interpretation of past and present developments in the Dutch energy system, I should note that these

interpretations, while valuable, may not be fully capturing the complexity inherent in the energy sector. As my research builds to a great extent on semi-structured interviews, which means that apart from my personal ability to analyse my findings, these findings and overall access to information might have been affected by my personal characteristics as a young, non-Dutch, female. While in some occasions these characteristics may have helped my interviewees to open and share their perspective on the topics under investigation more freely, it is also possible that these very characteristics may have constrained me during my research.

Furthermore, my investigation covered financial information, which has not always been disclosed due to confidentiality reasons. When provided, this information was presented at a higher level of abstraction (e.g. per type of organisation). The available data enabled a better understanding of the initiatives under study but did not provide the basis for statistical generalisation; case study research is known to only lead to analytic generalisations (Yin 2012). It can be argued that quantitative methods for financial data collection and analysis could have helped drawing additional conclusions on this dimension.

Lastly, while the topic of this thesis is the energy transition in the Netherlands, most of the initiatives studied focus on electricity production (and savings). This reflects the reality on the ground. In 2014 Thermo Bello was the only renewable energy cooperative with a focus on heat. Later, local energy cooperatives started to broaden their focus to the issue of heat; in 2019 about 37 feasibility studies on heat-related projects were carried out (Schwencke, 2019). Beyond such community-driven initiatives, private and public initiatives were also involved in electricity and heat related services, and thus studied. Specifically, this research studied the initiatives BAS Nederland and WeKa Daksystemen, emerging in the private sector, as well as Hoom and Buurkracht, emerging in the public sector.

9.4.3. Future (research) challenges

Future research has still to substantiate the effect of renewable energy initiatives on the energy transition. While this thesis has been exploring the role and (potential) impact of such initiatives, their transformative character can only be determined in hindsight; once our energy system has been altered to one direction or another.

Recent research shows that most energy efficiency interventions applied by renewable energy cooperatives have been effective in achieving their primary goal, sensitizing members, and leading them to a more efficient energy consumption behaviour (Sifakis et al., 2020). Future research could compare this effectiveness of renewable energy cooperatives in achieving energy savings with that of commercial ESCOs that may use automation, without connecting to a social network. In other words, it would be interesting to assess the impact of "community" in community energy initiatives.

At the same time, stereotypical perception of gender and internalised gender prejudices, such as the perception of energy as a technical, and thus "*masculine*", issue, in combination with the "*double labour burden*" (productive and reproductive) carried by women, prevents them from a more active involvement in the life of cooperatives (Łapniewska, 2019). In Germany, for instance, significant gender differences exist in the

average ownership rate, the average investment sum, and leadership positions in community energy initiatives (Fraune, 2015). In the renewable energy sector as a whole, women represent only 32% of the renewable energy workforce, still better than the 22% of the oil and gas industry workforce (IRENA, 2019). While renewable energy initiatives employ more women, Łapniewska (2019) finds that the majority of European electricity cooperatives do not include gender equality in their declarations or take any concrete actions to promote it. The debates on energy justice and gender-energy nexus are interlinked and intertwined (Feenstra & Özerol, 2021). Yet, while energy justice comprises an established research topic in the field of energy policy (e.g. Sovacool & Dworkin, 2015; Sovacool et al., 2017), the gender-energy nexus is an emerging research field, which deserves our attention (e.g. Feenstra & Özerol, 2021; Łapniewska, 2019; Tjørring, 2016; Fraune, 2015; Ryan, 2014).

The presence of conflict has been introduced as a proxy for the state of the energy transition and the initiatives' transformative potential impact. Future research could explore whether a causal connection exists between the intensity or recurrence of tensions and/or conflict with the regime context and the prospects of materialising this transformative potential.

This contribution has investigated the niche-regime dynamics that play out in a predevelopment phase, and the tensions that emerge when attempting to develop a collaborative business model for the energy transition with hybrid actors associated with the dominant regime. Future research could examine how such hybrid actors may be supported in facilitating sustainability transitions, and whether changes in intermediation take place over the course of transitions. This research would contribute to the overall analysis of how renewable energy initiatives scale, diffuse and institutionalise (see for instance the work in the context of the Accelerating and Rescaling, Transitions to Sustainability (ARTS) project and the Prosumers for the Energy Union (PROSEU) project).

It would also be worthwhile to explore the conditions under which collaborations for desired energy transitions could be developed; especially collaborations between renewable energy initiatives and big energy players. Big energy players are still too focused on establishing large-scale energy projects to ensure their profit margins. Collaborating with smaller local renewable energy initiatives could enable big energy players to change the consumption patterns of their clientele. This would enable big players to optimize their load management offering not only cost savings but also reductions of CO_2 emissions.

If community energy initiatives are only a facilitator, an intermediate step in the energy transition, and if collaboration between different commercial and non-commercial actors for the development of renewable energy projects will soon be the norm, the question that emerges is how the collaboration between (parts of) the incumbent regime and the emergent renewable energy initiatives could be facilitated assuring a socially just energy transition. Future research could explore what mechanisms could be put in place to inspire and maintain the collaboration between the currently fossil-fuel based energy companies and today's sustainability-oriented frontrunners for a fast, yet just energy transition.

In the context of the ongoing pandemic and the upcoming deepened economic crisis, the "*green transition to a climate-neutral economy"* has been presented as a central pillar of the EU's recovery plan. Left untackled, the climate and biodiversity crises will expose us to even greater threats to our health and wellbeing. It is, therefore, of vital importance that the public investments that are currently discussed are pursued in a transparent, viable and sustainable way. All public interventions should be based on the principles of accountability, democracy, justice (including gender justice) and community-driven solutions. The stimulus packages and bail-outs should follow scientific advice and ensure "future-proofing" companies through a shift of their business models in accordance with the Paris agreement. Such a shift will deliver long-term benefits and make our economies more resilient against the future shocks, which are expected to be deeper and more frequent. The Global Commission on Adaptation (2019) estimates that investing $1.8 trillion between 2020 and 2030 could generate up to $7.1 trillion in total net benefits. In these moments of collective reflection and systemic reorientation, supporting and learning from (trans)local sustainable (energy) initiatives can help Europe ensure its future prosperity and resilience.

Energy transition researchers should do their part to support the transformation. Beyond being critical and (self-)reflexive in order to ensure trustworthy research results, energy transition researchers should also embrace their role as public actors. In that, they should reflect about the broader impact of their research (process and outcome) and become proactive in communicating their research results to the wider public. It should be the researcher's responsibility to share his/her research in an approachable manner not only in terms of language but also in terms of media. From popular science books and public talks in events, to podcasts and infographics on social media, nowadays plenty alternative platforms and tools are available to support scientists communicate their message. Sharing the scientific knowledge on the energy transition can not only help address the questions and concerns of the public regarding the deployment of renewable energy technologies, but, in fact, it can contribute to the essential empowerment of citizens and communities so that they actively engage in the urgent transformation of our energy system.

9.5. Instead of an epilogue…

A vision for a sustainable and socially just energy system

Climate communications experts recommend messages on where the transition leads to rather than what it moves away from (Marshall, Bennett & Clarke 2018; Climate Access, 2018). After all, the transition is not a goal but a means to a better future. In this final chapter, I wish to devote a couple of lines to present my personal vision regarding the sustainable transformation of our energy system.

I believe that our future energy system could cover the basic right to energy for everyone, thereby contributing to what Aristoteles referred to as "Good Life". A good life for all would mean a flourishing society, where citizens are happy, healthy, capable and engaged. Our future energy system could provide for this in a sustainable and smart way that respects the "*the wellbeing of all people and the health of the whole planet*" (Raworth, 2017); I explain what this means using my framework.

When it comes to *technology and infrastructure*, our future energy system could be fully powered by decentralised renewable energy sources supported by smart infrastructure. The decentralisation could be accompanied with community or local ownership and control, helping in parallel to reduce energy wastage in distribution, as energy will be produced closer to the point of use. While some large-scale renewable energy infrastructure would be needed to supply cities and essential public services, the decision making over such large-scale infrastructure could be based on participative democracy at local level.

The *sector structure* and the boundaries between different sectors would be blurred. The future energy system would be multi-functional, combining power generation with chemical processes, while enabling maximum thermal energy utilization. Thus, the network would not only allow bi-directional electricity flows on the grid, but it would also accommodate power conversion for transport purposes or the production of chemicals, such as hydrogen, ammonia, etc. Furthermore, this decentralised energy generation and system integration would be accompanied by an emergence and proliferation of new actors: energy prosumers, aggregators, mobility providers, energy communities, etc.

Regarding the *organisational logic* of a future energy system, it could be expected that some of the emerging (individual-) initiatives could focus not only on the renewable energy generation through the development of projects and the relevant platforms, but also on the provision of flexibility services and the general exploitation of the market opportunities in place. At the same time, while our appliances and processes will be exhibiting increased efficiencies, awareness raising will continue being relevant as energy conservation could contribute to improving the lifespan of RES infrastructure and the respect of planetary boundaries. Maintenance, recycling, repair and restoration of infrastructural resources will help shifting income creation from industrial production to social and environmental reproduction that cares for people and the planet. A variety of models will be available for initiatives of citizens, businesses and public institutions to be active. Some actors will focus on facilitating the overall coordination. In the future smart and sustainable energy system, all actors would collaborate for the greater good, respecting the differences they may have.

The (self-)organisation of the different initiatives will be infused by *values* and principles associated to sustainability, regarding environmental protection, resource-driven efficiency, social justice, including gender justice, and, in parts, autarchy and/or self-determination.

As the distance between energy consumption and production will decrease, our *knowledge base* would be enhanced. Everyone will be aware about energy production, and conscious about energy consumption. There will be no concerns about the renewable energy production in anyone's proximity. Our knowledge base will be richer regarding community management, as well as energy markets management, and RES technology.

Regarding our *(user) practices*, every building would be energy positive or at least energy neutral. Our renewable energy prosumption would be supported by automation, and the effort necessary would be minimum. After a period of intense work for the development of the necessary renewable energy infrastructure and the reduction of our energy use,

the main effort by the experts would be on maintenance, recycling, etc. of this installed infrastructure.

In the *policy* sphere, regulations will be providing a level-playing field for the variety of actors to participate in the development and maintenance of renewable energy projects as well as in the energy market, whose overall functioning will be overseen at an international level. The policies will also fully respect the principle of subsidiarity, safeguarding that decisions are made and implemented at the most local level, consistent with all who will be affected by a decision being able to participate, directly or indirectly in making it.

Last, but certainly not least, as the pressing socio-ecological challenges also require popular struggle from below, I welcome (more) political initiatives that challenge the existing power structure and aspire to change the balance of forces in society. As Frederick Douglass famously put it *"if there is no struggle, there is no progress*", and, after all, "*power concedes nothing without demand. It never did and it never will".* Nevertheless, one must accept the size of the mountain ahead and start climbing it anyway*.*

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Summary

The energy transition is a lot more than just part of the solution to the climate problem. It is an inevitable, yet inherently uncertain process with deep social implications. The transformation of our energy system involves a shift away from the unsustainable, centralised energy system dominated by the large-scale combustion of fossil fuels and can spur wider fundamental changes in society.

Renewable energy initiatives are mushrooming in Europe and beyond, bringing to the fore a wide variety of novel ways of organising in the energy sector. Renewable energy communities, Energy Service Companies, citizen-driven energy cooperatives, crowdfunding and peer-to-peer platforms, as well as commercial energy project developers all contribute to the ongoing energy transition in their own distinct way.

The question that emerges is whether renewable energy initiatives can transform the energy system as a whole. My research analyses and evaluates the impact of renewable energy initiatives on the energy transition. In that, the issue of *organising* is central. Technological innovation alone, without a consideration of who is benefiting and who is being excluded, without a reflection on what is gained and at what cost, may get us to a 100% renewable energy system with intensified biodiversity loss and exacerbated social injustice. With the wish to support the transition to an environmentally sustainable and socially just energy system, the specific overarching research question guiding this thesis has been:

How can we understand the role and impact of renewable energy initiatives in the context of broader systemic changes in the energy domain and how can this impact be increased?

To address this question, I developed an analytical framework that combines insights on (sustainability-oriented) business models and sustainability transitions. The Transformative Business Models framework has been introduced as a tool to analyse and reflect upon a renewable energy initiative's contribution to the energy transition, but also as a device to navigate and strategize for increasing this contribution.

The business model concept functions as the vehicle for the assessment of how an organisation defines and aims to realise its intended sustainable impact. In my thesis, the concept has been operationalised into four building blocks:

A. *Value proposition*, which clarifies the kinds of benefits the organisation offers to its customers, investors and all other stakeholders. For sustainable companies such as energy cooperatives, the value proposition not only relates to immediate monetary profit, but more importantly, to realising societal benefits.
B. *Product or Service*, which the company delivers to its customers. This could be clean electricity, heat, electromobility, but also knowledge and advice.
C. *Architecture of value*, which relates to the partnerships through which value creation and delivery is accomplished. This building block relates to the strategy of the organisation to realise its value proposition.
D. *Value capture*, which relates to the cost and revenue flows that determine the monetary and non-monetary values associated with the organisation and define its viability.

My investigation targeted both the narrative and the actual structures and practices of the initiatives.

The potential of the initiatives to generate their intended impact relates to their ability to deal with their institutional context, as imposed by the incumbent energy regime. Actors in the niche, which can be understood as the marginal space of the energy system where alternatives to the dominant regime emerge, materialise their potential by transforming this very context. For assessing niche-regime dynamics, I consider seven system dimensions:

1. *Organisational logic* describes how an organisation generates value, including organisational decision-making processes, routines and activities directed towards the achievement of organisational aims, along with issues regarding ownership and the relationships between investors, producers and users;
2. *Technologies and Infrastructures* attends to the material dimension required for societal (energy) demand;
3. *User Practices* relates to the application domain of the concept or technology, and the associated routines and norms (e.g., prosumption);
4. *Cultural significance* relates to (widely) shared values associated with the (new) energy system, including the system's representation and symbolic meanings;
5. *Knowledge base* involves scientific, as well as tacit practical knowledge related to technological or social and organisational issues;
6. *Sector Structure* refers to the organisational networks, collective efforts, and the specific interaction platforms for the coordination of common interests;
7. *Policies and Political Power* relates to the role of government and the socio-economic lobbies in influencing policy-making, e.g., on the support framework for renewable energy initiatives.

In this thesis, regardless of their size and visibility, I consider niches as "embryonic regimes". This means that they are characterised by a (very) low degree of institutionalisation as compared to the dominant regime. Also, I consider that niches shape their identity in a dialectical and antagonistic relationship to the incumbent regime, meaning with the wish to replace them. The renewable energy initiatives in the niche try to consolidate alternative institutions, yet the extent of radicality may vary. Some niches may be radically different from the incumbent regime (wide difference in every dimension), while others may only be different in some of the dimensions (to a certain extent). Some niches will perish, others will be adopted or absorbed by the regime, and only a few will eventually break-through and take part in a new sustainable regime.

Such an understanding of the concept of niche brings more nuance to the niche assessment. Considering niches as embryonic regimes, a niche can be captured in its dialectical and antagonistic relationship with the regime context and its influence on it. The framework offers a fine-grained understanding of the actions the initiatives take regarding regime transformation, through the creation of new institutions and the parallel de-legitimisation and destabilisation of the institutions associated with the regime.

Key takeaways

- Niches often develop in opposition to certain regime dimensions; to better understand niche-regime dynamics niches and regimes should be analysed through the same dimensions;
- A business model perspective helps to understand how the strategy and ambition of an initiative align, and combined with transition thinking it helps comprehend and strengthen the impact of an initiative on its context;
- Conflicts may open windows of opportunity for accelerating the energy transition towards a different direction. The occurrence of conflict can function as an indicator of the transformative potential of an initiative, but in a paradoxical way as the regime can reinforce itself through this conflict, and thus limit the initiative's transformative impact;
- The ability and willingness of an initiative to engage in conflict, as well as to negotiate, exchange and make compromises are essential for its impact;
- Important for the transformative potential of sustainability-oriented initiatives is also coordination. Effective coordination – rather than complete alignment or uncoordinated diversity – between bottom-up initiatives is necessary to enable them to grow and diffuse.

This thesis is based upon three published journal articles, one published (peer-reviewed) book chapter, and two working papers, and it is framed by an overall introduction, methodology, and conclusion.

The first chapter introduces the context of the research: the energy system and its interrelated challenges and opportunities. In this first chapter, the transition perspective that frames this research is also introduced, explaining basic concepts like *transition, niche, regime, landscape,* and *lock-in*. Following, I describe the Dutch energy regime, its historic evolution, characteristics, and recent developments, as well as the emerging renewable energy initiatives. Last, I present my research aim and objectives, the positioning of my research, as well as the particular research questions of conceptual and empirical nature.

In chapter 2, I elaborate on my overall research approach and methodology. During my research I employed a mixed methods approach, combining both quantitative and qualitative tools. In parallel with my desk research, I conducted about 60 semi-structured interviews with a variety of actors involved in the Dutch energy transition: from local renewable energy cooperatives, commercial ESCOs and developer companies, to intermediary organisations and network operators. Additionally, my work also involved action research. Together with my promotor and co-promotor, and the support of an intern, we organised a strategic dialogue applying Transition Management to investigate and support the impact of renewable energy cooperatives in the Netherlands. I also pursued participant observation in the context of my five-month part-time placement within the network operator with the aim to investigate and support the potential development of a collaborative business model for local energy storage.

Chapter 3 discusses the state-of-the-art of the literature and introduces the conceptual foundations for understanding niche-regime interactions and the potential transformative impact of renewable energy initiatives. Specifically, to systematically examine the initiatives' contributions the chapter suggests studying the business models they develop and implement and how they relate to their institutional context. The chapter proposes to examine niches as embryonic institutions that exhibit a dialectic relationship with the regime. Illustrative examples are used to demonstrate the merits of the conceptual framework.

Chapter 4 is reproduced here with minor edits from its original source, a book chapter entitled *Transformative Business Models for Sustainability Transitions.* The chapter discusses the role of business models in sustainability transitions. The argument is introduced that the reflexive dynamics that play out between the innovative businesses and the regimes in which they emerge play a critical role in determining whether the emerging transformations will over time lead to fundamental systemic change. The Transformative Business Models framework is presented to advance our understanding of how the business model concept can contribute to sustainability transitions as well as how transition thinking supports the prospects of sustainable business models to unlock their transformative potential. The chapter focuses on the case of Deltawind, an energy cooperative in the Netherlands, which is analysed and discussed through the conceptual framework. Three main characteristics of business models exhibiting transformative potential are proposed: a broad value orientation, a broad stakeholder network, and a reflexive orientation.

Chapter 5 explores how renewable energy initiatives (self-)organise and legitimise their existence through their business model. The chapter starts with a brief discussion of the concept of impact and how the framework of Transformative Business Models relates to it. Then the focus goes first on the presentation of the business models the 12 renewable energy initiatives under study have developed and employ, and then, on a second level on the impact they (aspire to) have on the system. The first part, thus, focuses on the issue of "organising for impact" (i.e. on the sustainability-oriented business model), and the second focuses on the "impact of organising" (i.e. the impact of this sustainability-oriented business model). To map the latter, the divergence and tensions between the different organisations and the dominant regime is explored.

Chapter 6 is an article entitled *Transition without conflict? Renewable energy initiatives in the Dutch energy transition.* To assess the transformative potential of renewable energy initiatives in the Netherlands, the chapter builds on the analysis of the initiatives in chapter 5, and addresses the question: what kind of conflicts and tensions arise from renewable energy initiatives, and what strategies do they develop to overcome or avoid them? Combined with a business model perspective, transition thinking enables a better understanding of how the initiatives organise themselves, and where the points of friction with their institutional context emerge. In this chapter we suggest that the instances of conflict may function as an indication for the state of the energy transition and the transformative potential impact of such initiatives. The instances discussed in this contribution relate to existing support schemes, technology choices, and the overall organisational networks of the emerging sector.

Chapter 7 is an article entitled *Leading from the Niche: Insights from a strategic dialogue of renewable energy cooperatives in the Netherlands.* This chapter presents insights from a strategic dialogue co-organised with the Dutch national interest group of renewable energy cooperatives "ODE Decentraal". Transition management was used as action research methodology to organise the dialogue to understand and support the transformative potential of the cooperative energy movement. The dialogue helped to clarify the challenges and possibilities for scaling energy cooperatives beyond the niche, supporting at the same time the participants to reflect, strategize and develop a shared transition agenda. Our intervention and its impact is presented and analysed, while specifically evaluating the potential of transition management to facilitate social learning processes, reflexivity and the development of strategic actions. Our intervention confirmed the hypothesis that actors in the niche often focus too much on the competition with the regime for individual goals, thereby failing to collectively strategize and engage with incumbent regimes in a systematic way.

Chapter 8 is an article entitled *When top-down meets bottom-up: is there a collaborative business model for local energy storage?* Drawing on sustainability transitions and management literature, this chapter focuses on a neighbourhood battery with the aim to explore to what extent a collaboration between a network operator and renewable energy initiatives on local energy storage could help increase the impact of the latter in the energy transition. The opportunities and constraints for a collaborative business model for the neighbourhood battery in the Netherlands are explored, together with the challenges and tensions that emerge for the main parties involved. The concept of a neighbourhood battery involves strategic decisions, and perhaps a strategic innovation, whose transformative potential depends to a large extent on the perceptions and actions of those involved. The perspectives of the network operator were compared with those of renewable energy initiatives in the country, including the Energy Service Company involved in the pilot and, in parts, with the perspectives of the involved end-users. A misalignment of interests and expectations was registered which complicates the deployment of the neighbourhood battery concept. Recognizing the critical role of network operators, the conditions that may enable the emergence of collaborative business models for local energy storage are also discussed.

The concluding chapter 9 answers the research questions, discusses the identified paradoxes and presents lessons and recommendations for facilitating the development of transformative business models for the energy transition. The chapter also highlights the theoretical, methodological and empirical contributions of the thesis, and outlines a future research agenda.

Samenvatting

De energietransitie is veel meer dan alleen een deel van de oplossing voor het klimaatprobleem. Het is een onvermijdelijk, maar inherent onzeker proces met diepgaande maatschappelijke implicaties. De transformatie van ons energiesysteem betekent een verschuiving weg van het niet-duurzame, gecentraliseerde energiesysteem dat wordt gedomineerd door de grootschalige verbranding van fossiele brandstoffen, en kan bredere fundamentele veranderingen in de samenleving teweegbrengen.

Initiatieven op het gebied van hernieuwbare energie komen overal op, in Europa en daarbuiten, en introduceren een grote diversiteit aan nieuwe manieren van organisatie in de energiesector. Duurzame energiegemeenschappen, Energy Service Companies, burgergestuurde energiecoöperaties, crowdfunding en peer-to-peer platforms, maar ook commerciële energieprojectontwikkelaars dragen allemaal op hun eigen manier bij aan de energietransitie die gaande is.

De vraag die zich opdringt is of hernieuwbare energie-initiatieven het energiesysteem als geheel kunnen transformeren. Mijn onderzoek analyseert en evalueert de impact van hernieuwbare energie-initiatieven op de energietransitie. Daarbij staat het vraagstuk van organiseren centraal. Technologische innovatie alleen, zonder te beschouwen wie profiteert en wie wordt uitgesloten, zonder te beschouwen wat er gewonnen wordt en tegen welke prijs, kan leiden tot een 100% hernieuwbaar energiesysteem met groter verlies aan biodiversiteit en verergering van sociale onrechtvaardigheid. Met mijn onderzoek wil ik bijdragen aan de overgang naar een ecologisch duurzaam en sociaal rechtvaardig energiesysteem. De specifieke overkoepelende onderzoeksvraag die dit proefschrift richting gaf was:

Hoe kunnen we de rol en impact van hernieuwbare energie-initiatieven begrijpen in de context van bredere systemische veranderingen in het energiedomein en hoe kan deze impact vergroot worden?

Om deze vraag te beantwoorden heb ik een analytisch raamwerk ontwikkeld dat inzichten combineert over (op duurzaamheid gerichte) business modellen en duurzaamheidstransities. Ik introduceer het raamwerk van Transformatieve Business Modellen als een hulpmiddel om de bijdrage van een duurzaam energie-initiatief aan de energietransitie te analyseren en te overdenken, maar ook als een hulpmiddel om te navigeren en strategieën te ontwikkelen om deze bijdrage te vergroten.

Het business model is een concept dat fungeert als het voertuig voor de beoordeling van de manier waarop een organisatie haar beoogde duurzame impact definieert en wil realiseren. In mijn proefschrift is het concept geoperationaliseerd in vier bouwstenen:

A. *Waardepropositie*, die verduidelijkt wat voor voordelen de organisatie biedt aan haar klanten, investeerders en alle andere belanghebbenden. Voor duurzame bedrijven, zoals energiecoöperaties, heeft de waardepropositie niet alleen betrekking op onmiddellijke monetaire winst, maar, nog belangrijker, op het realiseren van maatschappelijke voordelen.
B. *Product of dienst,* die het bedrijf levert aan zijn klanten. Zoals schone elektriciteit, warmte, elektromobiliteit, maar ook kennis en advies.

C. *Architectuur van waarde,* de partnerschappen waardoor waardecreatie en -levering tot stand worden gebracht. Deze bouwsteen hangt samen met de strategie van de organisatie om haar waardepropositie te realiseren.
D. *Waardevalorisatie,* die betrekking heeft op de kosten- en inkomstenstromen die de monetaire en niet-monetaire waarde van de organisatie determineren, en haar levensvatbaarheid bepalen.

Mijn onderzoek richtte zich zowel op het narratief als op de feitelijke structuren en praktijken van de initiatieven.

Het potentieel van de initiatieven om hun beoogde impact te genereren hangt samen met hun vermogen om te gaan met hun institutionele context, zoals opgelegd door het gevestigde energieregime. Actoren in de niche, die kan worden opgevat als de marginale ruimte van het energiesysteem waar alternatieven voor het dominante regime ontstaan, verwezenlijken hun potentieel door juist deze context te transformeren. Om de dynamiek van de niche-regimes te beoordelen, beschouw ik zeven systeemdimensies:

1. *Organisatorische logica* beschrijft hoe een organisatie waarde genereert, met inbegrip van organisatorische besluitvormingsprocessen, routines en activiteiten gericht op het bereiken van organisatorische doelen, samen met kwesties betreffende eigendom en de relaties tussen investeerders, producenten en gebruikers;
2. *Technologieën en infrastructuur* betreft de materiële dimensie die nodig is voor de maatschappelijke (energie)vraag;
3. *Gebruikspraktijken* heeft betrekking op het toepassingsgebied van het concept of de technologie, en de bijbehorende routines en normen (bv. prosumptie);
4. *Culturele betekenis* heeft betrekking op (breed) gedeelde waarden in verband met het (nieuwe) energiesysteem, met inbegrip van de representatie en symbolische betekenissen van het systeem;
5. *Kennisbasis* betreft zowel wetenschappelijke als onbewuste praktische kennis in verband met technologische of sociale en organisatorische kwesties;
6. *Sectorstructuur* verwijst naar de organisatorische netwerken, de collectieve inspanningen en de specifieke interactieplatforms voor de coördinatie van gemeenschappelijke belangen;
7. *Beleid en politieke macht* heeft betrekking op de rol van de overheid en de sociaal-economische lobby's bij het beïnvloeden van de beleidsvorming, bijvoorbeeld inzake het ondersteuningskader voor duurzame energie-initiatieven.

In dit proefschrift beschouw ik niches, ongeacht hun omvang en zichtbaarheid, als "embryonale regimes". Dit betekent dat ze gekenmerkt worden door een (zeer) lage graad van institutionalisering in vergelijking met het dominante regime. Ik beschouw ook dat niches hun identiteit vormgeven in een dialectische en antagonistische relatie tot het heersende regime, dat wil zeggen met de wens deze te vervangen. De duurzame-energie-initiatieven in de niche proberen alternatieve instituties te consolideren, maar de mate van radicaliteit kan variëren. Sommige niches verschillen radicaal van het gevestigde regime (groot verschil in elke dimensie), terwijl andere misschien slechts in enkele dimensies (tot op zekere hoogte) anders zijn. Sommige niches zullen ten onder gaan,

andere zullen worden overgenomen of geabsorbeerd door het regime, en slechts een paar zullen uiteindelijk doorbreken en deel uitmaken van een nieuw duurzaam regime.

Een dergelijke opvatting van het begrip niche brengt meer nuance in de beoordeling van niches. Door niches te beschouwen als embryonale regimes, kan een niche worden gevat in zijn dialectische en antagonistische relatie met de regimecontext en zijn invloed daarop. Het raamwerk biedt een fijnmazig begrip van de acties die de initiatieven ondernemen met betrekking tot regime transformatie, door de creatie van nieuwe instituties en de parallelle delegitimering en destabilisatie van de instituties die geassocieerd worden met het regime.

Belangrijkste leerpunten

- Niches ontwikkelen zich vaak tegenover bepaalde regimedimensies; om de dynamiek tussen niches en regimes beter te begrijpen, moeten niches en regimes aan de hand van dezelfde dimensies worden geanalyseerd;
- Een businessmodelperspectief helpt om te begrijpen hoe de strategie en de ambitie van een initiatief op elkaar aansluiten, en gecombineerd met transitiedenken helpt het om de impact van een initiatief op zijn context te begrijpen en te versterken;
- Conflicten kunnen vensters van mogelijkheden openen om de energietransitie in een andere richting te versnellen. Conflicten kunnen een indicator zijn voor het transformatiepotentieel van een initiatief, maar op een paradoxale manier, aangezien het regime zichzelf door dit conflict kan versterken en zo de transformatieve impact van het initiatief kan beperken;
- Het vermogen en de bereidheid van een initiatief om conflicten aan te gaan, te onderhandelen, uitwisselingen te voeren en compromissen te sluiten, zijn van essentieel belang voor de impact ervan;
- Belangrijk voor het transformatieve potentieel van op duurzaamheid gerichte initiatieven is ook coördinatie. Effectieve coördinatie - in plaats van volledige afstemming of ongecoördineerde diversiteit - tussen bottom-up initiatieven is noodzakelijk om deze te laten groeien en zich te verspreiden.

Dit proefschrift is gebaseerd op drie gepubliceerde tijdschriftartikelen, één gepubliceerd (peer-reviewed) boekhoofdstuk, en twee working papers, en wordt omlijst door een algemene inleiding, methodologie, en conclusie.

Het eerste hoofdstuk introduceert de context van het onderzoek: het energiesysteem en de onderling samenhangende uitdagingen en kansen. In dit eerste hoofdstuk wordt ook het transitieperspectief dat dit onderzoek omkadert geïntroduceerd, waarbij basisbegrippen als transitie, niche, regime, landschap, en lock-in worden uitgelegd. Vervolgens beschrijf ik het Nederlandse energieregime, de historische ontwikkeling, kenmerken en recente ontwikkelingen ervan, evenals de opkomende duurzame energie-initiatieven. Ten slotte presenteer ik mijn onderzoeksdoel en -doelstellingen, de positionering van mijn onderzoek, en de specifieke onderzoeksvragen van conceptuele en empirische aard.

In hoofdstuk 2 ga ik dieper in op mijn algemene onderzoeksbenadering en methodologie. Tijdens mijn onderzoek heb ik gebruik gemaakt van een mixed methods-benadering, waarbij ik zowel kwantitatieve als kwalitatieve instrumenten heb gecombineerd. Parallel

aan mijn desk-research heb ik ongeveer 60 semi-gestructureerde interviews gehouden met een verscheidenheid aan actoren die betrokken zijn bij de Nederlandse energietransitie: van lokale duurzame energiecoöperaties, commerciële ESCO's en ontwikkelaarsbedrijven, tot intermediaire organisaties en netwerkbeheerders. Daarnaast omvatte mijn werk ook actie-onderzoek. Samen met mijn promotor en co-promotor, en met ondersteuning van een stagiaire, organiseerden we een strategische dialoog waarbij transitiemanagement werd toegepast om de impact van duurzame energiecoöperaties in Nederland te onderzoeken en te ondersteunen. Ik deed ook aan participerende observatie in het kader van mijn vijf maanden durende deeltijdstage bij de netwerkbeheerder, met als doel de potentiële ontwikkeling van een collaboratief bedrijfsmodel voor lokale energieopslag te onderzoeken en te ondersteunen.

Hoofdstuk 3 bespreekt de state-of-the-art van de literatuur en introduceert de conceptuele grondslagen voor het begrijpen van niche-regime interacties en de potentiële transformatieve impact van hernieuwbare energie-initiatieven. Het hoofdstuk suggereert om de bijdragen van de initiatieven systematisch te onderzoeken, door het bestuderen van de business modellen die ze ontwikkelen en implementeren en hoe ze zich verhouden tot hun institutionele context. Het hoofdstuk stelt voor om niches te onderzoeken als embryonale instellingen die een dialectische relatie met het regime vertonen. Met enkele illustratieve voorbeelden worden de voordelen van het conceptuele kader aangetoond.

Hoofdstuk 4 is hier met kleine aanpassingen overgenomen uit de oorspronkelijke bron, een boekhoofdstuk met als titel *Transformative Business Models for Sustainability Transitions*. Het hoofdstuk bespreekt de rol van business modellen in duurzaamheidstransities. Beargumenteerd wordt dat de reflexieve dynamiek die zich afspeelt tussen de innovatieve bedrijven en de regimes waarin ze ontstaan een cruciale rol speelt in het bepalen of de opkomende transformaties na verloop van tijd zullen leiden tot fundamentele systemische verandering. Het raamwerk van Transformatieve Business Modellen wordt gepresenteerd om ons begrip te vergroten van hoe het concept van business modellen kan bijdragen aan duurzaamheidstransities, alsook hoe transitiedenken de mogelijkheid versterkt voor duurzame business modellen om hun transformatieve potentieel te ontsluiten. Het hoofdstuk richt zich op de casus van Deltawind, een energiecoöperatie in Nederland, die wordt geanalyseerd en besproken aan de hand van het conceptuele raamwerk. Drie hoofdkenmerken van bedrijfsmodellen met transformatieve potentieel worden voorgesteld: een brede waardeoriëntatie, een breed stakeholdersnetwerk, en een reflexieve oriëntatie.

Hoofdstuk 5 onderzoekt hoe duurzame energie-initiatieven hun bestaan (zelf)organiseren en legitimeren via hun businessmodel. Het hoofdstuk begint met een korte bespreking van het begrip impact en hoe het raamwerk van Transformatieve Business Modellen zich daartoe verhoudt. Daarna gaat de aandacht eerst uit naar de presentatie van de business modellen die de 12 onderzochte duurzame energie initiatieven hebben ontwikkeld en hanteren, en vervolgens, op een tweede niveau, naar de impact die zij (beogen te) hebben op het systeem. Het eerste deel gaat dus over "organiseren met het oog op impact" (d.w.z. over het op duurzaamheid gerichte bedrijfsmodel), en het tweede deel over de "impact van organiseren" (d.w.z. de impact

van dit op duurzaamheid gerichte bedrijfsmodel). Om dit laatste in kaart te brengen worden de divergentie en spanningen tussen de verschillende organisaties en het dominante regime onderzocht.

Hoofdstuk 6 is een artikel getiteld *Transition without conflict? Renewable energy initiatives in the Dutch energy transition*. Om het transformatieve potentieel van hernieuwbare energie-initiatieven in Nederland te beoordelen, bouwt het hoofdstuk voort op de analyse van de initiatieven in hoofdstuk 5, en gaat het in op de vraag: wat voor conflicten en spanningen ontstaan er bij hernieuwbare energie-initiatieven, en welke strategieën ontwikkelen zij om deze te overwinnen of te vermijden? Gecombineerd met een business model perspectief, maakt transitie denken een beter begrip mogelijk van hoe de initiatieven zichzelf organiseren, en waar de punten van frictie met hun institutionele context naar voren komen. In dit hoofdstuk suggereren we dat de gevallen van conflict kunnen fungeren als een indicatie voor de staat van de energietransitie en de transformatieve potentiële impact van dergelijke initiatieven. De voorbeelden die in deze bijdrage worden besproken hebben betrekking op bestaande steunregelingen, technologiekeuzes, en de algemene organisatorische netwerken van de opkomende sector.

Hoofdstuk 7 is een artikel met de titel *Leading from the Niche: Insights from a strategic dialogue of renewable energy cooperatives in the Netherlands*. Dit hoofdstuk presenteert inzichten uit een strategische dialoog die samen met de Nederlandse nationale belangenorganisatie van duurzame energie coöperaties "ODE Decentraal" is georganiseerd. Transitiemanagement werd gebruikt als methodologie voor actie-onderzoek om de dialoog te organiseren en zo het transformatieve potentieel van de coöperatieve energiebeweging te begrijpen en te ondersteunen. De dialoog hielp om de uitdagingen en mogelijkheden voor het opschalen van energiecoöperaties buiten de niche te verduidelijken, en ondersteunde tegelijkertijd de deelnemers om te reflecteren, strategieën te ontwikkelen en een gedeelde transitie-agenda op te stellen. Onze interventie en de impact ervan worden gepresenteerd en geanalyseerd, waarbij specifiek wordt gekeken naar het potentieel van transitiemanagement om sociale leerprocessen, reflexiviteit en de ontwikkeling van strategische acties te faciliteren. Onze interventie bevestigde de hypothese dat actoren in de niche zich vaak te veel richten op de competitie met het regime voor individuele doelen, waardoor ze er niet in slagen om op een systematische manier collectief strategieën te ontwikkelen en te engageren met heersende regimes.

Hoofdstuk 8 is een artikel getiteld *When top-down meets bottom-up: is there a collaborative business model for local energy storage*? Dit hoofdstuk bouwt voort op de literatuur over duurzaamheidstransities en management en focust zich op een buurtbatterij. Met als doel te onderzoeken in hoeverre een samenwerking tussen een netbeheerder en duurzame energie-initiatieven op het gebied van lokale energieopslag kan helpen de impact van de laatste in de energietransitie te vergroten. De kansen en beperkingen voor een collaboratief business model voor de buurtbatterij in Nederland worden verkend, samen met de uitdagingen en spanningen die naar voren komen voor de belangrijkste betrokken partijen. Het concept van een buurtbatterij impliceert strategische beslissingen, en wellicht een strategische innovatie, waarvan het

transformatieve potentieel in grote mate afhangt van de percepties en acties van de betrokkenen. De perspectieven van de netbeheerder zijn vergeleken met die van hernieuwbare energie-initiatieven in het land, waaronder de bij de pilot betrokken Energy Service Company, en voor een deel ook met de perspectieven van de betrokken eindgebruikers. Er werd een gebrek aan overeenstemming van belangen en verwachtingen vastgesteld, wat de invoering van het buurtbatterijconcept bemoeilijkt. Met erkenning van de kritieke rol van de netbeheerders, worden ook de voorwaarden besproken die het ontstaan van collaboratieve business modellen voor lokale energieopslag mogelijk kunnen maken.

Het afsluitende hoofdstuk 9 beantwoordt de onderzoeksvragen, bespreekt de geïdentificeerde paradoxen en presenteert lessen en aanbevelingen voor het faciliteren van de ontwikkeling van transformatieve businessmodellen voor de energietransitie. Het hoofdstuk belicht ook de theoretische, methodologische en empirische bijdragen van het proefschrift, en schetst een toekomstige onderzoeksagenda.

drift for transition