Routledge Studies in Energy Transitions

ENERGY TRANSITION IN THE BALTIC SEA REGION

UNDERSTANDING STAKEHOLDER ENGAGEMENT AND COMMUNITY ACCEPTANCE

Edited by
Farid Karimi and Michael Rodi

"The climate urgency requires us to transition to an efficient, renewables based economy as soon as possible. This book is a welcome and timely contribution to the energy transition policy discourse in the Baltic Sea region. I am sure the experiences and best practices from across cities, regions and states will inspire action far beyond the region."

Krista Mikkonen, *Minister of the Environment and Climate Change of Finland*

"We already know that decarbonizing our economies at the pace and scale called for by climate science will face unprecedented obstacles. Increasingly, however, we are discovering that the greatest obstacle may not be a dearth of technological solutions or finance, but one of public opinion: whether expressed in the form of localised resistance against renewable energy projects or rejection of national climate action by a wavering electorate, lacking social acceptance threatens to undermine progress towards the necessary energy transition. Drawing on a region that offers pioneering insights, the diverse group of authors represented in this book offers a unique perspective and valuable lessons on perhaps the most intractable climate policy challenge yet."

Michael Mehling, *Deputy Director, MIT Center for Energy and Environmental Policy Research, Cambridge, Massachusetts, USA*

"The energy transition is not about business or official state strategies. First of all, it is about society – how individuals and communities change their habits of energy consumption and how they evolve to energy prosumers. This book helps to understand the social transformations and practical implications of policy measures targeted at transition to clean energy. The most needed analysis to understand the depth of processes we all are facing."

Tomas Janeliūnas, *Director of Energy Research Institute, Vilnius University, Lithuania*

"This is a topical book with hands-on policy recommendations for those in and outside of academia who want to learn about the crucial role of bottom-up activities in an energy transition: a comprehensive collection reflecting on various aspects of an energy transition using diverse approaches and examples from countries in the Baltic Sea Region."

Christian von Hirschhausen, *Technical University Berlin, Germany*

"One of the most important contemporary questions connected to climate change mitigation and energy transition is how to translate the scientific and political consensus about the need to limit the human impact on our environment into societal consensus and support. This edited volume examines these issues from a regional perspective and provides important insight into the complexity of energy transition and the role of various societal actors in it. A must-read for anybody interested in the Baltic Sea Region, energy transition, or climate change."

Matúš Mišík, *Department of Political Science, Comenius University in Bratislava, Slovakia*

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Energy Transition in the Baltic Sea Region

This book analyses the potential for active stakeholder engagement in the energy transition in the Baltic Sea Region (BSR) in order to foster clean energy deployment.

Public acceptability and bottom-up activities can be critical for enduring outcomes to an energy transition. As a result, it is vital to understand how to unlock the potential for public, community and prosumer participation to facilitate renewable energy deployment and a clean energy transition – and, consequently, to examine the factors influencing social acceptability. Focussing on the diverse BSR, this book draws on expert contributions to consider a range of different topics, including the challenges of social acceptance and its policy implications; strategies to address challenges of acceptability among stakeholders; and community engagement in clean energy production. Overall, the authors examine the practical implications of current policy measures and provide recommendations on how lessons learnt from this 'energy lab region' may be applied to other regions.

Reflecting an interdisciplinary approach in the social sciences, this book is an essential resource for scholars, students and policymakers researching and working in the areas of renewable energy, energy policy and citizen engagement, and interested in understanding the potential for bottom-up, grassroots activities and social acceptability to expedite the energy transition and reanimate democracies.

Farid Karimi is a senior researcher and lecturer at the Faculty of Bioeconomy, Novia University of Applied Sciences, Finland. His main research interests are in the social sciences, with a particular focus on the energy transition and energy politics. His articles and interviews have been published in major journals and outlets.

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Preface

This book aims to highlight the role and power of people and the grassroots in democratic societies for expediting an energy transition which evidently is needed now more than ever. An energy transition is crucial in order to decarbonise society in the heat of global challenges, not least vis-à-vis climate change and also ambitious goals pertaining to, for instance, the European Green Deal. The idea of working on this edited volume was initiated around the same time we began to establish the energy research group of the unique Interdisciplinary Centre for Baltic Sea Region Research (IFZO) at the University of Greifswald, Germany. The IFZO analyses cooperation and conflict-driven narratives of the future in the societies of the Baltic Sea Region (BSR). The energy research group is law and social sciences oriented, aiming to have social impacts vis-à-vis an energy transition in the BSR. The IFZO is funded by the German Federal Ministry of Education and Research (BMBF).

When it comes to energy, Greifswald is a prominent city in the BSR because, for instance, the first decommissioned nuclear power plant in the world is located in its vicinity. Greifswald is also the primary connecting point for the pipeline of the controversial Nord Stream projects. In addition, a cutting-edge experimental stellarator fusion reactor that is used to evaluate components of future fusion power plants was built in Greifswald.

All in all, focusing on a region so interestingly diverse as the BSR is meant to fill the current gap in the literature, as this region has much to teach us about expediting an energy transition. This is of relevance not only for this area, but beyond, and particularly for other parts of the EU. This book would not have been possible without the invaluable contributions and support of many, and we would like to take this opportunity to express our gratitude to those who made this book project possible.

First, we would like to express our gratitude to the contributors of this book for their patience and immense knowledge. Shortly after we initiated this book project, the Covid-19 outbreak started, which left us with peculiar and challenging circumstances. Regardless of these challenges, the authors did their best to push this project forward and revise their manuscripts several times during an iterative review process.

Further, our gratitude and appreciation go to Prof Michael North, the Director of the IFZO, and Dr Alexander Drost for their support. In particular, Alexander's efforts to provide what was needed in order to pursue this project and being extremely accommodating is something for which we are very grateful. We also appreciate Alexander's wisdom and insights. Moreover, we are grateful to Kate Miller for editing the introduction and conclusion chapters. We also thank the Institute for Climate Protection, Energy and Mobility (IKEM), Germany, for their support in organising the first workshop of this book project.

In the middle of this project, Farid joined the Novia University of Applied Sciences, Finland. Without the gracious and generous support of the vice-president of the university and Dean of the Faculty of Bioeconomy Dr Eva Sandberg-Kilpi, and research manager of the faculty Dr Marianne Fred, the completion of this work was nigh on impossible. Farid is grateful to them, and their kindness shall never be consigned to oblivion. Farid also thanks his research assistant Markus Enqvist who was a great help in preparing the manuscript of this book with his meticulous efforts.

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Michael would like to thank Farid, who invested so much time and work making this book a success. It was great to work closely with Farid during the founding years of the IFZO. It was a wonderful time from an academic and a personal perspective, and this book will represent and be a reminder of this time.

Last but not least, Farid gives a load of thanks and appreciation to his beloved fiancée Laura for her heart-warming support and for bearing with his long working hours; as well as his lovely family to whom he owes so much for their endless love: parents, siblings and all their beloved families. And, to Farid and Laura's baby who will make their lives even more colourful!

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Introduction

1 Energy transition in the Baltic Sea Region

Bottom-up activities, stakeholder engagement and social acceptability

Farid Karimi and Michael Rodi

Prologue: scope and overview

Public acceptance, bottom-up grassroots activities and social acceptability play an essential role in an energy transition. It is therefore vital to understand how to unlock the potential for public, community and prosumer participation in a clean energy transition. This requires a closer examination of how stakeholder acceptability, in particular social acceptability, emerges. The existing literature on these topics may be extensive, but it often provides little guidance to policymakers and other actors on how to proceed with their work given the complex nature of social acceptance and acceptability.

This book analyses the potential for active stakeholder engagement and bottom-up activities in an energy transition in various sectors. Using the Baltic Sea Region (BSR) as an empirical focus, it also examines the practical implications of policy measures in order to foster clean energy deployment in the region and apply lessons learnt from this region to other areas in and outside Europe. The chapters reflect an interdisciplinary approach that draws on various disciplines within the social sciences, including political science, economics and law.

In this book, the BSR is defined as the region encompassing the following countries: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Norway, Poland, Russia and Sweden. However, the various analyses included here only refer to the European Union (EU) and European Economic Area (EEA) of the BSR. The BSR is an interesting case study which offers fertile ground for empirical testing and for the transfer of lessons learnt to other parts of Europe and around the world. This is because the region represents a microcosm of diverse energy profiles and strategies, decarbonisation approaches, cultures, political histories, and legal and industrial profiles. It has the potential to harness significant renewable energy (RE), particularly wind power (e.g., Child, Bogdanov and Breyer, 2018; Karimi and Rodi, 2021), while ensuring the flexibility of the energy system.

While the BSR shares certain characteristics associated with its natural system, the region is geographically diverse: it encompasses metropolitan areas as well as a considerable number of islands and rural regions, many of which are remote and have low population density. Moreover, landmark events in the energy transition have occurred in the region, such as the first-ever

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decommissioning of a nuclear power plant, Greifswald nuclear power station, which took place on the Baltic coast near Greifswald, Germany. This took place soon after the fall of the Berlin Wall – or, in broader terms, the fall of the Soviet Union and the Eastern Bloc, an event that ultimately led to the democratisation of the Central and Eastern European (CEE) countries of the BSR. The economic and social challenges inherited by the post-Soviet countries of the region (e.g., Mišík and Oravcová, 2021) add another interesting dimension to the empirical study of this region. The BSR also faces complex political challenges and dilemmas that, in some cases, provoke conflict. These could hinder a timely energy transition and impede the development of common strategies to combat climate change. Such challenges pertain mainly to political disputes with, and security challenges posed by, Russia, not least vis-à-vis the CEE countries of the region; this can be seen, for example, in the controversy over the Nord Stream 2 gas pipeline (e.g., Karimi and Rodi, 2021) or in recent security concerns regarding external actors like China (e.g., Scott, 2018). In light of these challenges, there is a preference and a tendency to decrease dependency on fossil fuels imported mainly from Russia (and to a lesser extent from the Middle East) and on electricity imported from Russia to the other countries of the region, including the Baltic States and Finland. Finally, the region includes a few of the countries on the list of highest CO_2 emitters in the world, such as Germany and Poland (Global Carbon Atlas, 2021).

In sum, the countries of the BSR have certain notable features in common, but the region is also fragmented in many respects. These characteristics make the BSR an 'all-inclusive case' with enormous potential to inform broader debates, even beyond the region. Lessons from the BSR are particularly valuable as they suggest the potential for decentralised, bottom-up activities to serve as a complementary measure for energy independence and transition. This approach contrasts with the centralised, top-down energy transitions that tend to dominate mainstream discussions and the relevant literature.

Energy transition in the Baltic Sea Region: overview and concepts

An energy transition, as is used here, aims to decarbonise the energy system (or, broadly speaking, the economy) and secure the energy supply in order to ensure sustainable development and mitigate climate change. Such transitions entail a significant set of changes to the patterns of a society's energy use, with likely effects on resources, carriers, converters, institutions, services and behaviours (e.g., Sovacool et al., 2016). In the context of sustainable development, energy transition is a specific term used to describe a transformation of the economy from fossil-based to carbon-neutral by 2050 in an effort to mitigate climate change (European Commission, 2020a, 2020b). It is a process intended to significantly reduce global CO_2 emissions in line with the objectives of both Article 2 of the Paris Agreement (UNFCCC, 2016) and the European Green Deal (European Commission, 2020a). These ambitious objectives demand clear and effective strategies and policies, adequate resources and funding, and cultural and behavioural changes at all levels (Karimi and Rodi, 2021).

An energy transition has technological, socio-political, legal, economic and environmental dimensions. It can be analysed at three levels: global, (macro- or micro-) regional and national. In this book, we focus on socio-political, legal and, to some extent, economic dimensions of an energy transition at a regional level (i.e., the BSR) and at the national level (i.e., individual countries of the BSR). Although the region is fragmented in terms of energy governance and politics, it could theoretically achieve the ambitious climate policy objectives of the EU even before other regions, becoming a model for other areas (e.g., Child et al., 2018). This is mainly due to the region's enormous potential to harness RE (notably wind power, biomass and hydropower). It also has specific opportunities to increase energy system flexibility by balancing supply and demand, ensuring security of supply through energy storage options, liquefied natural gas (LNG), energy efficiency even at the household level, decarbonisation of the mobility sector and sustainable land use.

In order to expedite an energy transition, it is vital to increase the share of RE in the energy system, improve energy efficiency and ensure flexibility in energy supply and demand. These were long seen as challenges because of a lack of innovative technology and adequate funding. Technological challenges and funding issues are gradually being addressed; however, as is the case for any process of societal transformation, public participation and engagement continue to be highly relevant to the energy transition (e.g., Chilvers and Longhurst, 2016; Chilvers et al., 2021). Without public support, acceptance and participation, any societal change, including an energy transition, is doomed to failure in democratic societies.

Mainstream discussions of alternative energy policy for energy transitions tend to focus on large-scale centralised energy systems and on top-down activities and strategies. Nevertheless, it appears that promising potential and capacity exist for smaller-scale energy generators to make substantial contributions to an energy transition and to the fulfilment of EU climate goals, particularly in the BSR, which encompasses many islands and rural regions (Kotilainen, 2020; Hanger-Kopp et al., 2019; Zhang et al., 2017). Examples of small-scale systems and bottom-up grassroots activities and stakeholders include microgrids (e.g., prosumers) and community energy projects (Zhang et al., 2017; Bauwens et al., 2016; Burger and Weinmann, 2014). In other words, mobilising people to transition from being passive consumers to active 'energy citizens' would be an important guarantor of success in a new, decentralised and climate-friendly energy system. Prosumption offers an advantage to the energy system because it brings production closer to consumers and even creates green jobs in local communities. Moreover, it increases the share of renewables in power generation and decreases CO_2 emissions, since RE is the most common alternative for prosumers. Prosumption is likely to ensure the security of supply on a micro level while increasing the energy system flexibility. Active engagement of prosumers is necessary to ensure social and economic equality and wellbeing (Chapters 7 and

8). Flexibility, which is critical to the success of the energy transition, can be obtained from the following three sources: producers, interconnections and consumers. Thus, the challenge is to provide a level playing field for these three sources of flexibility, which have different backgrounds and driving forces, especially as consumers have generally been considered relatively insignificant relative to large producers and interconnectors.

Some see bottom-up, small-scale, grassroots activities for energy production as an opportunity to further democratise a central area of the economy (e.g., Heldeweg and Saintier, 2020) and as an alternative to energy dependency, particularly for smaller countries. Furthermore, media have generally portrayed small-scale energy generation as a policy that empowers people and civil society to directly affect their own lives and wellbeing (e.g., Pfeifer, 2018). This factor is especially important in light of the fact that, in democracies, governments generally change after four- or five-year terms; as a result, political rivalry may hinder governments from implementing concrete policies that bear fruit in the long term. In an attempt to circumvent these policies, governments may invest less in an energy transition and long-term commitments and adopt more populistic approaches that promote short-sighted policy or otherwise advance their political interests. Furthermore, if a political party in power denies climate change, or if climate policy is not central to the party's agenda, less attention is paid to the energy transition, and the entire process of the energy transition may stagnate. This can be observed, for example, in the recent political trend towards more conservative policies in some CEE countries. Thus, bottom-up, grassroots activities vis-à-vis an energy transition would, to a certain extent, ensure that the energy transition continues at a steady pace, regardless of the political orientation and policy preferences of national governments.

Perceptions, reactions and acceptance significantly affect the success of energy transitions at local, regional and global levels (Suškevičs et al., 2019; Wolsink, 2018; Chapters 4, 6 and 12). As Kojo et al. argue in Chapter 6, a decentralised energy transition can only be successful when it is accepted by the people. Social and psychological (e.g., Karimi and Toikka, 2018), economic (Chapters 4 and 6) and political (e.g., Dermont et al., 2017) factors influence social acceptance of new forms of energy production and attitudinal shifts towards energy consumption. Factors facilitating stakeholder acceptance include the presence of robust institutions, political commitment, supportive laws and regulations, competitive costs, a sophisticated communication system and comprehensive financing (Sovacool and Ratan, 2012). Incentivised policy with tangible local benefits and technical support would increase social acceptance among prosumers and microgenerators (von Wirth et al., 2018). In Chapter 3, however, Egelund Olsen argues that the design of these sorts of policies and support systems requires meticulous analysis of the effect of such measures and indicates a need for more dynamic and flexible regulatory approaches.

Although the above factors are crucial, they alone cannot fully explain the complex nature of social acceptance and the emergence of social acceptability (e.g., Krick, 2018; Devine-Wright et al., 2017; Sonnberger and Ruddat, 2017).

To overcome the current research gap concerning patterns of stakeholder acceptance and acceptability, it is necessary to understand how social acceptance and public engagement can be activated in order to increase social acceptability. Against this background, we scrutinise the influence of small-scale, regional and bottom-up activities (rather than that of top-down and large-scale activities) on the emergence of social acceptability.

The importance of social acceptability is also crucial to the fulfilment of broader policy goals. The European Commission strives to integrate renewable energy cooperatives into the citizen-driven governance of the Energy Union. This would enable citizens to 'take ownership of the energy transition' (European Commission, 2015, p. 2). Although the European Federation of Renewable Energy Cooperatives is quite strong, it is clear that most citizens are motivated more by local circumstances than by engagement at higher policy levels (Tosun et al., 2019). Still, there is a niche for such approaches: energy cooperatives often engage in regional energy transition governance and contribute to a democratic trans-municipal governance network (Hoppe and Miedema, 2020).

Finally, an increase in the share of variable renewable energy (VRE) (and, eventually, greater energy system flexibility) will contribute to job creation and increase employment, particularly on the demand side (e.g., Füllemann et al., 2020), for instance through the emergence of new enterprises. This is likely to significantly increase the social acceptability of the energy transition. In addition, investment in research and development in related areas promises not only to expedite this process, but also to create academic jobs, thus tightening the link between university, industry and society.

Stakeholder engagement and community acceptance: a missing piece of the jigsaw

As we argue in the previous section, public attitudes towards energy solutions vis-à-vis climate change considerably affect the development and deployment of different technologies. Social acceptability is a key factor that should be considered in parallel with the development of technologies themselves. According to the Eurobarometer (2015), 91% of people in EU countries support the EU policy to increase the share of renewable energy by 2030. However, it is important to understand the mechanism for local community participation in renewable energy deployment. Antoni and Rodi (Chapter 2) observe that people can be activated at different levels. This applies to flexibility options as well as to different opportunities to become actively engaged as producers or consumers (e.g., prosumers), either at an individual level or as part of more or less formal cooperation (e.g., companies or energy communities). At the first level, the energy transition requires increased opportunities for demand-side flexibility, which is normally controlled by third parties, generally grid providers. The provision of this service by companies as aggregators or new energy actors can be compared with commercial or industrial consumers (Leal-Arcas et al., 2018). These are already regarded as flexible consumers who often actively reduce their electricity demand and thus contribute to balancing supply and demand in the overall electricity system. A more important concept in the context of citizen engagement is the self-generation of energy (electricity or heat), which allows people to become energy producers ('prosumers').

Before analysing potential state and governmental approaches to increase stakeholder engagement, it is important to understand what has happened so far in this respect and which motivations activate people for the energy transition (e.g., Lennon et al., 2019). Studies show that motivations are extremely diverse (Soeiro and Ferreira Dias, 2020). Interestingly, the strongest and most common motivations are non-monetary: people feel responsible for the environment, want to influence their local community and bring people together (Kalkbrenner and Roosen, 2016). Thus, motivations to join community energy initiatives, for example, often seem to be connected to [sustainable] lifestyle (Soeiro and Ferreira Dias, 2020). People are of course also interested in business models offered by participatory schemes.

Against this background, the central research questions in this book are: what is the potential for bottom-up activities to ensure steady progress on an energy transition? What are the recent socio-political and legal developments concerning grassroots and bottom-up activities for an energy transition? Are current policies and strategies effective in decentralising energy systems and engaging people for an energy transition? What, if anything, about our current laws and regulations must be changed? Are there lessons to be learnt from the BSR as a microcosm of diverse decarbonisation, cultures, and different legal and industrial profiles? And, finally, how does social acceptability emerge in a way that would expedite an energy transition on the regional, national and international levels? Our hypothesis is that there is untapped potential for demand-side and bottom-up activities to expedite a secure energy transition, even in countries with top-down, centralised energy systems that have thus far appeared to make remarkable advancements in an energy transition and in the decarbonisation of the economy. This book draws on various case studies and interdisciplinary approaches to discuss this untapped potential and the challenges involved in translating it into action.

Stakeholder engagement and community acceptance: challenges for the legal order

Antoni and Rodi, and Egelund Olsen argue in Chapters 2 and 3 that, social, political and technological advancements can provide only partial solutions to challenges of the energy transition. The law must also provide an answer to these challenges. The legislature has the authority to determine how to promote public engagement in bottom-up activities for an energy transition, as well as to set targets in accordance with these decisions. To realise the goal of an energy transition with a special focus on decentralised and citizen-engaged activities, possible legal barriers must be identified and removed. This may not be sufficient, however, and the legislature must consider instruments to incentivise the private sector as well as individuals. In the EU, these decisions are taken in a fragmented multi-level legal system pertaining to EU law, national law, subnational law (e.g., laws of federal states and regions) and municipal law. To overcome the horizontal fragmentation, integrative institutions and governance systems must be designed and implemented. As EU law has not yet developed successful cooperation systems and institutions on the EU level, macro-regional strategies play an important role to fill the gap (Núñez Ferrer et al., 2019). Of these, the EU Strategy for the Baltic Sea Region (EUSBR) set up in 2009 is among the most important.[1] It extended the existing Baltic Energy Market Interconnection Plan (BEMIP), developed in 2008.[2]

This legal design is very much in its early stages, and the current approach of the European legislatures is extremely cautious and even vague. Thus, there is a need for input from the social sciences to further shape the instruments to be implemented. For instance, in Chapter 4, Pons-Seres de Brauwer and Cohen state that legislative efforts will remain impaired without empirically validated evidence addressing the various characteristics that influence citizen participation in RE initiatives. In this chapter, an analytical examination of survey data is used to demonstrate the relative influence of national socio-economic trends, energy cultures and demographic factors on the participation of citizens as co-investors in community energy developments providing input that legislatures can use in developing legislation.

In November 2016, the European Commission (EC) presented legislative proposals under the title 'Clean energy for all Europeans.'[3] The proposals of the EC were made to implement the conclusions of the European Council of October 2014 on the framework for climate and energy policy until 2030 (European Council, 2014). A significant portion of the reform covered the recasting of legal acts adopted in the framework of the Third Internal Energy Market Package of 2009,[4] which related to the internal electricity market and promotion of renewable energy sources (RES). The new Regulation on the internal market in electricity (Regulation (EU)2019/943 – Electricity Market Regulation or EMR) has been directly applicable in the Member States since 1 January 2020. Member States were required to implement the recast Directive on the internal electricity market (Directive (EU)2019/944 – Electricity Market Directive or EMD) by 31 December 2020 at the latest (Art. 71.1 EMD).

Digitalisation, technological progress in grid management and increased generation of RES have unlocked (new) opportunities – including the active participation of consumers – that allow for improved coordination of local supply and demand and thus help prevent regional grid bottlenecks. Because of this, 'consumers have an essential role to play in achieving the flexibility necessary to adapt the electricity system to variable and distributed renewable electricity generation,' as stated in recital 10 EMD. The EMD aims to strengthen the participation of various players in the electricity market, thereby reducing obstacles to citizen-supported supply concepts. Art. 15 EMD regulates the rights of 'active' customers, which, according to the definition in Art. 2.8 EMD, also includes prosumers. Active citizens may not be subjected to disproportionate or discriminatory technical and administrative requirements, procedures, levies and charges, or non-cost-oriented network charges. In accordance with European legal requirements, it is therefore likely that any equation of prosumers with energy supply companies is contrary to European law, as these are subject to disproportionate administrative requirements. Consequently, a legislature might be required to change its national regulations to be compatible with European standards.

Of equal importance is the fact that Directive (EU)2018/2001 – Renewable Energy Directive or RED II defines the rights of self-consumers in the field of renewable electricity (Art. 21 RED II) and of renewable energy communities (Art. 22 RED II) for the first time at the EU level. It defines certain framework conditions with regard to their financial burden in the form of taxes and levies, which obliges the Member States to create an enabling framework for these actors under national law by 1 July 2021 (Art. 36 RED II).

In sum, national legal orders within the EU contain an initial framework for the legal design of instruments to activate people for decentralised energy transformation, mainly in the electricity sector. It is now the responsibility of the national legislatures to translate these vague outlines into concrete measures, and it will be interesting to see how the results differ between legal orders. In Chapter 2 of this book, Antoni and Rodi explore the legal approach that the EU has taken to activate its citizens for further participation in the energy transition. The authors examine the existing conceptual legal framework for prosumers and provide an overview of the status of prosumers using the examples of Germany and Poland. The chapter suggests further steps that must be taken in the EU Member States – especially in the BSR – to implement the European framework for the active participation of citizens. In Chapter 3, Egelund Olsen discusses the legal challenges and gaps to promote local acceptance, using the Danish Renewable Energy Act as an example. She concludes that the current toolbox is not yet fully developed and that there is a need for a deeper understanding of the functions of different measures. Chapter 3 suggests that regulatory development needs to include individualised measures tailored to meet the distinct needs of local communities or individual landowners in the BSR and beyond.

In Chapter 5, Magnusson focuses on the case of community energy in Sweden and, based on a comprehensive study of the development of energy regulations and policy in Sweden, discusses how short-sighted regulatory design and a failure to consider alternative pathways would lead to path dependency and obduracy in an energy transition, even in countries with progressive energy policies like Sweden. Moreover, these pitfalls eventually hinder active citizen participation in, for instance, community energy activities and the development of decentralised RE generators.

Citizens as an expediting driving force for an energy transition: policy bottlenecks, evidence and cases from the BSR countries

One of the central objectives of this book is to examine the practical implications of current and potential policy measures and to provide recommendations or input for the development of the law and regulatory framework – as described above – that is a sine qua non of expediting an energy transition. To address this, in Chapter 6, Kojo et al. discuss how to move from social acceptance to social acceptability and what elements impact the acceptability of the transition, drawing on the electricity system in Finland as an example. The authors argue that, although Finland already has significant technical advancements in place for an energy transition, it must make certain changes to facilitate faster and further electrification of society and large-scale decarbonisation; the smart control of electrical loads in households will require a new business model and service concepts as well as active support from private individuals and consumers, among others.

In Chapter 7, Standal and Feenstra argue that local and individual activities for producing energy have several notable advantages: they increase the share of RE in the national energy mix, improve grid flexibility and bolster the social acceptability of RE. To promote these activities, a level playing field for all stakeholders is crucial. Because social and economic differentiation in societies might limit the potential of citizens to act (e.g., as prosumers), the concept of energy justice is a vital consideration in policymaking. This chapter employs the example of the Norwegian electricity system to explore how energy narratives reinforce and produce structures of gender and intersectional social differentiation that limit the inclusivity of the energy transition and hinder citizen energy production from becoming more mainstream.

Existing obstacles to an energy transition in the region include the sociopolitical and economic challenges that have plagued the post-Soviet countries of the region in their transition to democratic regimes and their recovery from communist systems (e.g., Gál, 2021). These countries suffered significant economic damage as a result of the collapse of major industries following the fall of the Communist regimes. Still, many of these, especially Poland, have developed a relatively strong economy. This has led to a reliance on a fossil-fuel-based, centralised energy system that hinders an energy transition. In some cases, it has also led countries to set less ambitious energy and climate goals (relative to their Western European counterparts) on the grounds that, in order for the economic level of such countries to equal that of Western EU states, 'the load [of ambitious EU climate and energy policy] carried by individual members should correspond to their economic performance and should not jeopardize their competitiveness' (Mišík and Oravcová, 2021, p. 8). Therefore, the role of Poland as one of the largest CO_2 emitters in the region (after Russia and Germany) is notable in the context of the energy transition. Against this background, Chapter 8 articulates a comprehensive post-Communist system transition in Poland vis-à-vis the energy transition, with a focus on the revitalisation process in the rural and semi-rural areas of Pomerania. Pietrzykowski, Rembarz and Cenian highlight the crucial roles of a bottom-up approach, with contributions from activists, scientists and entrepreneurs, in the revitalisation of less privileged regions. The authors assert that, although EU funds are extremely helpful enablers, local-level innovation cannot be limited to the adaptation of solutions from other environments to local conditions.

Chapter 9 analyses Polish energy clusters that aim to meet the energy needs of local communities while mobilising people to become actively involved in clean energy production. Surwillo argues that, due to stagnation in the wind energy sector in recent years and delays in establishing the first renewable energy sources (RES) cooperatives, there is a need for new business models that can accommodate bottom-up citizen initiatives in Poland to meet energy demand and achieve the EU energy and climate goals. This chapter explores some of the factors in the initial success of pilot energy clusters, as well as the challenges faced.

The transport and building sectors are among significant CO_2 emitters, with a share of 33% in total (IEA, 2021). Thus, these two sectors play a crucial role in the energy transition and in the decarbonisation of the economy. Chapters 10 and 11 examine these two sectors. First, Laakso and Lukkarinen refer to an example from Finland to discuss the practices that housing cooperatives have implemented to encourage engagement with sustainable energy in buildings, which affect the implementation of more ambitious climate policies. Chapter 10 argues that the critical practices from the perspective of energy policy are not necessarily related to energy per se but to ways of decision-making, providing and utilising information, planning and communication with the actors. The authors recommend policy interventions that focus on embedding sustainability considerations in these practices to facilitate a timely energy transition in buildings. For instance, it is worthwhile to introduce new incentive structures prioritising sustainable energy improvements and linking them more directly to management practices in buildings, as this can encourage housing cooperatives to integrate sustainability into their decision-making processes.

With regard to the transport and mobility sector, Sareen et al. shed light on the bifurcated challenge facing urban planners and policymakers: the swift decarbonisation of mobility and the legitimisation of these measures vis-à-vis a diverse public. Based on a case study of the city of Bergen, Norway, the authors argue that the mobility transition is mainly influenced by divergent socio-technical imaginaries of mobility among commuting publics. Thus, planners should consider these and change the embodied routines of transition planning and implementation to conform to a socially inclusive mobility future. This must be followed by legitimate participatory planning activities with input from relevant stakeholders. Finally, the authors contend that the rapid growth in electric vehicle (EV) adoption opens up low-carbon mobility transitions to the risk of an elitist 'green buyout,' whereby relatively wealthy households can persist with automobility practices while moving away from fossil fuel cars. The authors recommend that shifts to EVs thus be accompanied by a continued phase-out of car parking spaces, an increase in car-sharing schemes and a commitment to making the public transport system the most convenient and affordable transport option.

This book includes insights from a 'neighbour' of the BSR to indicate what the BSR can learn from an EU country outside the BSR and to compare states of affairs in the BSR and an EU country outside its borders. Thus, Chapter 12 provides 'external' insight into the topic of the book to enhance the comparative rigour of the book. Komendantova, Neumueller and Nkoana argue that climate change mitigation goals and energy security policies would lead to societal transformations, particularly due to the large-scale deployment of new technologies or changes related to the generation, distribution and transmission of electricity. The goals are often set at the national level of government, but their implementation occurs at a local level of government. As a result, the energy transition process should include measures to encourage the active engagement of inhabitants and local governments while providing a chance for the public to participate in decision-making processes that affect their lives. This chapter explores behaviour and motivation structures within different user groups in the energy transition process based on empirical case studies in Austria. The authors describe how lessons learnt in this region can inform policy and practice in the countries of the BSR. One of the main conclusions of the chapter confirms the key role of communication with the local public concerning the transformation of the energy system. Communication should be tailor-made to the needs of each social group and carried out through trusted communication channels. There is also a need for a greater understanding of the potential role that engagement can play in an energy transition, as well as the possibilities that already exist and the specific stages of the decision-making processes in which the public wishes to be engaged.

The final chapter, Chapter 13, discusses the main conclusions of the book and explains the potential role of the BSR as a laboratory for an energy transition. It also summarises policy recommendations of the book and provides suggestions for further research.

Each chapter describes impediments to mobilisation, as well as agency and theory. Although the broader focus of this book is on practical implications, the chapters advance theory-building slightly with a framework or discussion that connects theories. This book includes four parts. 'Part I: stakeholder engagement and acceptance: a legal framework' identifies legal gaps and requirements for facilitating stakeholder engagement and social acceptance in an energy transition. In 'Part II: energy policy for engaging people for an energy transition in the Baltic Sea Region,' some of the existing policy measures are evaluated in terms of their effectiveness and impact, and the policy requirements for expediting citizen initiatives are discussed. 'Part III: flexibility options for demand-side, social acceptance and community engagement – case studies' uses various empirical studies to examine different approaches to social acceptability and grassroots activities. Finally, 'Part IV: insights from other sectors and regions' assesses an energy transition in other major sectors, such as the building and transport sectors, as well as what can be learnt from a 'neighbour' of the BSR.

Notes

1 Council of the European Union, Brussels, 30 October 2009, 15265/09, concl 3; www.balticsea-region-strategy.eu.
2 https://ec.europa.eu/energy/sites/ener/files/documents/2009_bemip_mou_signed.pdf.
3 https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en.
4 https://ec.europa.eu/energy/topics/markets-and-consumers/market-legislation/third-energy-package_de.

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Part I

Stakeholder engagement and acceptance

A legal framework

2 Active participation in the energy transition

The challenges of European regulation

Johannes Antoni and Michael Rodi

Introduction

The European Union (EU) has the political goal of becoming the global leader in energy production from renewable energy sources (RES), with an emphasis on five dimensions: "energy security, [an] internal energy market, energy efficiency, decarbonisation and inventions" (European Commission, 2019: 1). Western European countries in the Baltic Sea Region like Germany, Denmark and Sweden have established remuneration regimes to incentivise a rising share of RES, leading to a rapid increase of renewable energy (RE) in their respective power mixes. In eastern Baltic states like Poland and Latvia, on the other hand, RES production appears to have stagnated at low levels due to the later promotion of RE in these countries. As a result, eastern Baltic states remain highly dependent on coal as a primary source of energy. There is thus significant disparity between the efforts made by countries of the Baltic Sea Region to meet the binding EU target of at least 32% RE in gross final energy consumption by 2030 (under Art. 3.1 Directive (EU) 2018/2001 Renewable Energy Directive or RED II) or even to become the first climate-neutral continent.

An increasing number of RE generators, like offshore wind farms and photovoltaic (PV) systems, is needed to reach RE targets and make the energy transition successful across the EU. However, RES projects in Poland, for example, have been hampered by the stagnation of the wind energy sector (Surwillo, in this book). In addition, many Baltic States still *lack an appropriate financial and legal framework* to empower ordinary citizens (Pons-Sere de Brauwer and Cohen, in this book), incentivise the growing societal interest in RES and democratise access to energy.

The required modernisation of the energy and heat supply in several Baltic States presents unique opportunities to expand RES in these states (Pietrzykowski, Rembarz and Cenian; Laakso and Lukkarinen, both in this book). The increasing number of RES generators will place a growing burden on electricity grids, which can be exacerbated by new consumers such as electric vehicles, heat pumps and electric storage heaters without good regulation.

A general challenge for the Baltic Sea Region – as for all EU Member States – is to *enhance awareness* about the need for not only climate change mitigation,

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but also for acceptance of RES projects (Kojo, et al., in this book) and even active participation in RES production (Magnusson; Komendantova, Nkoana and Neumueller, both in this book). It will be easier to mobilise people for a transition to RES if there is more honest and open-ended political conversation and if more information is made available about RES projects and the opportunity for citizens to participate in comprehensive visions.

The active participation of consumers could have a meaningful impact on the energy transition in the EU. The RED II has already laid out a new foundation for increasing RE. It is now the responsibility of the EU Member States to act on this foundation by changing the structure of their energy production and consumption accordingly. Generally, Member States need more flexibility in demand without leaving their citizens behind. Citizens, as consumers, are regarded as having a more central role in the future energy system, as they can present a potential bottleneck: a lack of social acceptance demands a change in policymaking (Olsen, in this book). A conceptual framework based on the agents of change theory and energy justice can therefore provide a useful tool for creating acceptance by designing socially innovative business models for prosumers (Standal and Feenstra, in this book).

Materials and methods

This chapter examines the requirements and scope for implementing the EU law and policy framework, particularly in the Baltic EU States, to activate their citizens for the energy transition. First, the current state of affairs regarding the active participation of people in the EU energy transition is described based on codifications, legal articles and studies. The existing conceptual framework in European law for the active participation of consumers in the energy transition is then analysed and compared with relevant Polish and German law based on legal and other official state documents, because these two countries are the biggest in the region and have the highest CO_2 emissions. The chapter concludes with a summary of further steps that the EU Member States must take to implement the European framework.

Political and legal discourse on active participation of people in the energy transition

It is first necessary to define what is meant by the "active role of people within the political and legal discourse on energy transition." The energy transition (German: *Energiewende*) is a mega-project that intertwines technological and political perspectives; it is therefore a political, or at least politically connoted, term (Dernbach, 2015). In this context, acceptance is a central factor in the success of the energy transition. Acceptance is needed from everyone who is affected by the transition; this includes not only those on the energy production side, but also electricity consumers. One way to generate acceptance is to actively involve people in the processes of production and consumption. This invokes the discourse about the "activation of people," since there are various methods and levels of participation.

At the first level of active participation, prosumers can "flexibilise" their electricity consumption. Flexible electricity consumption can contribute to the success of the energy transformation (IEA, 2019). "Flexible consumption" means using electricity when it is available in excess and reducing consumption when there is a shortage of production. Since the amount of electricity fed into the grid from RES will increasingly fluctuate due to weather conditions, e.g., wind, a flexible response is needed, such as the capacity to switch a heat pump on or off or recharge an electric vehicle. The necessary technical requirements for such responses are already in place. Final consumers are increasingly able to help maintain the stability of the entire electricity system and thus contribute to the security of supply. Nevertheless, the full potential of flexibility offered by household customers has not yet been fully utilised due to the lack of real incentives for consumers to offer such flexibility (Leal-Arcas et al., 2018). There is not an appropriate price signal or adequate coordination between consumers in the context of grid operation. There are, however, economic benefits to the activation of neighbours and communities and even to the organisation of these entities into cooperatives as a potent means of securing flexibility, e.g., through a new distribution system in which prosumers are encouraged by different balancing premiums to balance their electricity in a local community (Cai et al., 2016).

A consumer who offers flexibility is not automatically an active participant. Flexible consumption can be provided without active participation, e.g., through the implementation of an appropriate electricity tariff or the installation of interruptible or controllable consumer technologies (mainly night storage heaters and electric heat pumps) for space heating. In the future, the charging processes of electric vehicles will also become relevant in this context. For this kind of flexible electricity consumption, a third party is typically tasked with ensuring that the flexibility is provided without burdening the consumer. Ideally, the consumer will not even notice this kind of management in their daily lives. Apart from the conscious decision on an appropriate tariff, there is no active participation of the consumer; this is therefore generally not understood to be active consumer participation. However, this flexibility service can play a crucial part in the energy transition. The provision of this service by companies as aggregators or new energy actors (Leal-Arcas et al., 2018) is more comparable with provision by commercial or industrial consumers. These are already regarded as flexible consumers who often actively reduce their electricity demand and thus contribute to balancing supply and demand in the overall electricity system (Bons et al., 2020). Commercial consumers are excluded from the following analysis, as the focus is on private actors.

Consumers reach the second level of active participation by self-producing electricity. This is where the consumer begins to function as a "prosumer" (Bundesnetzagentur, 2016). "Prosumer" is an umbrella term that refers to a simultaneous role as producer and consumer; its use is not limited to electricity-related topics. Whether electricity prosumers operate as a private household or as an energy community, their role falls somewhere between that of a consumer and that of an entrepreneur (Roberts et al., 2014; Leal-Arcas et al., 2018). They are commonly understood to be self-generating electricity providers who consume the electricity that they generate themselves (e.g., from a PV system) and/or feed this electricity into the grid. If there is not enough self-generated electricity available, prosumers can also obtain electricity from the public supply network. At least in Germany, the term is often used for household customers, though often without further definition (Wübbels, 2015; Bundesregierung, 2016: 1/62/107/109; Milovanović, 2019) or without a precise distinction (Pielow, 2010; Müller-Kirchenbauer and Leprich, 2013; Schäfer-Stradowsky and Timmermann, 2018), in contrast to what is proposed above.

The European Parliament Research Service expanded the definition of prosumer to include more than just households. It distinguished four types of actors: residential prosumers (who produce electricity at home on their rooftops), citizen-led energy cooperatives and commercial and public prosumers (EPRS, 2016). European law, on the other hand, reflects a narrower understanding of prosumers, defining them as “renewables self-consumers.” More precisely, Art. 21 RED II refers to individuals and communities that are entitled to generate, consume, store or sell electricity from RES as “prosumers.” The present chapter focuses on private households and citizen-led energy communities who act as prosumers.

In addition to distinguishing between types of prosumer, one can also differentiate specific processes of participation. Prosumer activities are not limited to self-producing and self-consuming electricity. The German Federal Ministry for Economic Affairs and Energy (BMWi) interprets private prosumers more broadly, stating that “even without a solar system on the rooftop, households can be prosumers in the future. Because a flexible approach to electricity consumption can also contribute to the success of the energy transition” (BMWi-energiewende.de, 2016). Deviating from this interpretation, the present chapter defines a prosumer as a person who self-produces electricity – provided that electricity production is not the main business activity – without an obligation to self-consume. A private person can therefore participate in active prosumption at different sublevels, which can also be combined: the self-production of electricity, the self-consumption of electricity and the provision of potential flexibility in electricity consumption. The “provision of flexibility” can involve the use of batteries for electricity storage or even direct participation in demand response (Roberts, 2016).

There is also a third level of active participation: the sharing of energy as part of a “citizen energy community” (Art. 2(11) Directive (EU) 2019/944 – Electricity Market Directive or EMD) – not to be confused with the “Energy Community,” an international organisation established between the EU and a number of third countries to extend the EU internal energy market to Southeast Europe and beyond.[1] This level of participation can even include the sale of self-produced electricity; in this case, the prosumer becomes an energy trader or supplier.

In conclusion, active participation in the energy transition can take place at three levels: provision of flexibility in consumption, operation as an electricity producer and prosumer and participation in a citizen energy community that may act as an electricity trader or supplier.

European framework for the active participation of consumers

On 30 November 2016, the European Commission presented legislative proposals as part of the Clean Energy for All Europeans package.[2] These proposals were developed to implement the conclusions of the European Council of October 2014 on the framework for climate and energy policy until 2030 (European Council, 2014). A significant part of the reform covered the recasting of legal acts adopted within the framework of the Third Internal Energy Market Package of 2009, which addressed the internal electricity market and promotion of RES. The new regulation on the internal market in electricity (Regulation (EU) 2019/943 – Electricity Market Regulation or EMR) has been directly applicable in the Member States since 1 January 2020. The recast Directive on the internal electricity market (Directive (EU) 2019/944 – Electricity Market Directive or EMD) was to be implemented by the Member States by 31 December 2020 at the latest (Art. 71(1) EMD). The RED II must be implemented by the national legislatures by 30 June 2021 (Art. 36(1) RED II).

Digitalisation, technological progress in grid management and the generation of RES have unlocked (new) opportunities, including the active participation of consumers, that allow for an improved local coordination of load and generation and will thus help to avoid regional grid bottlenecks. For this reason, "consumers have an essential role to play in achieving the flexibility necessary to adapt the electricity system to variable and distributed renewable electricity generation," as stated in recital 10 EMD. The EMD aims to strengthen the participation of various players in the electricity market and thereby reduce obstacles to citizen-supported supply concepts. Art. 15 EMD regulates the rights of "active" customers, which, according to the definition in Art. 2(8) EMD, also include prosumers. According to these provisions, active customers may not be subject to disproportionate or discriminatory technical and administrative requirements, procedures, levies or charges, or to non-cost-oriented network charges. In accordance with these European legal requirements, it is likely that any equation of prosumers with energy supply companies is contrary to European law, since these companies are subject to disproportionate administrative requirements. Consequently, the legislature may need to modify national regulations in some cases in order to ensure compatibility with European standards.

It is equally significant that, for the first time at EU level, the RED II defines the rights of self-consumers in the field of renewable electricity (Art. 21 RED II) and the rights of renewable energy communities (Art. 22 RED II). It specifies certain framework conditions with regard to financial burdens in the form of taxes and levies and obliges the Member States to create an enabling framework (Pause and Kahles, 2019) for these actors in national law by 1 July 2021 (Art. 36(1) RED II).

Flexibility in consumption

The EU considers healthy competition in retail markets to be essential to ensure a market-driven deployment of innovative new services that can address the changing needs and abilities of consumers and increase electricity system flexibility to meet EU RES targets. Of particular importance is the inclusion of a completely new area of regulation in the EMD, which requires the activation of consumers, the introduction of new forms of participation and a greater focus on the flexibility of consumption and production. To this end, active customers, prosumers, citizen energy communities and aggregators, as decentralised actors, have been mentioned for the first time at EU level and recognised as having dedicated rights and obligations.

Art. 3(1) EMD, titled "*Competitive, consumer-centred, flexible and non-discriminatory electricity markets*" obligates Member States to comply with the Directive by means of a horizontal clause. They must ensure that their national legislation does not unnecessarily impede cross-border electricity trade or consumer participation, including demand management. This also applies to investments, especially in variable and flexible energy generation, energy storage, the expansion of electromobility or new interconnectors between Member States.

A direct incentive for more flexible consumption is provided in Art. 11 EMD, which entitles consumers to a dynamic electricity price contract. This entitlement is linked to another set of issues, namely the introduction of intelligent metering systems, commonly known as "smart meters." One obstacle impeding customers from becoming active participants in the energy market and the energy transition has been a lack of transparency regarding real-time or near real-time information about energy consumption. Providing consumers with real-time data and tools – like smart meters – that facilitate participation in the energy market will allow for a transformation from a traditional, centralised and inflexible power grid to a more decentralised, flexible smart grid. Under Art. 19–22 EMD in conjunction with Annex II, makes the introduction of intelligent metering systems by Member States conditional on a positive cost-benefit analysis. If a Member State does not systematically introduce intelligent metering systems, each final customer must still have a right to install such a system, though at their own expense.

Furthermore, Art. 15 EMD requires Member States to ensure that active customers can exercise their rights under Art. 15(1): acting as an active customer may not be subject to disproportionate or discriminatory technical or administrative requirements, procedures and charges, including non-cost-reflective network charges. In addition, under Art. 15(2)(a), active customers have the right to act directly or via aggregators. The storage of self-generated electricity by active customers in their capacity as storage owners is specifically addressed. According to

Art. 15(5), customers may not be subject to double charges for stored electricity remaining on their land or when providing flexibility services to grid operators.

Prosumer

Prosumers now play a well-established role in the self-production and feed-in of renewable electricity units. A report drafted by the CE Delft counted nearly 6 million "energy citizens" in the EU and showed that 7 million EU citizens could produce their own electricity by 2030 and over 264 million EU citizens (half its population) by 2050 (Kampman et al., 2016). This development was motivated by profit-yielding remuneration regimes established early on in the Member States' attempts to promote RES. Even though Directive (EC) 2009/72 (the former EMD) did not yet include a definition of "prosumer," it did introduce regulation for smart grids as a prerequisite for a more flexible energy system. Art. 3(5)(11) Directive (EC) 2009/72 states:

> In order to promote energy efficiency, Member States or, where a Member State has so provided, the regulatory authority shall strongly recommend that electricity undertakings optimise the use of electricity, for example by providing energy management services, developing innovative pricing formulas or introducing intelligent metering systems or smart grids, where appropriate.

The new EMD contains a legal definition of "prosumer" in Art. 2(8), using the terminology "active customer." Based on this definition, "active customer" means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a Member State, within other premises, or who sells self-generated electricity or participates in flexibility or energy efficiency schemes, provided that those activities do not constitute its primary commercial or professional activity. This definition aligns with the definition of "prosumer" used in the present article.

Self-production

With Art. 2(8) EMD and Art. 21 RED II, the EU has harmonised and created the right to self-supply and strengthened energy supply concepts. Under Art. 21(2)(a)(ii) RED II, self-generated RE that is used on-site may not be subject to discriminatory or disproportionate procedures or to any kind of levy, allocation or charge, meaning that every Member State must allow self-production.

Self-consumption

Self-consumption has clear benefits for prosumers, as it is generally cheaper to use self-produced electricity than to obtain electricity over the grid due to electricity price components (taxes, levies, charges, etc.). It also has benefits for the energy system and thus for consumers who do not self-consume. By reducing the strain on the grid, it can become a pillar of demand-side management (DSM) and accelerate acceptance of the European energy transition among both businesses and households. Today, self-consumption – the process by which final customers produce and consume their own energy on-site – is a relatively well-established concept in Member States.

The EU formally recognised RE self-consumers and introduced a slightly broader definition of self-consumption in Art. 2(8) EMD and Art. 2(14) RED II. Under the EMD, an "active" customer or self-consumer is entitled to consume, store and sell the electricity that it produces within its premises. Art. 2(14) RED II defines "self-consumption" as generating electricity on-site within specific limits and storing or selling RE generated by an end customer, provided that, in the case of commercial self-suppliers, this is not their main commercial or professional activity. The definitions in both the EMD and the RED II allow Member States to extend self-consumption beyond the premises but exclude professional activities of such kinds.

The definitions differ slightly in terms of the source of electricity, since RE self-consumers are limited to RES. "Active" customers under EMD can also explicitly participate in flexibility or energy efficiency schemes, which are activities beyond energy generation.

With Art. 21 RED II, the EU has standardised the right to self-generation and strengthened self-consumption concepts. Under Art. 21(2)(a)(ii) RED II, self-generated RE that remains in place may not be subject to discriminatory or disproportionate procedures or to any kind of levy, allocation or charge. According to Art. 21(3) RED II, exceptions to the exemption from charges and fees for self-supply are possible if

1. the electricity produced by self-generation is effectively supported by a support scheme and the burden does not undermine the economic viability of the project and the incentive effect of the support;
2. from 1 December 2026, if the overall share of (RES) self-consumption installations exceeds 8% of the total installed electricity generation capacity in a Member State; or
3. the electricity is generated in installations with a total installed capacity of more than 30 kilowatts (kW).

This establishes the general principle that self-consumed electricity remaining behind the meter will not be subject to any charges or fees, although Member States may apply charges in certain limited cases, in particular for installations with a capacity above 30 kW. As a result, Member State legislation prohibiting self-production and self-consumption must be reviewed in light of the EU right to self-consume.

Marketing flexibility

Load shifting by prosumers can reduce the total cost of the energy transition. Self-consuming prosumers can relieve the electricity grid, especially if electricity is self-produced and consumed at peak times; the load-shifting process can also help to avoid expensive grid expansion. Furthermore, in the future, self-production in combination with battery systems will enable active peak-shaving measures, e.g., the use of electric vehicles. The decline in battery costs is a critical variable for electricity markets as well as for electric cars (IEA, 2019).

Currently, the grid is used unconditionally, i.e., free of conditions, in most cases. This means that the final customer obtains electricity whenever it is needed. Conditional grid usage could motivate grid users to postpone their electricity purchases until a time of day when there is little demand for electricity. For example, users of electric vehicles could be encouraged to charge their vehicles at night rather than directly after work. It is, however, important to ensure that this does not lead to undesirable side effects, such as simultaneity. To this end, grid operators and grid users can enter into written contracts for a certain period of time, and grid users can be offered a financial incentive to shift their load. Art. 3 EMD includes only a very general obligation for the Member States not to "unduly hamper" consumer participation, including through "demand response, investments into, in particular, variable and flexible energy generation, energy storage, or the deployment of electromobility"; it leaves the implementation to the Member States.

Sharing with and sale to third parties and energy cooperatives

Art. 2(14–15) RED II also introduces the concept of "joint self-supply," which refers to a group of at least two jointly acting self-suppliers located in the same (apartment) building who have essentially the same rights as individual self-suppliers. In particular, they may agree among themselves on the exchange of locally produced RE. The surplus of self-produced electricity can be fed into the grid and virtually forwarded into an energy cloud where a digital electricity account is maintained. This allows the energy surplus to be stored and then withdrawn and consumed when the amount of self-produced electricity is insufficient.

By adopting RED II and EMD, the EU not only broadened the interpretation of self-consumption; it also defined two new electricity market players – in the form of energy communities – that strengthen the participation of citizens in RE production and supply. Art. 22 RED II refers to "renewable energy communities," while Art. 16 EMD uses the term "citizens' energy communities..

Under Art. 22(2) RED II, renewable energy communities have the right to generate, consume, store, sell and share electricity within the citizen energy community. Member States must ensure that renewable energy communities are treated without discrimination regarding their activities (Art. 22(4)(e) RED II). This applies to citizens' energy communities as well, which, according to Art. 2(11)(c) EMD, may be active in the areas of production (including RES), distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles; or it may provide other energy services for its members or shareholders.

Although renewable energy communities and citizens' energy communities are, to a large extent, similar, there are minor conceptual differences. Both legal entities are based on open and voluntary participation, controlled by their members or shareholders and primarily intended to provide their members, shareholders or local areas with ecological, economic or social benefits rather than financial profits (Art. 2(11) EMD and Art. 2(16) RED II). As a result, prosumers have a right to group and function in the market collectively.

Furthermore, under Art. 2(16) RED II, renewable energy communities are required to ensure that their shareholders or members are located in close proximity to community projects. The impact of this conceptual difference on practical implementations will become clear only after the directives have been transposed into national laws.

In general, regulations on renewable energy communities and citizens' energy communities contain various undefined legal terms that require more detailed specifications within the legal systems of the Member States. In practice, the suitability of the two legal entities to strengthen citizen participation in electricity generation and distribution will also depend on the concretisation and implementation of European legal requirements.

National frameworks

The German *Energiewende* has already led renewables to become the primary source of electricity; RES met 45.4% of Germany's electricity consumption needs in 2020 (UBA, 2020). Since the passage of the German Renewable Energy Act (*Erneuerbare-Energien-Gesetz – EEG*) in 2000, households have even had an incentive to produce their own electricity. The costs of RES have also decreased over the years. Germany may meet the obligation prescribed in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of RE use, which requires it to increase the share of RE in gross final energy consumption to at least 18% by 2020. In 2019, the share of RE in Germany's gross final energy consumption was 17.4% (Eurostat, 2020).

Poland, on the other hand, has an electricity mix that is unique in Europe due to the highest share of hard coal and brown coal in power and heat production (bpb, 2019). The decarbonisation of power and heat production is nevertheless inevitable. In 2019, renewable energies accounted for 16% of installed generation capacity (URE, 2020). Still, Poland probably did not meet its obligation under Directive 2009/28/EC to achieve a minimum 15% share of RE in gross final energy consumption by 2020. In 2019, the share of RE in gross final energy consumption in Poland was 12.2% (Eurostat, 2020).

Poland and Germany both demonstrate the challenges of the energy transition in the Baltic Sea Region. The following sections provide an overview of the status of prosumers in Poland and examine the conditions in Germany in greater depth.

Poland: an overview

Poland's Energy Policy for 2040 (PEP2040) calls for a significant decrease in the share of coal in the national power generation mix, from the current level of 80% to 60% in 2030 and 22% in 2040 (Ministerstwo Klimatu, 2020). It also contains plans to substantially increase the share of renewable generation in PV capacity and offshore wind; to decrease onshore wind capacity after 2030; and to introduce nuclear power in 2033 (Ministerstwo Klimatu, 2020: 10). In 2030, the share of RES in gross final energy consumption is to be at least 23% (not less than 32% in electricity, mainly wind and PV; 28% in heating (an annual increase of 1.1%); and 14% in transport, with a significant contribution from electromobility) (Ministerstwo Aktywów Państwowych, 2019; Ministerstwo Klimatu, 2020).

As part of PEP2040, a crucial part of the sixth strategic project – implementation of offshore wind energy – is the development of distributed energy generation based on energy production from RES, as well as the sale, storage or participation in demand-side response (DSR) programmes by individual entities (e.g., active consumers, prosumers of renewable energy and others) and energy communities (e.g., energy clusters and energy cooperatives). The Ministerstwo Klimatu expects that the number of prosumers will increase roughly fivefold by 2030, and the number of locally sustainable energy areas will increase to 300. To safeguard future security of supply, the connection of an unstable energy source will be linked to an obligation to ensure balancing in periods when RES does not supply electricity to the grid. Support mechanisms for RES will give priority to solutions that have maximum availability, entail the lowest relative costs of energy production and meet local energy needs, as well as to hybrid solutions that combine various RES technologies and self-balancing e.g., with the use of energy storage (Ministerstwo Klimatu, 2020).

In Poland, unlike in many other European countries, the majority of PV systems are operated by prosumers. This is because a reduction in technology costs and a favourable regulatory environment (e.g., discounts for prosumers and tax relief for households) have led to a high level of interest among citizens in producing their own energy. In 2015, the Polish Parliament (Sejm) adopted the Renewable Energy Sources Act (Ustawa z dnia 20 lutego 2015 r. o odnawialnych źródłach energii, 2015). This national law introduced a new support scheme for RES based on an auction system. The support is granted through an auction conducted by the President of the Energy Regulatory Office. The Polish government has also implemented a number of measures to support the production of energy from RES. For example, electricity trading power companies are obligated by law to purchase RES energy; RES producers have priority access to the transmission grid; RES electricity is exempt from the excise tax; the grid connection fee for smaller installations (< 5 MW) has been reduced by 50%; and investments in clean energy may be co-financed by the National Fund for Environmental Protection and Water Management.

In 2019, the installed capacity of PV micro-installations in Poland reached 640 MW, reflecting a nearly threefold increase in prosumers year-over-year. PV micro-installations in Poland accounted for over 70% of the total power installed in PV at the end of 2019. In the first quarter of 2020, about 300 MW of PV micro-installations were installed and connected to the electricity grid (IEO, 2020). The Polish government expects the number of prosumers in the country to reach one million by 2030.

The increase in prosumption is due to the introduction of a support scheme specifically for RES prosumers, which is based on a special energy supply contract. To benefit from this promotion, a Polish prosumer must sign a complicated, individualised agreement with an energy seller. The seller calculates the difference between the energy produced and the energy consumed. Owners of PV micro-installations (with a capacity of up to 50 kW) are allowed to exchange the surplus of energy generated under favourable conditions to make up for shortfalls in their own energy production (Ignaciuk, 2019).

Private energy companies and prosumers thus play the largest role in increasing the share of renewables in the Polish energy mix. These two groups of investors account for a combined 81% of all renewable capacities installed from 2013–2019. The share of the public sector and state-controlled energy companies in funding renewable energy technologies from 2013–2019 did not exceed 15% (WiseEuropa, 2020). This indicates that, although coal still accounts for the vast majority of electricity generation in Poland, prosumers already play an important and growing role in renewable energies (especially PV).

Germany: deeper insight

The following sections offer greater insight into the German legal framework for prosumers.

Flexibility in consumption

The starting point for the provision of flexibility by consumers in German law is § 14a of the Energy Industry Act (Energiewirtschaftsgesetz – EnWG, 2005). Due to the focus on final consumers in the present analysis, the following discussion does not consider the procurement of balancing power under § 12(1) EnWG by the four German transmission system operators (TSOs), which are responsible for maintaining grid frequency and supplying balancing power.

§ 14a EnWG is intended to create an incentive for more flexible grid usage by allowing the participation of consumers. The consumer may allow the grid operator or a third party to modulate controllable consumption equipment (e.g., a heat pump or a charging point for electric vehicles) for flexible grid use. In exchange, the consumer is offered a reduced grid fee. The controllable consumption equipment must have a separate metering point. However, the scope of application of § 14a EnWG is limited to the low-voltage range. Larger (commercial) consumption facilities connected to the medium-voltage level, for example, cannot benefit from the regulation. The Federal Government is authorised, with the consent of the Bundesrat, to specify the obligation in more detail by means of a statutory ordinance (§ 14a (3) EnWG). The German Federal Ministry for Economic Affairs and Energy (BMWi) has repeatedly postponed the presentation of a draft of a corresponding ordinance (Wiedemann, 2019). At the end of September 2019, the release of the expert report *Regulierung, Flexibilisierung und Sektorkopplung* (Regulation, flexibilisation and sector coupling) (BET and Boesche, 2018) and the discussion that followed it initiated a broad stakeholder process that was structured under the umbrella of the Working Group on Intelligent Networks and Meters of the Energy Networks Platform. The ongoing process is to be conducted without prejudice to whether and how proposals will be implemented. The BMWi stated: "If necessary, a draft for any necessary legislation will be presented in the course of 2020" (Bundesregierung, 2020: 12). However, soon after presenting a proposed amendment to § 14a EnWG for revision at the end of 2020, the BMWi withdrew the proposal. The future structure of Section 14a EnWG is therefore still undetermined.

Changes to § 14a EnWG could further support the integration of new types of flexible consumers (e.g., private charging stations) into distribution grids and avoid inefficient grid expansion at the low-voltage level. Better capacity utilisation of the existing networks is an important prerequisite to ensure that electricity networks do not become a bottleneck in the ramp-up of electromobility.

In principle, variable electricity prices use price signals to create incentives to adapt consumption to the current generation situation. Art. 11 EMD already requires electricity suppliers to offer final consumers load-variable or time-of-day-dependent tariffs in order to create an incentive to save energy or to control energy consumption, § 40(5) EnWG. However, this obligation is conditional on "technical feasibility and economic reasonableness." Such tariffs are not yet widespread due to insufficient installation of the necessary smart technology (Knoll et al., 2020).

Prosumer

In Germany, there are already regulations in place for prosumers who self-produce electricity and (partly) self-consume, even though the German legal framework does not define prosumers as such.

Self-production

Electricity production from RES in Germany is mainly supported through a market premium scheme (§ 20 EEG 2021). For most installations, the award and the level of the market premium a generally determined through a tendering scheme (§ 22 EEG); however, feed-in tariffs can also benefit plants with a capacity of up to 100 kW and other plants in exceptional cases, as well as plants that started to produce under previous legal frameworks (§ 21 EEG).

Residential prosumers – which often only have small RES plants (most commonly PV up to 100 kW) – are therefore generally eligible for feed-in tariffs as prescribed in § 19(1)(2) and § 21 EEG. Eligibility is coupled with the obligation of the plant operator to feed the electricity into the grid in the months in which financial support is claimed. Since 2017, the EEG has contained provisions for a tenant electricity surcharge, which supports electricity produced and consumed in the same residential building (§ 21(3) EEG). In addition, all RES plants – regardless of size – that feed into the national grid are eligible for a 20% reduction in the feed-in tariff (*Ausfallvergütung*) in exceptional cases, although the reduced rate can apply for no longer than three consecutive months and no more than six months within a calendar year (§ 21(1)(2) EEG).

Overall, German law already provides comprehensive support for self-production.

Self-consumption

After more than a decade of primarily self-producing prosumption in Germany, there has been a shift towards self-consumption due to the decrease in average remuneration for small rooftop PV systems (§ 48(2) EEG) to a level well below the average household electricity price of €0.27 per kilowatt-hour (kWh). Self-consumption allows consumers to lower their electricity bill by using self-produced energy either directly (by meeting their immediate electricity needs) or indirectly (by using batteries and managing their electricity demand). In this way, prosumers can use self-generated electricity for their own supply without marketing it to third parties. In line with the current legal situation in the EEG, self-consumption concepts are generally charged 40% of the EEG levy (§ 61b EEG). A complete waiver only applies to smaller generation plants with an installed capacity of no more than 10 kW for no more than 10 megawatt-hours (MWh) of electricity consumed by the producer per calendar year (§ 61a (4) EEG).

Art. 21(2)(a)(ii)(3) RED II prohibits discriminatory or disproportionate procedures or any kind of levy, allocation or charge for self-generated RE within the premises of the generator. This raises a key question: does charging 40% of the EEG levy under German law comply with European law, or should this provision be adjusted by the legislature? This is an important question, as it may lead to a need to adapt national regulation to the exemptions for self-supply set out in RED II within the EEG. The new regulation in § 61b (2) EEG, adopted at the end of 2020, waives the EEG levy for self-consumption up to 30 MWh of electricity per calendar year, as long as production is carried out by an RES plant with an installed capacity of no more than 30 kW. The same applies to conventional energy production plants with a maximum installed capacity of up to 10 kW, as stated in § 61a (4) EEG.

A remaining obstacle to self-supply is the very narrow understanding of the concept of self-consumption in German legislation, specifically the EEG.

According to its definition in § 3(19) EEG, self-supply requires the RES plant operator to be the same person as the electricity consumer. As a result, RES plants in multi-party buildings with typical landlord/tenant constellations do not qualify as self-supply; this ultimately forces the tenants to pay the full RES apportionment. Consequently, there are few incentives for tenants to purchase electricity from their own RES plant. From a European law perspective, the definition of self-supply in the German EEG is too narrow. Given the definition of self-supply in Art. 2(14) RED II – which requires end customers to generate electricity on-site within defined limits and to store or sell self-generated RE, provided that this is not their main commercial or professional activity – RES plant operators would be entitled to sell the generated electricity to third parties, as long as this is not their main activity. European law does not require the RES plant operator to be the same person as the electricity consumer. As a result, the landlord/tenant constellation would qualify as self-supply under RED II, but not under the EEG. German legislation is thus contrary to European law and requires action by the legislature.

Marketing flexibility

Studies show that, in principle, there is technical potential for DSM in all consumption sectors, including industry, trade and commerce and private households (Connect Energy Economics GmbH, 2015; VDE, 2012; Dena, 2010). However, the primary focus so far has been on industry and commerce, since these sectors generally have larger individual loads and professional measuring and control technology is commonly available – important prerequisites to simplify the development of DSM potentials. On the other hand, power-to-X technologies can offer marketable flexibility for sector coupling in which (self-produced) electricity is converted into other energy sources, such as power-to-mobility (electromobility), power-to-gas or power-to-heat (e.g., storage heating or heat applications).

Prosumers can also use battery technologies to store self-produced electricity and thus optimise their external procurement. In addition to personal economic considerations, factors such as technological affinity, self-sufficiency and sustainability aspects also play a major role when private users consider investing in flexibility technologies (Dena, 2017). Active marketing of their flexibility for the energy system is only carried out in isolated cases (ibid.).

The existing regulatory framework in Germany offers flexible grid users (both producers and consumers) few incentives or opportunities to use the grid in a way that aligns with demand and is compatible with the grid status. Like the general energy-related regulatory framework, the existing grid-related regulatory framework is still relatively rigid. Under the current regulatory framework, grid operators do not have sufficiently precise instruments at their disposal to encourage or use flexibility and thus avoid measures like additional grid expansion. In particular, the distribution networks in the low-voltage range are often still a black box for energy suppliers (Wilhelm, 2019). In the future, it will be necessary to be able to monitor the network more closely due to the regulatory disadvantages that, among other things, provide a greater incentive to expand the grid than to flexibilise/digitalise grid operation. For this reason, network operators have generally lacked the technical and organisational prerequisites to use existing flexibility in ways that benefit the network.

Sharing with and sale to third parties and energy cooperatives

Prosumers that actively sell surplus quantities of produced electricity to third parties qualify as energy supply companies under § 3(18) EnWG and § 3(20) EEG. They are thus treated as large companies, regardless of their size. This means that they are subject to the same comprehensive obligations as large energy suppliers, such as notification of the German Federal Network Agency (*Bundesnetzagentur*) regarding their energy supply in accordance with § 5 EnWG (excluding only supply of household customers exclusively within a customer installation or within a closed distribution network as well as via non-permanent lines (§ 5(1) EnWG)). This includes the obligation to immediately notify the TSO regarding the EEG levy in accordance with § 74(1) EEG and report the quantities of electricity supplied in accordance with § 74(2) EEG. In addition, they must comply with legal requirements regarding accounting, contract design and electricity labelling in accordance with §§ 40–42 EnWG. If electricity is supplied via the public grid, a grid usage agreement or supplier framework agreement pursuant to § 3 of the Electricity Grid Access Ordinance (Stromnetzzugangsverordnung, 2005) is also required. These bureaucratic obligations significantly challenge prosumers as smaller units and represent a central obstacle to citizen-supported decentralised supply concepts in Germany. Art. 15 EMD regulates the rights of "active" customers, which, according to the definition in Art. 2(8) EMD, also include prosumers. According to these provisions, active customers may not be subject to disproportionate or discriminatory technical or administrative requirements, procedures, levies or charges or to non-cost-oriented network charges. Based on these European legal requirements, it is likely that the German equation of prosumers with energy supply companies is contrary to European law, because it burdens them with disproportionate administrative requirements. As a result, the legislature will need to modify these provisions.

Even though i.e., community-driven energy projects have been part of the German energy landscape since its inception in the early 21st century, there is no real regulation or privileging of energy communities under German law. Currently, German law only regulates *Bürgerenergiegesellschaften* (citizens' energy communities), which differ from the energy communities at EU level. The scope of application of the *Bürgerenergiegesellschaft* is limited to tenders for onshore wind energy (§ 36g EEG). According to § 3(15) EEG, a *Bürgerenergiegesellschaft* is defined as any company:

(1) Consisting of at least 10 natural persons as members with voting rights or shareholders with voting rights;

(2) In which at least 51 percent of the voting rights are held by natural persons who have had their registered main residence for at least one year prior to the submission of bids in the city or district in which the wind turbines are to be set up according to the location information in the bid; and
(3) In which no member or shareholder holds more than 10 percent of the voting rights.

It should be noted, however, that German legislation suspended the privileges for *Bürgerenergiegesellschaften* for two years on 8 June 2018 and ultimately abolished them (Deutscher Bundestag, 2018). This was preceded by a systematic abuse of these privileges due to fears that projects subsidised under the scheme would never be realised.

Therefore, the German legislator must establish renewable/citizens' energy communities and grant them the rights assigned to them by Art. 22 RED II and Art. 16 EMD, respectively. However, due to the rather general provisions of both directives, the legislature has considerable legal scope for implementation. In addition, Art. 22(7) RED II requires Member States to ensure that the support schemes they design for RES allow renewable energy communities to apply under the same conditions as regular RES operators, irrespective of their specific characteristics (Boos, 2019).

Conclusion

The provisions of the Clean Energy for All Europeans package relating to the activation of people for the energy transition provide an extended framework to democratise access to energy and give everyone the right to participate. This and digitalisation are crucial tools for reaching the goal of decarbonising the economy, diversifying the energy supply and disrupting the traditional balancing of electricity production and demand. Therefore, giving individual rights to self-produce and self-consume and enabling prosumers to establish citizen energy communities represents a significant shift towards greater decentralisation and locally focused politics. Moving away from a few energy companies and their monopolies to more consumer-owned production will offer the possibility for more consumer empowerment.

Regarding the legal framework, it is clear that the rights of prosumers or energy communities granted under EU law remain relatively open to interpretation; the crucial step will be their transposition into national laws. Therefore, each Member State should ensure, among other aspects, that the flexibility of consumers is appropriately addressed in their national frameworks. "Active" consumers, prosumers and energy communities can help to activate the flexibility potential of customers and thus facilitate more effective integration of RES and new technologies, e.g., electric vehicles, into the grid. An effective market design is crucial to ensure that the system is cost-effective overall, not just for those who "actively" participate, because local consumption also needs to respond to effective market price signals. Member States must ensure that self-consumed electricity that is used behind the meter is not subject to any charges or fees, although Member States may apply charges in certain limited cases, in particular for installations with a capacity above 30 kW. Models from many other countries show that it is possible to regulate self-consumption in a cost-effective and simple way; one example is the net metering system in Denmark (Wikberg, 2019).

Poland appears to be moving in a promising direction by supporting prosumers with special energy contracts. This development indicates that Poland has implemented effective methods to encourage local citizens to participate in the energy transition. However, it remains to be seen how the further expansion of wind energy, in particular, will proceed. In Germany, EMD and RED II will not bring about significant changes to German law – especially the EEG – regarding active participation. The EEG levy has already been adapted for the self-consumption model. The most significant change will be the establishment of renewable/citizens' energy communities in German law and the granting of rights assigned to them in Art. 22 RED II and Art. 16 EMD.

Granting certain consumer rights to "active" consumers, prosumers or energy communities is only one aspect of improving the balancing of generation and demand. It is also important that active participation in energy communities not entail a (partial) loss of consumer rights, e.g., as a result of supplying or selling energy.

Finally, in order to motivate consumers to become active in the energy transition, e.g., as prosumers, it is crucial to make the process as interesting (e.g., financially attractive), transparent and simple as possible. Adequate and precise information is needed regarding the possibilities to participate in the energy transition. Too often, a lack of important information constitutes a significant obstacle to participation. Sufficient and transparent information, a simple process and the rights of consumers to participate will lead to more flexible demand and grid optimisation. This will also increase acceptance and is essential to the success of the energy transition.

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Notes

1 See the Treaty establishing the Energy Community: www.energy-community.org/legal/treaty.html.
2 See further: https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en.

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3 Acceptance issues in the transition to renewable energy

How law supposedly can manage local opposition

Birgitte Egelund Olsen

Introduction

Recently, Danish legislators have introduced an updated toolbox of financial measures to promote local acceptance of renewable energy projects.[1] This recent amendment to the Renewable Energy Act adjusts incentives initially introduced with the first Renewable Energy Act in 2008,[2] and replaces original incentives with new ones. The updated legal toolbox is designed to deal with the well-known concerns of neighbours to renewable energy facilities, such as perceptions of an unfair distribution of burdens and financial benefits, including significant impacts on property prices.

The newly updated toolbox is characterised by even stronger elements of individual compensation and attempts to address issues of distributive fairness. It introduces a "bonus scheme," which entails direct annual compensation for households in the proximity of the renewable energy facility. It also imposes an acquisition option – a right for homeowners to transfer ownership of their homes to developers if their property suffers a loss of value due to the renewable energy facility.

However, experience shows that local opposition should be approached with caution, as financial incentives to promote local acceptance can be seen as buying consent or even "bribery," stirring up further opposition (Olsen, 2016; Jørgensen et al., 2020). As a result, there is a need to rethink the traditional legal approach and revise the current "nuisances equals compensation" methodology and turn to more forward-looking and sustainable regulatory models that may impede an overemphasis on the negative impacts of renewables in the vicinity of where we live.

The current incentives are aimed mainly at onshore facilities and, in some cases, offshore facilities in coastal areas. As a result, the financial incentives that apply to land-based and near-shore facilities, do not apply to offshore facilities in general, and local communities affected by offshore projects are treated differently.[3] From a general point of view, this may seem logical, as an offshore facility – such as an offshore wind farm – in many cases is not visible from shore. However, this ignores the fact that all large offshore installations come with large onshore infrastructures. Given that an increased focus on offshore developments

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is inherent in the next steps towards climate neutrality, there is a need to consider regulatory models that improve the relationship between offshore project developers and the affected onshore communities.

The overall aim of this chapter is to analyse the role of law in addressing community opposition towards renewable energy projects based on Danish experience. More specifically, it examines legal incentives for enhancing local acceptance of renewable energy projects, focusing on measures with a financial element outside the legal framework of planning, site designation, strategic environmental assessment and environmental impact assessment. The notion of "community acceptance" in this chapter is understood in the light of the comprehensive concept of "social acceptance" introduced by Wüstenhagen et al. (2007). The analysis has been based on the legal framework, including preparatory works, case law and parliamentary questions, applying primarily a legal doctrinal research method. Academic literature, general observations stemming from public debate and insights into specific renewable energy projects also form the basis for the analyses and conclusions.[4] How the legal framework and the specific regulatory measures actually affect community acceptance falls outside the scope of this chapter, as it would require in-depth empirical studies drawing on a broader range of social science methods.

The structure of this chapter is as follows: the next section focuses on community perceptions, local concerns and NIMBYism. Then, an insight into different categories of financial instruments for promoting local acceptance is provided. Next, the current Danish instruments are discussed and suggestions to alter the existing instruments are put forward, although they should not be seen as an exhaustive list nor as fully developed. Focus is on legal measures directly aimed at community opposition issues. Finally, I discuss some concluding remarks on the implications for the green transition, also beyond the Danish context.

Perceptions of renewable energy and community opposition[5]

Before exploring the different tools for responding to local opposition to the siting of renewable energy infrastructure, it will be helpful to briefly explore the underlying motives and the circumstances under which opposition arises. At a general level, there is strong public support for moving to low carbon energy systems (Ellis et al., 2020). However, there is often opposition to renewable energy projects at a local level. Community opposition reflects the frequently large gap between supporting the general idea of renewables as a strategy for mitigating climate change and increasing energy security, and accepting renewable energy installations in the local landscape (Ellis et al., 2020; Batel and Devine-Wright, 2015).

Previously, community opposition was typically referred to as "NIMBY" (Not In My Back Yard), thus referring to a preference for a public good combined with a refusal to contribute to the public good. However, the term does not adequately account for other explanations for opposing renewable energy projects, such as broader concerns of distributive fairness and lack of transparency or inclusiveness in the decision-making processes (Nolon, 2011; Wolsink, 2012; Jørgensen, 2019).

There are many reasons why local communities may object to renewable energy developments. There are at least the following categories of factors: physical, health, environmental and financial factors, perceived distributional fairness and level of inclusion in the decision-making procedure.

The physical or technical factors include the visual impacts and the aesthetic intrusion of renewable energy facilities. Moreover, local opposition may concern noise, flickering shadows or simply the proximity of installations (Scherhaufer et al., 2017). In Denmark, issues such as visual impacts and noise from wind turbines are dealt with by public law requirements, such as requirements for minimum distances and noise thresholds.[6] There are not (yet) such specific requirements with regard to solar parks for instance. Nonetheless, local opposition prevails even if intensive public law regulation of adverse effects applies.

Health concerns are closely related to physical factors. Uncertainty about the health impacts of a renewable energy facility may be an important contributor to local opposition (Zaunbrecher et al., 2017). Another frequent concern is the impact on the environment, including on wildlife, for example bats and birds, the ecosystem in general and the impact on vegetation and groundwater connected with building access roads and hardstand areas.

Moving renewable energy production offshore, away from the coast, may reduce or even eliminate visual and immediate health impacts from the renewable energy facility as such. However, it does not per se erase community opposition (O'Keeffe and Haggett, 2012). Offshore projects are not necessarily "out of sight, out of mind," but may remain contested. In addition, the onshore infrastructure for offshore wind farms is in many cases disputed, such as cable connections and the construction of transformer stations.[7]

Another important concern is the financial impact of renewable energy installations on members of the affected community. People are generally concerned about the effect of solar parks and wind farms on their surroundings and on the value of their property. Community opposition may also be due to the financial effect on conflicting land uses, such as a large solar park near a recreational area or an offshore wind farm disrupting the view of the sea from holiday rentals.

Beyond more direct impacts, another critical issue is the symbolic and affective aspects of renewable energy development, including perceptions of distributional inequity, for instance whether there is a fair sharing of the costs and benefits of projects (Jørgensen et al., 2020). Moreover, when a development benefits some sections of a community at the perceived expense of others, this may damage relationships and divide communities, leading to increased opposition.

Finally, resistance to renewable energy projects may not be directed at the infrastructure, affiliated infrastructure or the negative impacts it causes, but may be due to mistrust of the developer, the decision-making process or the public authorities that approve the development plans. Citizens' attitudes towards development will largely depend upon the perceived possibility of influencing the decision-making (Armeni and Anker, 2020). Citizens who doubt the credibility of the information they receive or their ability to influence decision-making will be less likely to exercise their rights to participate in consultations and to support a project proposal.

Local authorities, which are often very sensitive to organised local opposition, have to balance the negative local impacts of renewable energy projects against the wider national or global benefits. This is even more of a challenge if the legal framework does not provide for an adequate balancing of these sometimes-conflicting interests. Nevertheless, local authorities and developers cannot avoid addressing potential conflicts with local interests. A failure to address issues of local acceptance increases the risk of projects being delayed or simply failing.

Addressing local acceptance through law – the Danish experience

The legal framework for replacing carbon-dependent energy systems with renewables must provide well-thought-out incentives for enhancing local acceptance of renewables, while at the same time acknowledging that no two cases are the same and not all opposition can be eliminated. Danish legislators have been at the forefront with regard to the adaptation of law-based incentives directly aimed at promoting community acceptance. However, the instruments applied focus strongly on the negative financial impacts of renewable energy projects and the approach is entirely compensatory.

The first legally binding measures directly addressing community opposition were introduced with the first Renewable Energy Act adopted in 2008. It enacted an individual compensation scheme, which applied to all types of property, including existing wind turbines that would be subject to wind shadows from a future wind project (Mortensen, 2011). The 2008 Act also introduced a co-ownership scheme, which imposed an obligation on developers to offer a minimum of 20 per cent ownership of wind projects to local citizens. It was supposed to promote a feeling of local control and a sense of "local ownership" of the project. The 2008 Act also introduced a community benefit scheme, which provided funding for projects that enhanced local scenic and recreational values. This was a one-off payment based on the capacity of the project and funded by electricity consumers as part of general energy taxation, contrary to the other measures that were financed by wind developers.

Since the 2008 Renewable Energy Act, the measures for improving local acceptance have been amended a number of times, especially their scope of application, and in some cases they have even been replaced by new initiatives. Accordingly, the diversity of the toolbox has decreased with the latest amendments to the Renewable Energy Act, and today individual compensatory measures are by far the leading approach. Most noteworthy in terms of community involvement is the abandoning of the idea of local co-ownership (Olsen and Anker, 2014; Olsen, 2016; Johansen and Emborg, 2018; Jørgensen, 2019).

Individual compensatory measures

Often the development of renewable energy facilities raises the concerns of neighbours about the impact on their property value. In response to this, individual compensatory measures have been introduced. More generally, the reasoning is that a fairer distribution of benefits and losses will generate more general acceptance of renewable energy projects in local communities. However, there is a fine line between compensation and “bribery.”

The 2020 Renewable Energy Act contains three partly interlinked legal measures that aim at compensating individual losses, thus challenging the perception that the underlying aim is to bribe local individuals by offering financial benefit schemes. The compensatory instruments are: the compensation scheme, the acquisition option and the renewable energy bonus scheme.

The compensation scheme

The compensation scheme within the frameworks of the Renewable Energy Act functions as an individualised compensatory payment based on tort law principles, compensating specific losses of property value (Jørgensen et al., 2020). The scheme, which was introduced with the first Renewable Energy Act in 2008, aims at gaining acceptance of new renewable energy projects from owners of affected dwellings close to the site. The reasoning is that the neighbours to a wind turbine, for instance, would be more willing to accept it if they were compensated for the loss of value of their property. It entails a requirement for the developer to pay compensation for the loss of property value to dwellings caused by the installation of renewable energy facilities. This includes not only wind turbines, but also solar parks (since 2018) and most recently wave and hydro power plants, and hybrids of all the above energy facilities. The scheme requires renewable energy developers to fully compensate neighbours for their loss of property value, if they are facing more than a 1 per cent decrease in property value and have not contributed to the loss.

The level of compensation may be settled either by a private agreement between the developer and the neighbour or by an administrative decision of the Valuation Authority, set up specifically to deal with neighbours’ claims for compensation. In practice, decisions are made by the Valuation Authority. Under the scheme, neighbours are required to submit a claim for compensation to be eligible for compensation. It costs nothing for a neighbour to submit such a claim if the dwelling in question is in close vicinity to the renewable energy facility. If this is not the case, the applicant must pay an administration fee of EUR 530. However, the fee is reimbursed if compensation is granted.

With the latest amendments to the Renewable Energy Act, the time of the assessment carried out by the Valuation Authority takes place later in the process. It now takes place when the production of power has begun. Previously, decisions on the level of compensation were based on visualisations of the future renewable energy facility. The reasoning behind this was to make sure that the developer would know all the costs related to the compensation scheme early in the process. A neighbour would also know the economic consequences of living next to a renewable energy facility relatively early and would in theory not be tied down to a house during the planning process. However, experience has shown that preparing visualisations is economically relatively burdensome, and neighbours often distrust the correctness of the visualisation and hence the decision made by the Valuation Authority in some cases has led to legal proceedings.[8]

Consequently, by changing the time of assessment, decisions will in future be based on the actual impacts of the renewable energy facility, and fewer decisions will, in theory, be reopened and taken to court (Energy Agency, 2019a). The main criteria for calculating loss of property value have not changed with the latest amendment. Based on a brief site visit to each dwelling, the Valuation Authority takes into consideration the characteristics of the area, visual interference, distance to the renewable energy installation, estimated levels of disturbance, including noise and reflections, public and private restrictions on the property, the property value and type of dwelling and the housing market conditions.

Since 2009, about 1300 decisions have been made by the Valuation Authority covering approximately 130 different projects (Energy Agency, 2019a). So far, the majority of decisions concern land-based wind energy. The only other renewable energy projects completed under the compensation scheme have been two solar parks, both from 2020.[9] At present, two near-shore wind projects are pending (Anker and Olsen, 2019). They have resulted in about 600 claims for compensation, thus proving that the perceived impact of offshore installations is not comparable to projects on land (Energy Agency, 2019a). Furthermore, this first experience with near-shore wind projects has revealed a weakness in the system, as the functionality of the compensation scheme has been put under huge pressure, almost undermining the system in practice.

Looking at the period from the enactment of the Renewable Energy Act in 2009 to November 2019, applicants have been granted compensation in about 68 per cent of the decisions made by the Valuation Authority. The average compensation in proportion to the property value of the dwelling is eight per cent. This corresponds to an average compensation of about EUR 15,500, although compensation of between EUR 3,350 and 13,350 has been granted in about two thirds of the cases (Energy Agency, 2019a).

As mentioned above, two solar park projects have been assessed under the scheme. They generally do not deviate significantly from the level of compensation granted for land-based wind projects. The average compensation in proportion to the property value of the dwelling for the first two solar projects under the scheme is only slightly lower, at around 6.7 per cent. This corresponds to an average compensation of about EUR 7,750.

The Danish compensation scheme takes the view that wind turbines, solar parks and other renewable energy installations will cause a loss in value to neighbouring properties. However, do they in fact inflict an economic loss? And if so, then to what extent?

Only relatively few studies of individual compensating measures have been carried out, and the results are not concordant. So far, the studies concern wind energy. There are no applicable studies of the impact of solar parks. While some studies clearly anticipate negative effects on property values (Jensen et al., 2014; Cowi, 2016; Sunak and Madlener, 2016), others have demonstrated that wind turbines may not have a measurable impact on house prices, or the impact may be relatively low and not necessarily permanent (Hoen et al., 2015; Vyn and McCullough, 2014; Dröes and Koster, 2016; Vyn, 2018).

The most recent Danish study shows that the average level of compensation of the Valuation Authority is only slightly higher than what the study models imply (Jensen et al., 2018). Concerning the impact of near-costal wind farms on property values, the same study interestingly shows that there is no significant effect on property prices (Cowi, 2016). Nevertheless, Danish lawmakers assume that this is the case by including near-shore projects among the renewable energy projects that are subject to the compensation scheme.

Offshore wind projects will presumably also affect property prices in practice, although the Valuation Authority has not yet released any final decisions on the matter. Since some level of discretion is involved in assessing losses in property value, it is simply presumed that the Valuation Authority will be influenced by the fact that the legislation assumes there will be an effect on property prices.

The acquisition option

The acquisition option is a new instrument within the framework of the Renewable Energy Act. The measure responds to the concerns of neighbours of not being able to sell or live in their homes (Energy Agency, 2019b). However, it is not an entirely new legal instrument, either in law or in practice.

A similar measure is incorporated into the Act on Wind Turbine Testing Sites at Høvsøre and Østerild.[10] According to the Act, any homeowner within a certain distance of the nearest testing turbine may request that the state takes ownership of their property at a price that corresponds to the official property valuation.[11] So far, only one homeowner has made use of the instrument. A similar instrument has also been used by developers on a voluntary basis to reduce local opposition from neighbours and in some cases also to enable compliance with distance and noise standards for wind turbines. Apparently, the price determination has been a little higher in these cases, roughly corresponding to the official property valuation plus 20 per cent (Energy Agency, 2019b).

The new instrument is closely connected to the compensation scheme by law. However, the scope of the acquisition option is much narrower, as it only covers the neighbours living closest to the renewable energy facility, while the compensation scheme covers any loss of property value constituting more than one per cent, irrespective of the distance.[12]

The acquisition option constitutes a right for an individual homeowner to transfer ownership of property to a renewable energy developer if the property suffers a loss of value due to the renewable energy facility. The renewable energy developer is obliged to buy the dwelling at a price set by the Valuation Authority. However, the obligation only applies when the dwelling is at least partly located within a distance equal to six times the height of the closest wind turbine, or 200 m from a solar park, hydro power plant etc. and provided that the homeowner has been granted a compensation payment under the compensation scheme. The homeowner may notify the developer within a certain time span that he or she wants to utilise the acquisition option – and thus trigger the legal obligation of the developer to buy the property.[13]

The introduction of the acquisition option entails that the Valuation Authority is obliged to not only assess the loss of property value, but also to assess and determine the price if the acquisition option is activated. The option, and hence the price determination, covers the entire property, while the compensation scheme only covers the dwelling and the close surrounding areas. However, neither the Renewable Energy Act nor the preparatory works provide any guidance as to how the price should be determined and whether it should be a price estimate (as under the compensation scheme) or a more careful and exhaustive price setting.

The bonus scheme

Like the acquisition option, the renewable energy bonus scheme is also a new instrument within the framework of the Renewable Energy Act. The reasoning behind the bonus scheme is to offset perceptions of unfair distribution of the financial benefits from a renewable energy project between the developer and the local households that are affected by the perceived burdens from the project.[14] Lawmakers also expect the instrument to contribute to enhanced local support and involvement in the project, including a sense of local ownership.[15]

Unlike the acquisition option, the bonus scheme has not yet been used to promote renewable energies. The scheme directly compensates for a household living in an existing dwelling in the proximity of the renewable energy facility.[16] A household is one or more physical adult persons, registered as living at a specific address in the social security register. Unlike the compensation scheme and the acquisition option, this instrument is directed towards the household of a dwelling, not the owner. To avoid social imbalance, the bonus is tax-free and it is not set off against any social benefits. Moreover, the compensation does not counterbalance a specific loss, such as a loss of value. Instead, it is a general and uniform sum that does not reflect any differences in the impact.

The households eligible for a renewable energy bonus are only those living the closest to the facility in question. In relation to solar parks, hydro plants etc., the bonus scheme covers the same dwellings as those that may file a claim for compensation without paying a fee and those covered by the acquisition option. Concerning wind, the scope of application is wider as the scheme covers households living in dwellings located within a distance of eight times the total height of the nearest turbine, while the limiting distance under the other acceptance schemes is six times the total height of the nearest turbine.[17]

The bonus is not automatically payable to the eligible households. To receive the bonus, the household has to formally accept the offer from the developer. Confirmation is subject to certain conditions. The acceptance has to be provided in writing, determine the allocation of the bonus among the members of the household and be submitted within an eight-week-deadline.

The developer is obliged by law to pay the bonus and to implement the scheme, while the Energy Agency monitors the individual projects and ensures that the bonuses have been calculated correctly. The bonus calculation is based on the capacity of the renewable energy facility, the production above 6.5 kW and the electricity market price. Accordingly, the average bonus per household is expected to be around EUR 870 per year in relation to wind projects and EUR 335 for solar parks. However, this will depend largely upon the availability of resources (such as wind and sunlight), as well as electricity prices and the efficiency of the facility. Furthermore, to limit the economic burden on the developer, the law sets a cap on the amount payable under the bonus scheme.[18]

COMMUNITY-AIMED COMPENSATION

As a supplement to the individual compensatory instruments, a community-aimed compensation scheme – the green fund – has been introduced to encourage acceptance of renewable energy facilities not only from the primary affected neighbours, but also the surrounding community. The green fund also aims to enhance and promote local government support for the green energy transition locally.

The green fund is not an entirely new legal instrument. It bears some resemblance to the previous green scheme, which formed part of the first Renewable Energy Act. The green scheme provided funding for community projects, which either enhanced the local landscape and recreational values or initiated cultural and informative activities in local associations in the municipalities. It was managed by the Energy Agency. Initially, the previous scheme was financed by electricity consumers as part of general energy taxation. However, since 2017 it formed part of the national Budget.[19] The green scheme is no longer active.

Unlike the green scheme, the new initiative is managed locally by the municipality hosting the renewable energy facility.[20] Under the green fund, the developer pays a fixed amount per MW installed, inter alia, EUR 16,700 for land-based wind, EUR 22,000 for offshore coastal or open door wind and EUR 5,400 for solar. The amount is payable almost immediately after the production of the first kWh.

The green fund offers a stronger financial incentive to the hosting municipality. Firstly, a small percentage of the payment is set aside for administration of the fund. Secondly, there are a few constraints on the type of projects that may be funded. Finally, the hosting municipality is left with discretionary powers as to how to prioritise the applications for funding, including whether to give priority to projects that benefit the areas or citizens affected by the renewable energy facility in question. The scope for funding projects is thus wider than under the previous centralised regime of the green scheme, which provided funding for projects such as the renovation of sporting facilities, installation of solar power, enhancement of local art, cycle paths, nature trails and recreational areas etc. (Olsen and Anker, 2014).

The previous green scheme was popular among municipalities.[21] In addition, it was not disliked by developers and after its expiry, some developers continued the payment on a voluntary basis (Energy Agency, 2019d). The green fund provides even more room to manoeuvre for local governments and is expected to be warmly welcomed by the municipalities in particular. It is thus the expectation of the lawmakers that this instrument will contribute to the adoption of more (legally) binding land use plans for the development of renewable energies.

Rethinking the design of legal instruments

A strategy for dealing with community opposition must permeate the overall legal frameworks of planning, site designation, strategic environmental assessment and environmental impact assessment, while specific legal incentives focussing on community acceptance issues are only supplementary measures. The application of such incentives must be cautious. The types of financial measures that enhance local acceptance may vary in different regions or under different circumstances. The same method for increasing local acceptance may not work everywhere and in all projects. In addition, financial measures to promote local acceptance are often perceived as attempts to buy consent or as "bribery," thus stirring up further opposition. Moreover, legal measures that entail complex procedures are often less transparent.

Accordingly, there is a need in the Danish context to rethink the legal approach and revise the current "nuisances equals compensation" methodology and turn to more forward-looking and sustainable regulatory designs that may reduce the current overemphasis on the negative impacts of renewable energy facilities and the lack of transparency. In general, the current instruments stipulated in the Renewable Energy Act have a predominately negative outlook. For instance, the compensation scheme is highly focused on the negative impacts of renewable energy projects, suggesting that wind turbines and solar parks automatically cause a loss of property value. Similarly, the acquisition option implies that renewable energy facilities not only cause a loss of value to property but also it implies that it is somehow not possible to live in a house located in the vicinity of, for example, a wind turbine, even if it is further away from the nearest turbine than legally required.

Suggestions and remarks concerning existing legal measures

The compensation scheme has, from the outset, been highly controversial, but for different reasons (Olsen, 2010, 2015; Jørgensen, 2019; Jørgensen et al., 2020). While the costs of the scheme may not be as high as predicted by the wind developers back in 2008, the scheme is still questionable from a local acceptance point of view.

First, renewable energy facilities are treated differently from a number of large or intrusive infrastructure projects of vital public interest, such as highways and biogas installations. Such installations only give rise to compensation if the activity results in an unreasonable interference that exceeds the "tolerance limit" under disturbance legislation (Olsen and Anker, 2014). This in itself seems to indicate that renewable energy facilities cause great impacts even if public law requirements (such as distance and noise standards) are adhered to. The scheme thus emphasises the negative local impacts of renewable energy projects, while the overall societal benefits of energy from renewable sources generate less attention.

Second, there is an obvious gap between the intentions and the actual performance of the compensation scheme. This is in particular due to the challenges of ensuring a fair and acceptable level of compensation that reflects a fair distribution of the burdens and benefits of a renewable energy project and which is acceptable to the affected homeowners (Jørgensen, 2019). A recent study found that the compensation scheme often undermines the positive effects of the project on local acceptance and may even be counterproductive. The study shows that while the compensatory instrument is recognised as fair, the compensation as such is perceived as insufficient to offset the impacts and unfair in distribution with regard to level and scope (Jørgensen, 2019; Jørgensen et al., 2020). An inherent problem of the instrument is thus the perception that developers collect unreasonably large profits, while unreasonable burdens are imposed on the neighbours. Moreover, the burdens are not only perceived as financial, they are also seen as non-financial and relating to conditions such as a sense of not feeling at home and as the cause of stress symptoms, sleep disruption and other disturbances.

Thirdly, the calculation of the compensation lacks transparency. For instance, the assessment of the visual impact of a wind farm will always be subjective. Furthermore, experience shows that affected property owners have difficulty comprehending that it is not the disturbance as such that is compensated; it is the impact of wind turbines or solar parks on property values (Olsen and Anker, 2014; Energy Agency, 2019a). Accordingly, when the property value is low, the assessed compensation becomes similarly low. In some cases, a dwelling is in such a bad condition that there is no loss of property value, while neighbouring dwellings in a better state, are granted compensation.[22] This may lead to perceptions that the scheme is unfair, not only in comparison with the perceived financial benefits to the developer, but also in comparison with other neighbours (Jørgensen, 2019). Consequently, neighbours of a renewable energy facility who do not receive their expected compensation will feel they have been treated unfairly and may, as a result, be dissatisfied not only with the decision of the Valuation Authority, the developer and the renewable energy facility, but also with the local authorities and perhaps even with their neighbours.

In a number of cases, unfulfilled expectations have led to requests for the reopening of cases and litigation (Olsen and Anker, 2014; Olsen, 2015, 2016). Such requests to reopen cases (that is the decision made by the Valuation Authority) have been submitted in approximately 20 per cent of cases. Several cases have also been reviewed by the Danish courts, including by the Supreme Court.[23] Although the courts have upheld the level of compensation granted by the Valuation Authority in most cases, case law has not been entirely concurrent. To some extent, the Supreme Court has rectified this problem. It held in both judgements that in view of the expertise and function of the Valuation Authority, a court can overturn the decision of the Valuation Authority only if solid grounds prevail. As a result, it is not sufficient that the opinion of an independent surveyor differs from the decision of the Valuation Authority. The case law of the Supreme Court may have reduced the chances of overriding the decisions of the Valuation Authority and, as a result, decreased the number of court cases, but it has not reduced the lack of transparency in the actual application of the legal instruments.

A fourth observation is that changing the time of the assessment of the compensation scheme – and the concurrent introduction of the acquisition option – may actually lead to an increase in requests to reopen cases and, accordingly, also litigation. Under the current scheme, the price determination is just an estimate based on a desktop survey of the Central Register of Buildings and Dwellings and the housing market prices of that particular area, combined with a brief inspection of the property. In most cases, this assessment would be nowhere near adequate when it comes to a conveyance of the ownership. In addition, contrary to the current situation, it is likely that developers will also be forced to litigate the price of a dwelling if the acquisition option is activated. The latest amendments would thus add to the lack of transparency.

Fifthly, depending on the response among neighbours eligible under the acquisition option, this newly introduced instrument may also affect the geographical distribution of renewable energy facilities even further and consequently increase the uneven allocation placing such facilities primarily in the areas with the lowest house prices (Concito, 2018). This may increase the perception of unfairness among citizens living in those areas. From a developer point of view, this new measure may also be counterproductive to the aim of fewer but bigger projects. It may obstruct the voluntary buying up of neighbouring properties carried out by some developers during the initial planning process, given that the acquisition option constitutes a future right for the closest neighbours that may affect their willingness to give up their homes at this early stage in the process.

A sixth observation is that the "compensation" provided by the bonus scheme may become so insignificant that it will be perceived as unimportant and, consequently, have limited effect. The bonus scheme and the green fund are separate from the above-mentioned schemes, primarily because the compensation provided is not connected to ownership. Moreover, the compensation is more indirect, given that neither of the schemes compensates for any specific monetary loss of value. Over a period of time, the green fund may ex post increase local acceptance of specific renewable energy projects, provided it profits the community affected. However, the instrument may have less influence on local opinion in the crucial initial planning phases.

In conclusion, the need for financial measures to promote local acceptance is acknowledged, while it is disputable whether the Renewable Energy Act provides the most suitable legal framework. A more transparent and less complex framework to consider is an approach similar to one used when locating new overhead power lines and high-voltage pylons. As a starting point, the compensation would thus in most cases be based on standardised principles and rates, and there would only be a need to determine additional compensation in exceptional cases, while cases of conflict would involve the use of (compulsory) acquisition measures. Another but considerably more positive mindset or approach than the existing schemes would be the introduction of the concept of a "local tariff" that would bring cheaper renewable electricity to local residents by offering reduced tariffs. With a well-thought-out design, such an initiative could even bring about a positive vibe to dwellings in the vicinity of renewable energy facilities, comparable to the strong focus on a house's energy performance label when purchasing one, thus providing dwellings in renewable energy-intensive areas with a higher market value.

Thoughts on local opposition and offshore renewable energy

The instruments laid down in the Renewable Energy Act are aimed at onshore facilities, but do in some cases include near-shore projects, including so-called "open door" projects.[24] This may seem logical from a general point of view, as offshore infrastructure, such as an offshore wind farm, which has been subject to a site-specific tender, in some cases is neither visible nor audible from shore. However, this view ignores the fact that not all offshore facilities are "invisible" and that all large offshore installations come with large onshore infrastructures. Given that an increased focus on offshore developments is inherent in the next steps towards climate neutrality, there is a need to consider the design of potential regulatory measures that aim at improving the relationship between offshore project developers and the affected onshore communities and landowners beyond the current requirements of public participation that form part of, e.g., the environmental impact assessment procedure.

A major shortcoming of the current legal framework – aside from the negative outlook, lack of transparency and the difficulties of offsetting perceptions of unfair distribution – is the lack of flexibility that follows from static legal provisions that do not consider individual circumstances, such as positive attitudes, prior experience with wind energy, confidence in local authorities or high involvement in decision-making processes. In consequence, there is, in most cases, a lack of impetus to do more than what is required by law.

However, would it be possible to think of community acceptance mechanisms as dynamic instruments rather than static standards? Is it possible to design regulatory measures within a legal framework, but still with an inherent flexibility that can be applied in the light of variations among the specific places, people and communities? While the current traditional compensatory approach may be difficult to discard entirely in relation to land-based facilities, it may be possible to implement with regard to offshore renewables that have so far been "under the radar" in a Danish context.

One approach could be to revisit the design of the offshore tender process and the traditional basis that the only criterion in selecting the winner is the price, and turn towards strategies that incorporate community acceptance into the tender criteria. In the design of any tender system, focus should be on a careful blend of financial and technical criteria and on project milestones. However, besides a number of financial and technical criteria, it is possible to include other limitations or non-financial criteria, which may enhance renewable energy development.

A potential limitation as part of the tender criteria could come in the shape of a mandatory corporate social responsibility (CSR) strategy for community acceptance that would not only address the usual tender criteria, but also require the implementation of initiatives designed to improve the relationship with the specific local community, thus complementing business activities with socially responsible actions that acknowledge and support local communities.

Concluding remarks on community acceptance measures

The Danish Renewable Energy Act has provided various financial measures to promote local acceptance for more than a decade. There is no doubt that, from a green transition point of view, the community acceptance schemes introduced in the Renewable Energy Act have been very successful. During the period from 2009 to 2020, more than 130 new wind farms and solar parks have been subject to the acceptance schemes. During the same period, wind energy has represented an increasing amount of aggregated electricity consumption, from 19.3 per cent in 2009 to 48.0 per cent in 2020 (Energinet, 2020). However, local opposition has not been eliminated; on the contrary, the number of special-interest groups opposing new renewable energy projects have grown significantly and have generally adopted a more professional approach. Accordingly, there is a need for further understanding of how different measures and incentives work, also in relation to more recently introduced renewables within the community acceptance schemes, such as solar power, including whether the right balance between developers, investments interests and neighbour concerns have been achieved.

The pursuit of local acceptance is by no means an issue just in a Danish context, and Denmark is not the only country that has introduced financial incentives to promote community acceptance. This has been the case in a number of countries. Some incentives are provided by developers on a case-by-case basis, others are general legal requirements. However, it is crucial to acknowledge that a toolbox of community acceptance measures does not provide an adequate solution by itself. Such measures would always be add-ons only. They must fit into the overall economic, legal and policy framework of the jurisdiction in question. Of vital importance is a decision-making process designed to address concerns about procedural justice to ensure that the process is both transparent and fair, and a project planning process that seeks to minimise potential negative effects, for example by installing shadow detection systems or increasing the setback from dwellings. However, when negative impacts cannot be avoided, an obvious measure for a developer is to pay reasonable compensation for individual or community nuisances, which is exactly where law and legal measures may come into play. Measures stipulated in law can be the most adequate solution to ensure transparency, predictability and the set level of distributive fairness. Concurrently, this would be an opportunity for lawmakers in the other Baltic Sea Region countries to learn from the Danish experience and to consider instruments that are less complex, more predictable and promote a more positive outlook on the local implications of the green transition.

Notes

1 Act No. 738/2020 on amending the Renewable Energy Act.
2 Act No. 1392/2008 on the Renewable Energy Act.
3 Completely exempted from the toolbox of financial measures to promote local acceptance are site-specific offshore wind projects subject to tenders.
4 From 2009 until 2019, the author was Chairman of the Valuation Authority of Region Midtjylland. Currently, the author is member of the Energy Board of Appeal (2009–) and Chairman of the Environment and Food Board of Appeal (2017–).
5 This section constitutes a rewritten version of section I.39.2 in Olsen (2016) 477–479.
6 For example Executive Order No. 923/2019 on Wind Turbine Planning and Permitting (minimum distance requirements etc.) and Executive Order No. 135/2019 on Noise from Wind Turbines (noise thresholds).
7 This has proved problematic in a number of offshore projects, for example in the Energy Board of Appeal cases relating to the Anholt Wind Farm, cf. Decision File No. 1011-12-3-185, 30 August 2012.
8 Numerous cases have been reviewed by the courts, however, only two cases have been granted leave to appeal to a third instance, and have thus been reviewed by the Danish Supreme Court, cf. UfR 2017.3354, Ejstrup Case and UfR 2018.3205, Nørhede-Hjortmose Case.
9 Solar Park Næssundvej and Solar Park Harre.
10 Act. No. 1069/2018 on Act on Wind Turbine Testing Sites.
11 At the Østerild Testing Site, it was within a distance of 1,500 m, while at Høvsøre Testing Site, it was within a distance of 900 m.
12 Dwellings located more than 5 km from the nearest turbine have been grated compensation under the scheme, cf. Bill No. L 114, Folketingstidende 2019–20, Appendix A, 18.
13 The time span is a maximum of one year and at least three months. The minimum time span for farmhouses is six months, cf. Renewable Energy Act, s 6(5).
14 Bill No. L 114, Folketingstidende 2019-20, Appendix A, 19.
15 Answer to Section 20 Question No. S 1152 (Parliamentary Question to the responsible Minister) File No. 2020-1396, 18 May 2020; Energy Agency (2019c).
16 The Act is implemented further by Executive Order No. 2161/2020 on Renewable Energy Bonus to Neighbours to Wind Turbines, Solar Parks, Wave- and Hydropower Plants.
17 The preparatory works do not elaborate on the reasoning behind this variation.
18 The cap is 1.5 per cent of the capacity of the project in question.

19 The amendment was a result of the expiry of the EU Commission's state aid approval (case N 354/2008).
20 Executive Order No. 742/2020 on the Green Fund.
21 Amounts corresponding to 97 per cent of the total funding have been used under the previous green scheme involving 47 municipalities.
22 See, for example, Decision of the Valuation Authority concerning Engholmvej 5, 6950 Ringkøbing, Case 09/618.
23 UfR 2017.3354, Ejstrup Case and UfR 2018.3205, Nørhede-Hjortmose Case.
24 In the open-door procedure, the project developer initiates the establishment by submitting an unsolicited application for a licence to carry out preliminary investigations.

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Part II

Energy policy for engaging people for an energy transition in the Baltic Sea Region

4 Citizen preferences for co-investing in renewable energy

An empirical exploration of the "community-as-investor" acceptance of renewables' innovation

Cristian Pons-Seres de Brauwer and Jed J. Cohen

Introduction

The "Clean Energy for All Europeans" (CEP) legislative package represents the legal framework to guide the European Union (EU) in decarbonising its energy system by mid-century. As part of its governance mechanism, EU Member States (MSs) have been tasked to design and deliver National Energy and Climate Plans (NECPs) in order to meet increasingly ambitious climate and energy targets by 2030. An important insight guiding NECP design ought to acknowledge that the disruptive changes required for a timely implementation of national decarbonisation strategies cannot be fully realised by an exclusive reliance on renewable energy (RE) technological innovations, as their mass-scale diffusion and systemic adoption entail important shifts in the ways we currently organise, govern and consume both energy supply and its end-use services (Smith, 2016; Hoppe and de Vries, 2018; Hoppe, Butenko and Heldeweg, 2018). In other words, the diffusion of renewables' innovation is inevitably subordinated to, and determined by, the extent in which they are progressively adopted by end-users across society – itself a function of the level of support (or contestation) expressed by different stakeholder groups across society.

As such, both the extent and pace of RE technology uptake will itself be determined by the relative legitimacy that local communities (end-users, residents, municipalities), market actors (developers and operators, investors, consumers), government authorities (policymakers, regulatory agencies) and the broader public delegate to its process of deployment (open and participatory vs. closed and private), the allocation of burdens and benefits (concentrated vs. distributed) and for its ease of use (seamless vs. faulty), among other considerations (Walker and Devine-Wright, 2008; Upham, Oltra and Boso, 2015; Wolsink, 2018). Success in RE innovation diffusion may therefore be better understood and addressed as a matter of "social acceptance" (Wüstenhagen, Wolsink and Bürer, 2007).

Importantly, due to its decentralised nature and bottom-up configuration, addressing acceptance challenges around RE infrastructure deployment inevitably

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requires “new ways of collaboration, decision-making, and of mobilising society” (Hoppe and de Vries, 2018, p. 2). Citizen-driven forms of RE generation locally embedded around participatory practices offers a promising vehicle through which to operationalise such changes.

Research aim and objectives

In order to catalyse citizen involvement in RE generation and obtain conditional NECP approval, MSs must transpose EU-CEP legislation[1] concerning the rights and responsibilities of citizen-driven forms of RE generation into national enabling frameworks by June 2021 (Lowitzsch, Hoicka and van Tulder, 2020). However, national policy makers will most likely remain handicapped in their legislative efforts without an empirically validated informational source base guiding responsive policies to broaden citizen participation in energy decarbonisation efforts.

Limited understanding of the various characteristics shaping citizen participation in different RE initiatives may in turn result in deficient information flows that can potentially lead to misguided or insufficient RE investment decisions, as well as to regressive RE policies hindering (rather than supporting) citizen-financed RE developments. This might be particularly true for some BSR countries, where citizen investment preferences for co-financing community-driven forms of RE generation have seldom been explored.[2] The study reported in this chapter aims to address this information deficit through an analytical examination of different factors influencing citizen interest and participation in collective investment schemes for different RE project configurations throughout the BSR.

In order to do so, we use data from an international discrete choice experiment (DCE) survey conducted across every BSR country: Germany, Poland, Lithuania, Latvia, Estonia, Finland, Sweden, Norway and Denmark. Respondents were presented with different investment options to co-finance RE generation schemes. Through multinomial logistic regressions conducted on the survey data, we draw inference on the relative influence that different national socio-economic trends, energy cultures and demographic factors have in shaping citizen financial participation on different RE investment schemes and derive empirically validated insights on citizen-centric RE policy support as a key constitutive pillar of NECP design.

We structure the chapter as follows: first, we conceptualise community renewable energy through a socio-technical lens and introduce insights from the social acceptance literature to enrich our conceptualisation. With this novel combination, we add to existing acknowledgements of citizens’ salience for the realisation of sustainable energy transitions beyond their traditional “end-user” role (Göpel, 2016; Schot, Kanger and Verbong, 2016; Ingold, Stadelmann-Steffen and Kammermann, 2019). Also, we attempt to refine the social acceptance framework forwarded by Wolsink (2018) by exploring the conceptual space resulting from the overlap of the community and market acceptance dimensions of renewables' innovation – we call this the "community-as-investor" acceptance of renewables' innovation.

Secondly, we introduce the DCE survey as our main data collection tool, describe the development of our sampling and analytical methodologies and outline the steps taken throughout the data gathering process. We follow with a descriptive disclosure of our analytical outputs and present the results stemming from our regression analysis.

We then reflect on the policy implications stemming from our results and discuss the impact that the EU's latest shift on RE support policy – namely from a feed-in-tariff (FiT) system to a competitive tendering scheme in the form of auctions – has for incentivising citizen-led finance for CRE across the BSR. We specifically narrow in on the Danish and German experiences – two of the most prominent countries with long-standing traditions on cooperative association (Danielsen, 1995; Jørgensen, 1995; Kemp, Rip and Schot, 2001; Debor, 2018) – to illustrate the challenges that such a policy shift has brought in terms of hindering a more actor-diverse RE development pathway in both countries.

Theoretical considerations

Towards a socio-technical understanding of community renewable energy

Citizen involvement in RE generation schemes has been the object of ample enquiry, capturing the attention of both policy and practice actors including project developers, asset operators, policy makers, local municipalities, residents, etc. (Creamer et al., 2019; Seyfang, Park and Smith, 2013). Due to its manifold attributes, diverse stakeholder dynamics and multiple project designs and legal configurations, citizen-driven or community-based RE has been subject to countless interpretations and multiple definitions, challenging integrative efforts to reach a broadly accepted definition and resulting in cautionary calls against single, all-encompassing definitions (Brummer, 2018; Hicks and Ison, 2018).

In that respect, "community renewable energy" (CRE) may be more safely approached as an umbrella term encompassing various different "innovative configurations for sustainability" operationalised through different organisational forms and/or collective investment vehicles co-driven by environmental and social goals (Smith et al., 2015). These may refer to energy cooperatives, municipality-owned utilities, community development trusts, consumer stock ownership plans or online crowdfunding platforms, to name a few (Hewitt et al., 2019; Lowitzsch, 2019; Bourcet and Bovari, 2020; Torabi Moghadam et al., 2020).

Mirroring this organisational versatility, the "community" condition attributed to the CRE concept has thus been appraised quite diversely, yet most commonly categorised either as a geographically delimited "community of place" with social interactions unfolding within a localised setting or as a "community of interest" extending participation beyond place-based contexts and facilitating interaction based on shared/common interests, such as geographically dispersed co-investors in a cooperative scheme (Walker, 2008, 2011). However, more often than not, different types of communities tend to coexist within one CRE scheme simultaneously (Bauwens and Devine-Wright, 2018). In that respect, the "community" quality of CRE is not necessarily ascribed in reference to the geographic scope of the scheme itself (e.g. localised, dispersed), but rather to its citizen-oriented participation and membership-based characteristics.

Cutting across this myriad of views and interpretations, however, are two key dimensions of "process" and "outcome" underlying different RE development configurations (Walker and Devine-Wright, 2008). While "process" refers to "who a project is developed by" and "outcome" to "who a project is developed for" (ibid., p. 409), both dimensions are anchored in reference to the extent through which different stakeholder groups relate to RE technology and its deployment – either through direct involvement or indirect affect. Importantly, these two dimensions highlight the prominence that social arrangements have in shaping RE technology deployment efforts irrespective of the scale, cost, efficiency, performance/functionality or any other defining techno-economic attribute of the innovation itself (Walker and Cass, 2007; Walker and Devine-Wright, 2008). Such an insight implies that RE diffusion is partly shaped by the socio-communal arrangement upholding it, with more open and collaborative arrangements (e.g. wind energy cooperative) conducive to potentially greater participation and hence socially accepted technology diffusion, than closed and private ones (e.g. private utility wind farm).

In that respect, the idea of "social innovation" – whereby social practices, institutions and networks are reconfigured to empower citizens in supporting novel solutions to address societal challenges – emerges as a highly relevant resource to guide, broaden and deepen citizen engagement through novel ways of generating, managing and consuming energy more sustainably (Cajaiba-Santana, 2014; MacCallum, 2016; Neumeier, 2017; Polman et al., 2017; Caiati, Marta and Quinti, 2019). It is this focus on citizen participation what positions CRE as a social innovation, as it effectively reconfigures citizens' energy consumption and production practices as a means to enact renewables' innovation diffusion processes (Hewitt et al., 2019).

However, it is precisely due to the RE technological innovation itself (i.e. its decentralised nature and enhanced modularity) that socially innovative ways of collaboration are enabled and more participatory socio-communal arrangements are made possible, in the first place (c.f. how many citizen-financed coal-fired or nuclear power cooperatives exist?). CRE might therefore be better understood as a "socio-technical" innovation for sustainability, whereby novel social arrangements (e.g. cooperative) organise around technological innovations (e.g. renewables, storage) moving across a bi-dimensional continuum of process (open ↔ closed) and outcome (collective ↔ private) (see Figure 4.1).

The "community-as-investor" acceptance of renewables' innovation

The socio-technical conceptualisation outlined above advances an understanding of CRE development as a societally embedded process of technological innovation diffusion (Smith, Voß and Grin, 2010; Scherrer, Plötz and Van Laerhoven,

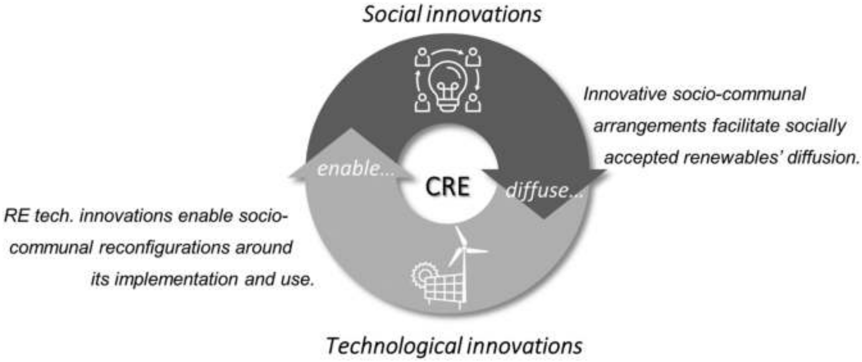

Figure 4.1 Community renewable energy (CRE) as a socio-technically innovative approach for renewables' diffusion. Source: authors.

2020). Importantly, this positions CRE as a *legitimation vehicle* through which to disrupt the locked-in role of end-users as passive energy consumers, enabling individual citizens to join communities of place/interest to collectively finance a RE generation facility. In doing so, the *subject* of acceptance[3] correspondingly shifts from traditional market incumbents (e.g. energy utilities, commercial project developers, capital fund managers, financial institutions, etc.) towards individual citizens in their newly acquired role as co-investors of socially innovative forms of RE generation.

Embedded in this new role, community-related concerns on e.g. procedural fairness, distributional justice, visual impacts, transparency, trust, place attachment etc., become entangled with investor-related considerations on e.g. market performance and revenue (un)certainty, tariff structures, fiscal obligations, regulatory risk, etc. As such, the community and market acceptance dimensions underlying both stakeholder groups progressively overlap under a hybrid "community-as-investor" acceptance dimension representative of the co-investor facet of individual citizens which emphasises the relations between the market, community and socio-political dimensions of RES developments (see Figure 4.2).

The community-as-investor acceptance is partly shaped by the information flows generated through the manifested preferences that individual citizens express for a myriad of differing characteristics cutting across the community, market and socio-political acceptance dimensions of CRE. For instance, more financially attractive co-investment schemes offering a higher return on investment or shorter holding periods may be better perceived than competing schemes offering lower returns or with longer holding times (Salm, Hille and Wüstenhagen, 2016; de Brauwer and Cohen, 2020). Additionally, socio-psychological motives such as an individual's particular (pro)environmental behaviour, place attachment, community identity or energy culture may shape the relative propensity to co-invest in any one particular CRE development (Bauwens, 2016; Cohen et al., 2019; Süsser, Döring and Ratter, 2017). Furthermore, certain national socio-economic

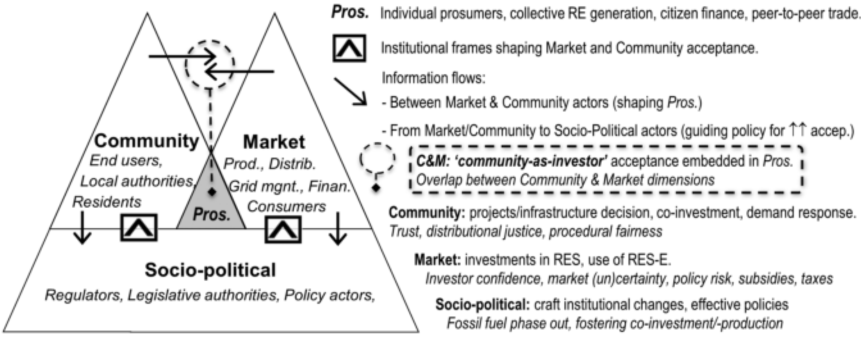

Figure 4.2 Multi-layered conceptualisation of the four dimensions of social acceptance of renewables' innovation – including the novel "community-as-investor" acceptance dimension derived from citizen co-investment on renewable energy generation. Source: conceptual illustration adapted from Wolsink (2018).

or demographic trends such as income/wealth distribution or incidence of energy poverty may also play a relevant role in nudging an individual's propensity to co-invest or not (Johansen and Emborg, 2018; Leiren et al., 2020).

Table 4.1 illustrates a selective categorisation of these various influencing factors for the BSR, under two main clusters of characteristics potentially shaping citizen preference formation for co-investing (or not) in CRE.

The relevance of the aforementioned factors in the table and other driving factors in shaping citizen involvement in renewables' innovation diffusion processes has been a recurrent object of enquiry across the acceptance literature. However, despite ample empirical work conducted in the context of socio-economic energy research, limited attention has been paid thus far to extend survey-based appraisals with experimental methodologies (Yildiz and Sagebiel, 2019). This may be particularly concerning given the increasing tendency towards evidence-based policy as a means to devise effective strategies to foster the diffusion of renewables' innovations, including socially innovative formats such as CRE (Sorrell, 2007).

The empirical enquiry outlined herein attempts to bridge this shortcoming through the development of an analytical procedure used on experimental data collected for every BSR country. The resulting analytical outputs may thus facilitate an empirically validated knowledge source base for calibrating more citizen-centric NECP designs supporting community-anchored renewables' innovation diffusion processes across the BSR.

Methods and data

Data collection: discrete choice experiment survey design and sampling methods

The main data utilised for our analytical procedure was obtained from the responses reported to a discrete choice experiment (DCE) included as part of an

Table 4.1 Descriptive variables on national economic and energy cultural characteristics for each BSR country (averaged at the country-level with the exception of "CRE culture" variable, which depicts absolute values).

Variable	*Description*	*Denmark*	*Estonia*	*Finland*	*Germany*	*Latvia*	*Lithuania*	*Norway*	*Poland*	*Sweden*
Natl. economic & energy characteristics*										
GDP PPP	GDP purchasing power parity	38,900	24,800	33,700	37,000	20,900	24,400	46,000	21,400	36,600
Gini index	Gini coefficient	27.8	30.6	25.9	31.1	35.6	36.9	24.8	27.8	27.0
Electricity price	Residential electricity prices in PPP per kWh	0.08	0.13	0.09	0.13	0.15	0.12	0.09	0.15	0.1
Electricity market share	Market share (%) of largest electricity generator	32.7	80	24.7	30.2	63.4	15.5	31.5	17.1	43.6
RES share	Renewable energy share (%) in final energy consumption	35.7	30.0	41.2	16.5	40.3	24.4	72.8	11.3	54.6
Heat poverty	Inability to keep home warm (% of households)	3	2.3	1.7	2.7	7.5	27.9	0.9	5.1	2.3
Arrears	Arrears on utility bills (% of households)	5.1	6.5	7.7	3	11.6	9.2	2.7	6.3	2.2
RES support	Gov. support for RES-E in 2016 (in € per capita)	164.0	19.0	31.2	295.3	47.6	31.7	15.5	15.4	35.9
CRE culture	Number of energy cooperatives in the country	133	-**	80	965	-	-	-	1	81
Natl. energy culture characteristics (Likert scale mean)***										
RES environment	RES uptake improves the environment	4.2	4.2	4.3	4.1	4.0	4.1	4.4	4.2	4.2
RES jobs	RES uptake increases employment	3.5	3.3	3.6	3.4	3.4	3.4	3.6	3.5	3.5
Climate change truth	Believe that climate change is happening	3.9	3.9	4.3	4.1	3.9	3.8	4.2	3.8	4.2

(*Continued*)

Table 4.1 Continued

Variable	*Description*	*Denmark*	*Estonia*	*Finland*	*Germany*	*Latvia*	*Lithuania*	*Norway*	*Poland*	*Sweden*
Save energy	People in my area try to save energy	3.3	3.3	3.5	3.4	3.2	3.2	3.4	3.4	3.5
Support transition	People in my area support the energy transition	3.3	3.4	3.4	3.6	3.2	3.3	3.2	3.3	3.2

Source: authors' elaboration based on survey data; (Bauwens, Gotchev and Holstenkamp, 2016; Eurostat, 2019a, 2020a, 2020b, 2020c, 2020d, 2020e, 2020f; Capellán-Pérez et al., 2020; Council of European Energy Regulators, 2018; Hewitt et al., 2019; REScoop, 2020; Wierling et al., 2018).
*Variables not obtained directly from survey responses but instead taken from public statistical repositories and relevant literature (see sources below).
**(-) no relevant projects.
***Variables constructed from survey responses to 5-point Likert scale questions, averaged over all survey respondents within each BSR country.

international survey conducted across every BSR country to identify different decision-driving factors on energy-related choices and behaviours. DCEs are a particularly well-suited data collection technique for our analytical purposes, as they enable us to estimate probabilistic models to investigate the relative influence of different socio-economic and demographic variables on individual preference and related choice dynamics (Yildiz and Sagebiel, 2019). As such, the purpose of the DCE section of the survey was to identify the respondents' levels of interest in participating in a community-based investment scheme to finance solar or wind energy projects consisting of different financial and operational characteristics and to infer the relative influence that national socio-economic trends, energy cultures and demographic characteristics have in shaping respondents' willingness to collectively finance CRE-based developments in their role of co-investor.

The DCE survey was distributed online by the market research firm Ipsos during 2018–2019. Country-specific panel samples consisted of around 600 respondents for each BSR country, with a total final sample of 5,425 respondents. Panel samples were drawn through a quota sampling procedure, with the requirement that the final samples were representative of each country's national population over the sociodemographic dimensions of age, gender and income[4] (see Table 4.2).

Table 4.2 Sociodemographic indicators included in the survey quota sampling process.

Country	*Indicator*					
	Age		*Gender*		*Monthly income*	
	Mean age in sample	*Median age of population*	*% males in sample*	*% males of population**	*Sample***	*Population****
Denmark	47.7	41.8	51%	49%	€2,093	€2,449
Estonia	40.1	42.1	55%	49%	€805	€782
Finland	42.7	42.7	52%	49%	€1,772	€1,999
Germany	42.8	46.0	49%	49%	€1,653	€1,827
Latvia	41.1	43.5	53%	49%	€600	€551
Lithuania	43.0	43.8	55%	49%	€549	€511
Norway	42.7	39.5	50%	49%	2,780	€3,206
Poland	42.8	40.7	50%	49%	€ 498	€495
Sweden	42.7	40.8	51%	51%	€1,746	€1,948
BSR	**42.8**	**42.3**	**52%**	**49%**	**€1,388**	**€1,530**

Source: authors' elaboration based on Eurostat (2019b, 2019c, 2019d, 2019e).

*Obtained by taking each country's ratio of women per 100 men.

**Estimated mean value of equivalised monthly income in EUR; obtained from dividing the net household income per number of household members (based on quartile and 90th percentile cut-offs from survey respondents.)

***Estimated median value of equivalised monthly income in EUR (obtained by taking the 5th decile of each country's annual income and dividing it by 12 months).

DCE survey respondents were presented with eight different investment scenarios (choice tasks) in a random order, each one displaying a total of three different RE investment options (choice objects) to choose from. Two choice objects showcased a specific hypothetical investment opportunity displaying a unique combination of different investment and operational attributes related to a CRE development. A third "opt-out" option was included in each choice task where all attribute values were set to zero, provided in the case where a respondent had no interest to invest in any of the two hypothetical investment options disclosed in the choice task. Different investment and operational attributes were included in the investment opportunities/choice tasks, as well as the range of values randomly disclosed under those options (see Table 4.3).

Table 4.3 Investment and operational attributes, their descriptions and range of values.

Investment & operational attributes	*Description*	*Values*
RE installation	The type of renewable energy project the respondent is investing in	• Wind farm • Solar park
Capital requirement	A randomly assigned, risk-free investment amount the respondent has to pay to join any of the investment opportunities being offered	• €50 • €100 • €1,000 • €2,000 • €5,000
Profit rate	A one-time lump sum payment to the respondent at the conclusion of the holding period, when the RE project is finalised. Displayed as a real rate of return on the initial investment that already accounts for inflation*	• 0% • 10% • 20% • 50%
Holding period	The number of years elapsed until the respondent's initial investment and the profit generated from it are both repaid	• 5 years • 10 years • 15 years
Visibility	Whether or not the RE installation is visible from the respondent's home	• Visible • Not visible
Administrator	The legal entity overseeing the respondent's investment and in charge of building and administering the RE installation	• Community organisation (e.g. energy cooperative) • Utility company • Government entity (e.g. municipality)

Source: authors.

*The CE defined "investments" as lump sum money transfers that are to be fully repaid at the conclusion of the holding period. This specificity allowed to disentangle the profit rate from the holding period and avoided the necessity to consider compounded interest, thereby simplifying the set of considerations that respondents had to account for when evaluating the profitability and, by extension, the preferred choice option.

The eight different choice tasks were presented to each survey respondent from a randomly selected block in a random order. Respondents were then tasked with selecting one option for each of the eight different choice tasks, resulting in eight different choices per respondent and a final sample of 43,400 choice responses selected from 130,200 different choice objects (i.e. investment options) available (see Table 4.4).

Complementing the investment and operational attributes included in the DCE section of the survey, we further identify a set of proxy variables representative of national socio-economic trends, energy cultures and individual demographic factors potentially shaping survey participants' DCE survey responses and thus their willingness to collectively finance CRE-based developments in each BSR country. We split these into three different sets of variables (see Table 4.5).

The national economic, energy and energy culture variables in Table 4.5 contain nation-wide values for each BSR country, matched to respondent observations from respondents who live in the country. Due to collinearity, all national level variables disclosed in Table 4.1 cannot be included together in the choice model. However, the included variables still represent major national economic and energy indicators, including GDP per capita adjusted for purchasing power parity (PPP), electricity price and the share of renewables currently in the national energy mix.

Specifically, in regard to the national "energy culture" variables, these are constructed from survey responses to three 5-point Likert scale questions, averaged over all survey respondents within each BSR country. We compute the standard deviation of these responses at the national level to proxy for the range of viewpoints on critical energy issues within a given national context. We call these variables

Table 4.4 Number of respondents per sampled country, choice options available for each respondent and final choices selected from respondents.

Country	*Number of respondents*	*Investment options available**	*Final choice responses*
Denmark	604	14,496	4,832
Estonia	605	14,520	4,840
Finland	604	14,496	4,832
Germany	603	14,472	4,824
Latvia	600	14,400	4,800
Lithuania	601	14,424	4,808
Norway	603	14,472	4,824
Poland	602	14,448	4,816
Sweden	603	14,472	4,824
BSR	**5,425**	**130,200**	**43,400**

Source: authors' elaboration based on individual participant responses to the DCE survey.
*These refer to the final number of choice options disclosed to the sample of respondents in each country: at the conclusion of the survey each individual survey respondent had seen a total of 24 investment options to select from. These were distributed into eight choice tasks with three options per task.

Table 4.5 Summary statistics for variables included in the multinomial logistic regression model of DCE survey participants' investment choice probabilities.

Variable	*Description*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Natl. economic & energy characteristics*					
GDP per capita PPP	GDP purchasing power parity	31,531.87	8,402.13	20,900	46,000
Gini index	Gini coefficient	29.716	3.974	24.8	36.9
Elec. price	Residential electricity prices in PPP per kWh	0.115	0.025	0.081	0.152
Elec. mkt. share	Market share of largest electricity generator	0.377	0.202	0.155	0.8
RES share	Share of RES in final energy consumption	36.313	17.962	11.284	72.752
Natl. "energy culture" characteristics (std. dev. of all Likert scale responses) **					
RES environment dissonance	RES uptake improves the environment	0.888	0.054	0.803	0.964
RES jobs dissonance	RES uptake increases employment	0.937	0.025	0.891	0.978
CC truth dissonance	CC is happening	0.988	0.058	0.927	1.122
Individual demographic characteristics***					
Age 35–44	Respondent age 35–44	0.216	0.412	0	1
Age 45–54	Respondent age 45–54	0.192	0.393	0	1
Age 55+	Respondent age 55+	0.237	0.425	0	1
Urban	=1 if respondent lives in town with less than 10,000 inhabitants	0.717	0.45	0	1
Male	=1 if respondent identifies as male	0.517	0.508	0	3
Household size	Number of people in household	2.505	1.235	1	6
Children	Number of children under 14 in household	0.611	0.488	0	1
HH income	Household net monthly income	2.165	1.548	0.1	6.566

Source: authors' elaboration based on Table 4.1 values.
*Variables not obtained directly from survey responses but instead taken from public statistical repositories and relevant literature (see sources below).
**Variables constructed from survey responses to 5-point Likert scale questions. Standard deviation of obtained responses computed at the national level. Averaged over all survey respondents within each BSR country.
***Variables derived directly from survey responses to sociodemographic questions.

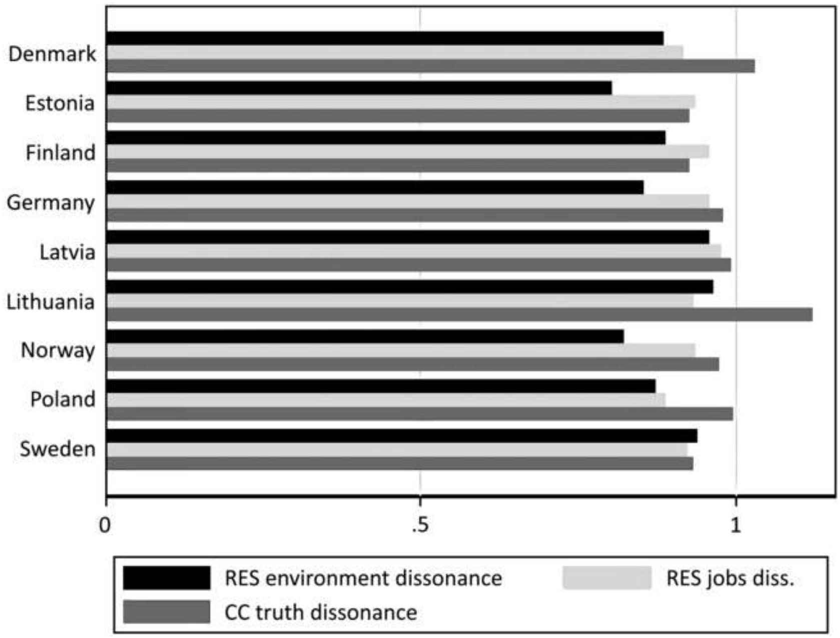

Figure 4.3 Cross-country comparison of respondent dissonance to three main variables illustrative of national energy cultures of BSR nations. Source: authors' elaboration based on survey responses.

"dissonance," as higher values denote energy cultures with a wider heterogeneity of viewpoints and therefore less societal consensus (see Figure 4.3). We observe that the main variation (i.e. respondent dissonance) in these variables across the BSR is in the belief that climate change is happening, with some notable variation in the dissonance on the belief that RE technologies improve the environment. We hypothesise that higher dissonance levels in the national energy culture are posited to reduce feelings of social cohesion and collective action around climate and energy objectives. Thus, citizens in nations with higher dissonance would manifest a decreased willingness to co-invest in a CRE. This hypothesis is tested through a multinomial logistic regression analysis in the proceeding section.

Analysis and results

Following the DCE survey description outlined in the previous section, the analysis in this section showcases a) descriptive results of the DCE survey responses for each BSR country and b) results stemming from a multinomial logistic regression that estimates the association of socio-economic trends, energy cultures and individual demographic factors (Table 4.5) with BSR citizens' willingness to co-finance CRE developments.[5]

In doing so, the analytical exercise reported hereafter allows for an empirical investigation of certain facets of the "community-as-investor" dimension of the social acceptance of renewables' innovation (see Figure 4.2).

Descriptive analysis of DCE survey responses

The 43,400 choice responses obtained from the DCE survey are summarised by the share (percentage) of respondents who chose an investment option at least once throughout the DCE and the total share (percentage) of investment options selected by respondents in each BSR country (see Table 4.6).

Descriptive results indicate an elevated interest expressed by respondents for co-investing in CRE developments via collective finance and co-ownership schemes: 74% of survey participants selected at least one investment option and further chose to co-invest in 53% of choice tasks. These initial results thus point towards a substantial acceptance from BSR citizens for CRE opportunities.

Specifically, survey countries with a low or non-existent CRE culture (see Table 4.1) and showcasing high acceptance rates (i.e. >50% – Estonia, Lithuania, Norway, Poland) may be indicative of citizens' favourable predisposition to partake in novel co-investment schemes on CRE initiatives within their communities. This may be particularly the case for countries with acutely low RES installed capacities per capita (i.e. Estonia, Lithuania and Poland)[6] and thus where acceptance concerns stemming from new RE infrastructure development are not yet consolidated (Cohen et al., 2016).

Survey countries with an emerging or robust track-record on cooperative association (and thus with a strong CRE culture) yet manifesting low acceptance rates (i.e. <50% – Denmark, Finland, Germany and Sweden) may be illustrative of a more cautious co-investment behaviour due to perceived small-scale energy investment risks derived from a combination of prohibitive capital investment requirements (Bauwens, Gotchev and Holstenkamp, 2016; Laybourn-Langton,

Table 4.6 Descriptive statistics of responses to investment options in the BSR.

Country	*% of respondents selecting at least one investment option*	*Total % of investment options selected*
Denmark	64%	44%
Estonia	91%	84%
Finland	74%	46%
Germany	74%	49%
Latvia	68%	44%
Lithuania	80%	58%
Norway	75%	52%
Poland	76%	55%
Sweden	64%	44%
BSR	**74%**	**53%**

Source: authors.

2016), strict spatial planning criteria (McLaren Loring, 2007; Bauwens, Gotchev and Holstenkamp, 2016), lengthy permitting procedures (Hildebrandt, 2019), expensive legal disputes (WindEurope, 2019), unaffordable grid access fees (Ruggiero, Martiskainen and Onkila, 2018) and increasingly stringent RE compensation mechanisms (Wierling et al., 2018), among others.

Alternatively for Latvia, a country with a low/non-existent CRE culture and acceptance rate (<50%), survey responses may shed additional light on the findings reported by Leiren et al. (2020), which found GHG emission reductions from wind energy infrastructure the most salient factor driving the acceptance of local communities in the country. While our investment offerings articulated the specific economic benefits stemming from CRE co-investments, they omitted the positive environmental impacts stemming from such co-investment. In light of Leiren et al.'s (2020) findings, a more explicit articulation of our investment proposition formulated around the positive environmental impact of CRE could potentially yield a more favourable predisposition to co-invest in CRE developments from Latvian citizens.

While these initial observations may be indicative of BSR citizens' propensity to partake in socially innovative forms of CRE co-financing, it is important to note that the DCE survey design assumes full (albeit imperfect) access to robust market information from survey participants and explicitly communicates a risk-free and profit-guaranteed financial return. Critically, in spite of the genuine interest that survey respondents may have manifested for any investment option, these additional design elements most likely remain a crucial driving factor underlying the generalised high acceptance manifested for the investment options displayed in the survey.

This is an important detail that we further reflect on in our discussion section, as it touches directly on the relevance that different RE policy support instruments have for (de)incentivising more actor-diverse RE development pathways through, among others, citizen-financed CRE formats across the BSR. It may thus have far-reaching implications for ongoing legislative efforts underlying the provision of supportive governance and regulatory frameworks captured under NECPs.

Multinomial logistic regression: analytical outputs

Building on the respondents' heterogeneous levels of expressed interest in CRE co-investment schemes, we conduct multinomial logistic regressions in order to estimate the relationships that the different characteristics depicting national socio-economic trends, energy cultures and individual demographic factors have with BSR citizens' willingness to collectively finance CRE-based developments. The resulting model estimates the latent probability of an individual's choice for an investment option as a function of the options' unique combination of different financial and operational attributes as outlined in Table 4.3. The estimation of the multinomial logistic model is reported as marginal effects of a unit increase of each variable on the individual's choice probability to select an investment option to co-finance a CRE development. Positive marginal effects indicate a favourable influence of a variable on the respondent's choice probability. Alternatively, negative marginal effects indicate an adverse influence on the respondent's choice probability.

Importantly, we consider proxy variables with a p-value of less than 0.1 to have a statistically significant marginal effect (see Table 4.7).

Results from the multinomial logistic regression show that the average BSR citizen manifests a slight priority for solar parks over wind farms as the preferred RE installation to co-finance. However, this observation is likely highly context-dependent and as such increased heterogeneity may be expected when assessing country-specific outputs, as explored in Cohen et al. (2019).

In spite of this first appraisal, it is important to reiterate that our analytical efforts do not focus on elucidating the relative effects of the investment options' financial and operational attributes (see Table 4.3) on the respondent's manifested co-investment choice probabilities and decision-making.[7] Instead, our primary interest concerns the relative influence that certain socio-economic, energy culture and demographic factors constitutive of a nation-wide community

Table 4.7 Multinomial logit model-estimated marginal effects of selected variables on choice probability for selecting an investment option.

Variable	*Marg. Eff.*	*Std. Err.*	*p-value*
National economic & energy characteristics			
GDP PPP	1.5E-05	1.8E-06	0.000
Gini index	0.09754	0.0092	0.000
RES share	0.00397	0.0007	0.000
Elec. mkt. share	-0.50130	0.0830	0.000
Elec. price	-6.08963	0.5889	0.000
National "energy culture" characteristics			
RES jobs dissonance	-5.94739	0.6004	0.000
CC truth dissonance	-3.84145	0.4497	0.000
RES environ. dissonance	-3.66271	0.2334	0.000
Individual demographic characteristics			
Male	0.08642	0.0122	0.000
HH income	0.02428	0.0060	0.000
Urban	0.01928	0.0135	0.155
HH size	0.00689	0.0063	0.271
Children	-0.01157	0.0158	0.464
Age 35–44	-0.06274	0.0170	0.000
Age 4–-54	-0.10491	0.0181	0.000
Age 55+	-0.14687	0.0184	0.000
Solar tech.	0.01000	0.0035	0.004
Capital requirement	-5.20E-06	3.40E-06	0.130

Note II: Sample size (N) = 5,425 respondents and 43,400 choice responses.
Note I: Highlighted rows indicate statistical significance at the 10% level. Model estimation includes all financial/operational attributes outlined in Table 4.3 yet these estimates are not reported here as our primary focus is on nation-wide community characteristics (as opposed to project-specific attributes).
Source: authors.

of citizens have in shaping individuals' willingness to collectively finance CRE-based developments across the BSR. In that respect, the analytical outputs stemming from the regression analysis indicate a number of statistically significant marginal effects, which we interpret through the "community-as-investor" lens outlined in the conceptual framework in section 2.

National economic and energy characteristics

First, we observe a significant negative marginal effect of GDP PPP on the likelihood of CRE co-investment uptake from citizens across the BSR. Interestingly, across the BSR, nations with higher Gini index of wealth inequality show higher acceptance of CRE schemes, with every unit increase in Gini leading to a 9.7% increase in the willingness of BSR citizens to co-invest in CRE schemes. When taken together, these two observations plausibly suggest that it is not only a country's aggregated wealth – but rather its distribution – that prominently associates with the propensity of its citizens to collectively invest in community-based forms of RE generation across the BSR. Importantly, both GDP and Gini index findings may be indicative of the fact that CRE schemes enable a lower required investment amount for individuals to co-own RE generation assets, as opposed to a fully self-owned scheme (Cohen et al., 2019; Haggett and Aitken, 2015; Hall, Foxon and Bolton, 2016; Yildiz, 2014; Yildiz et al., 2015), thus enabling population segments with lower financial means to partake in, and benefit from, collective investment and co-ownership schemes in contrast to more traditional, larger single-investment schemes or private single-owner RE generation systems (de Brauwer and Cohen, 2020).

Second, a higher RES share in a country's final energy consumption appears to associate with an increased propensity to co-invest in CRE, on average. Specifically, every additional percentage point increase of the RES share in final energy consumption yields a corresponding 0.4% average increase in the willingness to co-invest from BSR citizens. As such, BSR countries with higher RES market penetrations may be more likely to trigger citizen-financed CRE schemes than neighbouring countries.

Thirdly, BSR countries with more restrictive energy markets – in the form of either higher market concentrations of leading electricity generators or higher household electricity prices – tend to yield lower citizen co-investment probabilities in CRE schemes. Specifically, every additional percentage point increase in the market share of the largest electricity generator triggers a 50% decrease in the average BSR citizen's probability to co-invest. Furthermore, higher electricity prices are strongly associated with lower willingness to invest, with every 1 Euro cent increase in price triggering a 6.1% decrease in willingness to co-invest.[8]

National "energy culture" characteristics

Turning to the energy culture characteristics, we attempt to use these as a means to forward a better understanding of the relative influence that community cohesion/dissension on different energy-related aspects has on driving an individual's propensity to invest in energy socio-technical innovations such as those disclosed under the CRE concept.

For our particular purposes, we align with Walker (2008) in adopting a broad view of "community," in our case illustrating the nation state where a given individual resides. This enables us to assess the relative influence that country-level social cohesiveness has in shaping an individual's decision to co-invest in CRE. With this in mind, we take the "dissonance" variables (see Figure 4.3) as proxy values to measure the relative social cohesion across the sample countries (as these showcase the range of viewpoints with respect to the energy culture of a nation-wide community of citizens) and test the hypothesis that higher dissonance levels in the national energy culture are posited to reduce BSR citizens' willingness to co-invest in a CRE initiative.

Across the BSR, dissonance within the national community's energy culture is shown to negatively drive CRE co-investment probability choices for all three "energy culture" proxy variables (see Table 4.7). Specifically, individual dissonance regarding the impact of RES uptake on job creation showcases the strongest negative marginal effect on co-investor acceptance for CRE, with a 0.01 unit increase in dissonance associated with a 5.9% point reduction in the probability of CRE co-investing. Similar findings are observed for individual dissonance on the veracity of climate change (-3.8% points) and with respect to the environmental benefits from increased RES adoption (-3.7% points).

These findings substantiate our hypothesis that higher dissonance levels in the national energy culture can reduce the willingness to co-invest in CRE initiatives. As such, BSR countries with increased societal discrepancy on energy and climate issues may tend to disfavour co-investment schemes on CRE, while BSR countries with reduced discrepancy may tend to favour CRE co-investment schemes.

Individual demographic characteristics

We complement the insights disclosed above with a set of demographic characteristics furthering a more rounded appraisal of the individual members constitutive of a nation-wide community of citizens.

As expected, household disposable income exerts a strong positive marginal effect on the acceptance of CRE co-investment offerings from citizens across the BSR. Specifically, for every €100 increase in household income the probability to invest in CRE is 2.4% points higher.

Age appears as a relevant driver in choice probability formation across the entire sample, with respondents aged 35–44 more accepting of co-investment options than older respondents aged 45–54 and 55+. Such an observation may suggest reduced risk aversion (or a willingness to wait for more mature investments) from younger groups, who are more inclined to the possibility of co-investing in socio-technically innovative forms of RES diffusion.

Finally, female respondents on average are less likely to invest in the options offered. This translates into an 8.6% reduced likelihood on the probability to co-invest in CRE schemes for female respondents.

Discussion and conclusion

The analytical outputs outlined in the preceding section showcase an overall high interest expressed by BSR citizens to partake in socio-technically innovative forms of CRE co-financing. However, our use of country-level variables in the logistic regression model opens the door for country-level factors that were left out of the model to induce omitted variable bias. As such, we cannot interpret these country-level variables causally and instead note that the results stemming from our analytical exercise suggest a heterogeneity of driving influences both fostering and hindering the community-as-investor acceptance of citizens for partaking in CRE developments across the BSR. As such, future work could narrow down the community boundaries and consider the role of smaller community units (e.g. regional/provincial jurisdictions, municipalities, neighbourhoods) in facilitating citizen-financed CRE schemes, as well as develop in greater depth the number of driving influences underpinning each set of variables outlined in Table 4.7.

Furthermore, it is critical to reiterate here that our empirical findings rest on a DCE survey design that explicitly communicated to respondents a risk-free and profit-guaranteed financial return.[9] These facts, paired with the availability of multiple investment options, may substantiate the elevated acceptance manifested for the investment options being offered (see Table 4.6).

Approximating the DCE conditions above would thus require NECP legislative efforts across the BSR to risk-proof citizen investments by ensuring the bankability of CRE-oriented concepts. Relevant (yet non-exhaustive) measures could include:

- Facilitating easy access to government-backed finance (e.g. via low interest or interest-free public loans, capital subsidies, loan guarantees);
- Harmonised fiscal incentives (e.g. via production tax exemptions to clean fuel commodities commensurate with their CO_2 emissions avoidance potential and in consonance with domestic carbon taxes);
- Long-term remuneration schemes (e.g. via feed-in policies).

These and other RES support policies may contribute to advance a risk-minimised environment conducive to the participation of more socially innovative but risk-exposed CRE stakeholders such as energy cooperatives. In that respect, the progressive evolution towards more stringent remuneration mechanisms across the EU – culminated by the latest policy trend to substitute Feed-in-Tariff (FiT) schemes for competitive tendering in the form of RE auctions – runs diametrically opposite to such an objective. The disruptiveness of such a policy shift for citizen-financed CRE can be observed in countries with long-standing traditions on cooperative association such as Denmark and Germany, often considered frontrunners in fostering CRE-based developments (Danielsen, 1995; Jørgensen, 1995; Kemp, Rip and Schot, 2001; Debor, 2018; Roberts, 2020).

In 2002, over 700 energy cooperatives owned approximately 40% of all wind power installations in Denmark, with up to 150,000 participating households across the country (Bauwens, Gotchev and Holstenkamp, 2016; Wierling et al., 2018). An additional 40% was owned by single individuals (mostly farmers) and the remaining 20% by energy utilities (Bauwens, Gotchev and Holstenkamp, 2016). However, between 2000–2003 Denmark enacted legislation to substitute its FiT-based remuneration scheme for market premiums, lowering FiT payments by 25% along with a reduction in their duration (Bauwens, Gotchev and Holstenkamp, 2016; Roberts, 2020). This resulted in a substantial decrease in wind energy cooperatives. In effect, by 2004 the number of households owning shares in energy cooperatives had declined to 100,000 and by 2009 to 50,000 (Mendonça, Lacey and Hvelplund, 2009). By 2010, no more than 15% of wind energy assets were owned by cooperatives, and by 2017 less than 200 wind energy cooperatives remained operational across the country (Wierling et al., 2018).

Along similar lines, in 2014 Germany hosted almost 800 energy cooperatives, the largest number from any EU country (Wierling et al., 2018). By 2016, German citizens owned 42% of the country's installed renewable power capacity (trend:research, 2017). The prolonged use of FiTs throughout the 2000s contributed amply to this outcome, triggering an eleven-fold increase in community-based cooperative associations between 2000–2014 (Leiren and Reimer, 2018; Wierling et al., 2018). In 2014, Germany transposed EU legislation to substitute its FiT-based remuneration scheme for an auction-based system of competitive tendering. On its first 6 pilot auction rounds between 2015–2016, only 0.8% of bids were won by energy cooperatives, triggering the dissolution of over 163 RE cooperatives (Bundesnetzagentur, 2015a, 2015b, 2016a, 2016b, 2016c, 2017; Beermann and Tews, 2017). In light of such bleak prospects, in 2017 the German Federal Network Agency issued an auction round with special provisions for community energy associations, yet a loosely formulated definition of "citizen energy companies" (CECs) enabled corporate developers to rather easily qualify as CECs when in fact their operational structure and financial capital was not reflective of such a legal form (Tews, 2018; Gsänger and Karl, 2020). Furthermore, only 14 new energy cooperatives were created in 2019 as opposed to 139 newly founded cooperatives in 2013 (Roberts, 2020).

Denmark's and Germany's experiences thus offer a stark reminder of the increasing policy risk derived from competition-inducing regulatory frameworks for fostering an actor-diverse energy transition based on the participation of citizens as co-investors of socially innovative RE generation concepts locally embedded around participatory practices. In that respect, the increased price volatility and revenue uncertainty brought about with the progressive evolution from fixed FiTs, to market premiums and ultimately towards auction schemes imposes too high a barrier for unlocking citizen-financed CRE formats, as these do not tend to be driven entirely by profit-seeking enterprises but by communal initiatives with other social and environmental motivations (Breukers and Wolsink, 2007; Bomberg and McEwen, 2012; Rogers et al., 2012a, 2012b). BSR countries with limited experience in CRE-based policy development may thus find the Danish and German experiences instrumental in their legislative efforts to design responsive NECP proposals rewarding – rather than penalising – citizen involvement in national energy decarbonisation efforts, as required under the EU-CEP.[10]

The analytical enquiry reported herein attempts to bridge the potential information deficit regarding individual preference formation with respect to citizen-financed forms of CRE generation. The guiding objective of this enquiry has therefore been to contribute to an empirically validated knowledge source base for substantiating citizen-centric NECP design efforts and, in doing so, contribute to foster a *socially legitimised* diffusion of renewables' innovation across the BSR.

Ultimately, our conceptual contribution and empirical enquiry jointly attempt to support BSR countries in their efforts to address and operationalise the European Union's ambition to have citizens "take ownership of the energy transition, benefit from new technologies to reduce their bills, [and] participate actively in the market" (European Commission, 2015, p. 2).

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Notes

1 These refer to the official definitions of "renewable energy communities" (RECs) and "citizen energy communities" (CECs) disclosed under the recast Renewable Energy Directive – RED II ((EU) 2018/2001) and the recast Internal Electricity Market Directive – IEMD ((EU) 2019/944), respectively. For details see https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en.

2 With the exception of Germany, where various empirical studies have been conducted on the driving motivations behind citizen participation in community-driven forms of RE generation. Examples include Yildiz (2014) for financial motivations and Kalkbrenner & Roosen (2016) for social and environmental drivers. Furthermore, other studies have also conducted similar enquiries – albeit to a lesser extent – under a Danish context (e.g. Johansen & Emborg, 2018).

3 As opposed to the *object* of acceptance which, in this case, would be the socio-technical innovation itself (i.e. CRE-based development or legal entity such as an energy cooperative).

4 It is important to note that the outlined sampling procedure was conducted to ensure representative samples for each BSR country. Therefore, the resulting final sample is not weighted according to national population.

5 Important to note that our analytical exercise does not address the relative effect of the investment options' financial and operational attributes (Table 4.3) in shaping respondents' manifested choice probabilities, as this is dealt in greater detail in Cohen et al. (2019) and de Brauwer & Cohen (2020).

6 In 2018 Estonia (0.48 kW/capita), Lithuania (0.3) and Poland (0.22) had the 6th, 4th and 2nd lowest RES installed capacities per capita of the EU-28, respectively (IRENA, 2019; Eurostat, 2020g).

7 These are addressed in greater detail in Cohen et al. (2019) and de Brauwer & Cohen (2020).

8 Specifically with respect to household electricity prices, it is important to note that these do not drive the return on the investment disclosed in the investment options presented to survey respondents, since the rate of return is specified as a differentiated attribute on the choice experiment. The observed influence of household electricity prices highlighted here therefore relates to structural characteristics of national energy markets aggregated across the BSR.

9 While not originally conceived to mirror a specific policy framework, these additional design elements are representative conditions illustrating the risk-contained and financially enabling regulatory environment facilitated under a fixed Feed-in-Tariff (FiT) system, whereby a stable remuneration is guaranteed to RES-E operators based on a combination of long-term (e.g. 20 years) fixed electricity prices, along with "priority dispatch" guarantees (Lipp, 2007; Fouquet and Johansson, 2008; Cointe and Nadaï, 2018).

10 Poland's NECP, for instance, has a target to facilitate the creation of around 300 "community energy clusters" by 2030, yet existing regulation appears ill-suited in generating the necessary legal, financial and regulatory certainty to expedite cluster developments across its jurisdiction (Dragan, 2020).

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5 Better off alone?

The development of citizen involvement and community energy in the Swedish energy transition

Dick Magnusson

Introduction

The transition towards a low-carbon society is urgent and is underway. The goals are ambitious, with EU targets of at least a 40% reduction in greenhouse gas (GHG) emissions, 32% renewable energy usage and an energy efficiency of at least 32.5% by 2030 (European Commission, 2019a). Corresponding Swedish goals are a reduction of 63% in GHG emissions, an increase in energy efficiency of 50% by 2030 and 100% renewable energy production by 2040 (Swedish Government, 2019). In order to reach these goals, society must transition on international, national, regional, local and individual levels. While research and policy regarding national energy systems have received much focus, initiatives from communities have only recently gained attention. However, the potential of such initiatives to complement measures taken by energy actors is high.

The concepts of "grassroots innovations" or "grassroots initiatives" (GI) and "community energy" (CE) have received increased attention in recent years. In the first studies on grassroots innovations, they were defined as:

> *networks of activists and organisations generating novel bottom-up solutions for sustainable development; solutions that respond to the local situation and the interests and values of the communities involved. In contrast to mainstream business greening, grassroots initiatives operate in civil society arenas and involve committed activists experimenting with social innovations as well as using greener technologies.*
>
> (Seyfang and Smith, 2007, p. 585)

This definition emphasizes cooperation among citizens, and citizens taking an active role from their own ideas and initiatives. CE is defined as a category under GI, with a focus on either or both renewable energy production or energy saving (Martiskainen, 2017). Interest in GI and CE has increased at the EU level in recent years, with an increased emphasis on their roles in the energy transition. For example, community energy is explicitly mentioned in the directive on common rules for the internal market for electricity (European Commission, 2019b, p. 130):

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> *Community energy offers an inclusive option for all consumers to have a direct stake in producing, consuming or sharing energy. Community energy initiatives focus primarily on providing affordable energy of a specific kind, such as renewable energy, for their members or shareholders rather than on prioritising profit-making like a traditional electricity undertaking.*

National differences in the development of community energy are substantial, and some authors have analyzed the reasons for these. Kooij et al. (2018) argued that material-economic, actor-institutional and discursive dimensions have influenced the development of GIs in Denmark, the Netherlands and Sweden, especially concerning existing market structures. They also pointed to the importance of historical development.

This chapter takes its departure from the literature on community energy (cf. Bauwens et al., 2016; Berka and Creamer, 2018; Hargreaves et al., 2013; Martiskainen, 2017; Seyfang et al., 2014) and especially from the dimensions proposed by Kooij et al. (2018). It focuses on Sweden and analyzes the structures that have limited the room for maneuver for CEs and focuses in particular on policy. It suggests that while there has been some development of CEs in Sweden, especially wind cooperatives and eco-villages, it has been limited. During the past decade it has been more modest than in, for example, the Netherlands (Oteman et al., 2017). The reasons involve an already high share of renewable energy in the energy system, strong involvement from the state and municipalities, and the financing structure.

The aim is to analyze the institutional settings and policy settings for community energy Sweden in order to understand the prerequisites for its development.

Methods and material

The chapter is based on material from research in a project financed by the Joint Programming Initiative Urban Europe (JPI) program (Joint Programming Initiative, 2021). The project was called MobGIS (Linköping University, 2021) and focused on GIs and ECs in Denmark, the Netherlands and Sweden. The results have been presented in several papers (Kooij et al., 2018; Magnusson, 2018; Magnusson and Palm, 2019; Magnusson et al., 2021) and the results in this chapter are based on the material presented in these papers, with some supplementary literature and policy documents.

The Swedish material was obtained by a step-wise process (for a detailed description, see Magnusson and Palm (2019)). First, CE initiatives in Sweden were mapped. This process ended in March 2017 and covered databases (e.g., "Cesar," which covers organizations registered in the electricity certificate system, "Vindstat," which covers wind power producers, and "Retriever-business," which covers all registered companies in Sweden); previous research (journals, books and reports); popular science reports from interest groups and umbrella organizations (e.g., SERO, Ekobyarnas riksorganisation, Vindkooperativ); magazines and web searches based on the Swedish terms for such concepts as "energy community," and "energy cooperative." The cases identified were entered into a database along with background information (such as geographical location, organizational form, types of renewable energy projects, goals, number of members, ownership and membership in umbrella organizations).

The database initially contained 225 organizations, which was reduced to 140 after in-depth studies of websites and additional sources. These organizations were cooperatives in wind power, solar energy, small-scale heating, eco-villages and rural communities that owned hydro power or energy-saving plans.

We conducted semi-structured interviews with 36 organizations and five umbrella organizations in the database, focusing on questions that examined the establishment of the cooperatives and their motivations, challenges and organizational structures. The questions also looked at institutional support and barriers, and asked about plans for future development.

The results were analyzed and presented in the papers described above.

This chapter presents a basic mapping of Swedish energy policy that supplements the previously published material. Reports from the Swedish Environmental Protection Agency that evaluate energy policy, along with similar reports from the Swedish Energy Agency, have been used. The main purpose has been to present a picture of the most important policy measures for investment in renewable energy and to identify the targets of these policy measures.

Previous research

Community energy systems have been increasingly studied in recent years. Several definitions of community energy have been proposed, all of which contain an understanding of local, citizen-driven projects, formal or informal, with the purpose of establishing collaborative solutions to facilitate the development of sustainable energy technologies, mainly with non-profit ambitions (Bauwens et al., 2016; Martiskainen, 2014; Martiskainen, 2017; Seyfang et al., 2014).

The most important aspects of such systems for this chapter relate to policy and the different target groups for subsidies and grant programs. Curtin et al. (2017) concluded that these economic incentives have an impact, but that there is no "one size fits all" solution and that it is important to understand the specific needs of local citizens and groups when implementing policies. They argue that regulatory stability and policy certainty are important success factors and that feed-in tariffs, grants and tax incentives are the most successful policy measures.

Kooij et al. (2018) analyzed the institutional settings surrounding GIs in Denmark, the Netherlands and Sweden, and identified historical explanations which they described using three dimensions: material-economic, actor-institutional and discursive. The material-economic dimension contains several components. The structure of the economy and a high degree of industrialization in a country lead to the centralization of the energy production, as the industries are based on cheap and reliable domestic energy. They show that the pricing mechanism has a major impact on whether grassroots innovations succeed, as subsidies, feed-in tariffs or emission taxation is necessary for such initiatives to enter the market and stand a chance.

Kooij et al. (2018) further argued that the actor-institutional dimension shapes the possibilities for GIs. Market rules and liberalization may have an effect, as they lower the entry threshold to producing renewable energy, but subsidies are still necessary at an early stage to support investment. Another important factor is acceptance from existing grid owners and energy companies, as they can lobby against new market entrants. Small actors do not have the power or organization required to influence policy and depend on rules being in place that enable their entrance. Municipal energy companies can also be important partners for CEs in many cases. Further, the political culture and decision-making processes are important, as networks between various actors are necessary if ECs are to have a chance of entering the market. A nation's vision of the energy future is a further important aspect. In Sweden, for example, a continued strong emphasis on a mix of nuclear power, hydro power plants and other renewable energy sources shapes legislation and investment in the energy sector. The culture and perspectives on citizenship, finally, concern how the roles of the citizen and cooperatives are perceived. Kooij et al. (2018) showed that the Netherlands and Sweden share a culture based on individualism, which leads to renewable energy cooperatives being a rare phenomenon, while Denmark has a history of agricultural and other cooperatives.

A concept known as "path dependency" is important for this study. Path dependency relates to how decisions that are made concerning such issues as technology influence the system development for a long period. Commonly used examples are how standardization leads to path dependency in, for example, decisions about the width of train tracks, as all decisions made after this point must relate to this choice of technology (David, 2001). Hughes (1983) described the concept of "momentum," which is related to path dependency, and how choices of technology, regulations and investments in a technological system generate inertia and make it difficult to change the system. Bladh (2020) uses the concept in a wider form and argues that a decision does not necessarily need to be about a specific technology: a decision may be a political choice of pathway that causes actors to work in this direction. It can relate to a lock-in of the centralization of energy systems rather than their decentralization or a supply orientation rather than efficiency.

The concept of "obduracy," as introduced by Hommels (2005) is related to the idea of path dependence. She introduced the concept in relation to urban planning, but it can be applied to technology development in a broader sense. The argument is that once cities have been built, obdurate structures and technologies make them difficult to change, which can be explained using three concepts: frames, embeddedness and persistent traditions. The frames and persistent traditions described by Hommels are relevant to this chapter. A focus on the roles and strategies of the actors, on a local or micro scale during the development phases of specific technologies or systems, together with the way the actors think, i.e., the sociotechnical framework in which they work, both constrain the possible development paths. It becomes difficult to work for change that requires ways of thinking that lie outside the current scope and the way in which certain groups of actors share views of the world, values, conventions, problem definitions and typical solutions. Related to this is the idea of persistent traditions. While frames are considered from a micro or local perspective, persistent traditions relate to the wider cultural contexts and long-term persistence of traditions that may explain obduracy. The rules, values and culturally rooted traditions that transcend local contexts are shared by many people, and this shapes systems in a certain direction on a higher level. These ideas are thus more general but can be used in more contexts and will endure for a longer period. Further, they will not be shaped only by certain groups.

I will use the concept of path dependence in relation to the policy decisions that have been unfavorable for the development of CE, often unintentionally, and that have often limited room for action in these matters.

Energy system development in Sweden

In order to understand the Swedish energy system, a brief description of the institutional levels is necessary. Sweden has a long tradition of public ownership and centralized energy systems. Further, municipal autonomy is highly developed in Sweden, and municipalities are self-governing, have taxation rights and a monopoly in urban planning (Blücher, 2006). Public ownership has meant that the Swedish state and the municipalities are responsible for energy production and have been responsible for the transition that has occurred (Magnusson, 2013; Palm, 2004). Municipalities acquired greater power during the 20th century. They were active in the establishment of municipal energy companies, first in the form of municipal gasworks and later district heating. In parallel, the state took an active role in the establishment of hydro power through the state-owned company Vattenfall and later in building and operating the transmission grid. The state cooperated with the industry for the construction of nuclear power from the 1950s. We see that the state has always held a strong position in the energy market (Kaijser, 1994).

Against this background, it is important to understand the relationship between the state and actors at the local level. Both institutional levels strengthened their positions during the late 1800s and 1900s, and the competition has led to a weak regional level (Magnusson, 2013). Municipalities have several other mandatory assignments, such as childcare, schools, elderly care, and water and sewage. They also play an important role in environmental protection and waste management, and their ownership of the energy companies (which only started to become less important in the mid-1990s) made them a part of the welfare state. The situation was characterized by an understanding of strong public involvement, and citizens became accustomed to public institutions being deeply involved in energy production. This has lately continued as the use of renewable energy has grown (Kooij et al., 2018).

Swedish municipalities play other important roles in the energy area. They are required by law to have an energy-conservation policy and to take active measures to develop an energy-supply system that is sustainable in the long run.

Thus, municipalities often take a comprehensive view of the energy system and formulate goals and visions from a system perspective that includes all components of the system: supply, conservation measures and environmental strategies. The municipalities could formulate these goals much thanks to their energy companies. As oil was used in district heating plants at this time, they played an important role in oil-reduction, and in the wider perspective, to reduce CO_2-emissions (Palm, 2004, 2006).

Another important feature of the Swedish energy sector is its low carbon production. Today, nuclear power and hydro power make up 41% and 39% of the production, respectively, with other contributions from wind power (10%), electricity production in combined heat and power plants (9%) and solar power (0.2%) (Swedish Energy Agency, 2020). This composition of energy production gives low emissions of CO_2. The development of wind power has been rapid and has increased from less than 1% in the mid-1990s to 10% in 2018. Even though the share of electricity produced from solar photovoltaics installations is low, capacity increased by more than 70% between 2017 and 2018, from 231 MW to 411 MW. The Swedish Energy Agency has concluded that lower prices for PVs, in combination with favorable economic incentives, are driving this development (Swedish Energy Agency, 2020).

In the heating sector, district heating makes up almost 60% of the market, while electric heating (including heat pumps and resistance heating) makes up 29%, biomass-based production 12% and oil-based production around 1% (Statistics Sweden, 2020; Swedish Energy Agency, 2020). In the district heating sector, 42% of the production in 2018 was from biomass, around 22% from waste and the remainder from a combination of sources (including internal flue gas condensation, peat, waste heat, oil, heat pumps and coal) (Swedenergy, 2021). This means that carbon production from the heating market is generally low.

Ownership has changed substantially in the energy sector in Sweden in recent decades. The hydro power plants were mainly built by state-owned Vattenfall, while nuclear power has remained state-owned or jointly owned with private actors. Large changes have occurred in electricity production and sales, while another major change has been the increase in the number of municipal energy companies, due to the liberalization processes that started in the 1990s. The electricity market was deregulated in January 1996, and production and sales were opened for competition, while distribution and transmission remained as natural monopolies. The district heating market changed from self-cost pricing to market pricing at the same time (Högselius and Kaijser, 2007). However, the free market was available in practice only for large consumers at that time. An electricity meter that measured consumption on an hourly basis was required, and these were relatively expensive, which meant that small consumers lacked an economical incentive to buy them and change suppliers. The Swedish parliament subsequently removed the requirement for hourly meters for most consumers and introduced profile-settlement of consumption instead. In 2004, the government introduced monthly meter readings of electricity consumption for all customers from 1 July 2009 at the latest, to comply with EU regulations (Palm, 2018).

Before the deregulation in the latter half of the 1990s, energy companies were owned mainly by municipalities, but a clear trend of mergers and acquisitions on the electricity and district heating market began. Previously, actors in the manufacturing industry owned substantial electricity production facilities, especially in hydro power, but these were sold to large companies (private, state-owned or municipally owned) that operated in several municipalities. The market was consolidated until only three large energy companies remained: E.ON, Fortum and Vattenfall. During this period, however, several other companies increased their market share (Högselius and Kaijser, 2007) and, importantly, new actors entered the market. These were mainly in two fields: investment in wind power and investment by district heating companies in combined heat and power plants. Notably, many municipal energy companies with district heating were sold to private, state-owned companies or large municipal companies owned by neighboring, often larger, municipalities that basically ran their company as regional energy companies (Magnusson, 2016).

Public involvement was generally strong during the 20th century, and municipalities and the state played an important role in both establishing a low-carbon energy system and in transitioning the sectors with high shares of fossil fuels into more sustainable production systems. This meant that the starting point in Sweden was better than in, for example, the Netherlands, when policies intended to reduce climate impact started to be introduced (Kooij et al., 2018). It is possible that this led citizens to downplay the urgency of investing in renewable energy, since the public was taking an active role in this. The citizens *participated* in municipal planning, but seldom initiated it or took the lead (Fenton et al., 2016).

The price of energy is an important factor in the Swedish context. This is the case for electricity in particular, and for district heating, the pricing of which was determined by self-cost principles until 1996. The price of electricity (in particular to industrial customers) in Sweden was kept low as a consequence of heavy investments in hydro power and later nuclear power. It should be remembered that industry in many cases owned the production plants and adopted a policy of keeping prices low, in order to increase international competitiveness. Bladh (2020, p. 228) summarizes the situation:

> *The structure of the Swedish electricity system, with hydro power and nuclear power, where the industries themselves were electricity producers and could thus ensure low prices for themselves, has arguably been successful in the intent to make Swedish industry competitive.*

Low electricity prices and high energy security were clear political goals throughout the 1990s (Bladh, 2020). Deregulation and competition, however, led to higher electricity prices, and I argue that the low prices led to lower interest among citizens and potential cooperatives to invest in renewable energy, as the economic incentives were low. Only a strong, over-arching environmental interest would be enough to cause people to "do something," and this was the trend among the eco-villages (Magnusson, 2018).

Development of grassroots innovations in Sweden

Community energy in Sweden can be divided into five categories: wind cooperatives, eco-villages, solar PV communities, small-scale district heating networks and rural communities with some variety in focus (hydro power or energy-saving projects). We identified around 140 active CE initiatives in our study in 2017 and around 20 previously active ones, most of which were wind cooperatives. This is considerably lower than in, for example, Denmark, the UK and the Netherlands (Kooij et al., 2018; Oteman et al., 2017; Seyfang et al., 2013).

The largest number of CE initiatives were wind cooperatives, with 78 active and around 20 discontinued. The second largest group was eco-villages[1] (32), most of which were in rural settings. We identified ten solar PV communities and ten small-scale heating organizations that we classified as CE. Eight rural communities ran various forms of production with a local focus.

The total generating capacity of the organizations was around 160 MW, most of which was from wind cooperatives, with a smaller amount coming from solar PV cooperatives.

Figure 5.1 presents the starting years of the initiatives. The years of the new millennium have seen considerable growth in the number of organizations founded. The main reason for this is the liberalization of the electricity market,

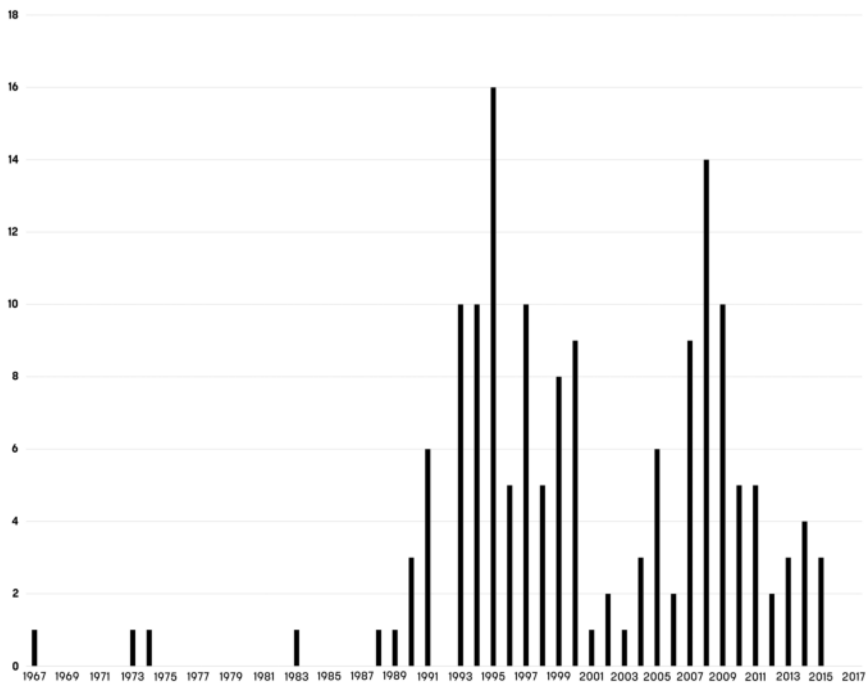

Figure 5.1 Starting years of CE initiatives (number per year).

which created opportunities to invest in such technologies as wind-based generation. Many eco-villages were founded during the 1990s. The peak in new establishments that occurred between 2006 and 2010 arose from new establishments in most categories.

More than 20 wind cooperatives have been discontinued since 2010. Magnusson and Palm (2019) identified several factors and showed that timing is a critical factor. Most of these cooperatives had been started in the 1990s and the plants were reaching the end of their technical life span. It was necessary to decide about new investments. The founding members had been active in the facility for a long time and were hesitating to continue with a new round of applications and plans. An organizational vacuum appeared, while at the same time the profitability was low due to low electricity prices and the expiration of green electricity certificates.

Most CEs were located in the Västra Götaland region (in the west of Sweden), and the number was somewhat higher than expected from the population distribution in Sweden. CE initiatives in Norrland (northern Sweden) were also over-represented relative to the population, while they were underrepresented in the Stockholm region. The population density is high in the Stockholm region, and thus land available for CE initiatives is limited (Magnusson and Palm, 2019).

The most common form of organization was as an incorporated association,[2] used by 90 of the organizations, followed by non-profit association (samfällighet) 20, tenant-owned apartments (bostadsrättsföreningar) ten and non-profit organizations four. Fourteen CE initiatives were organized as some kind of commercial enterprise (ranging from a limited company to an individual enterprise) (Magnusson and Palm, 2019).

We identified the keywords used in aims and goals used by the initiatives, based on strategy documents and websites, in order to understand the focus of the organizations (see Figure 5.2). There is a significant focus on the production of green

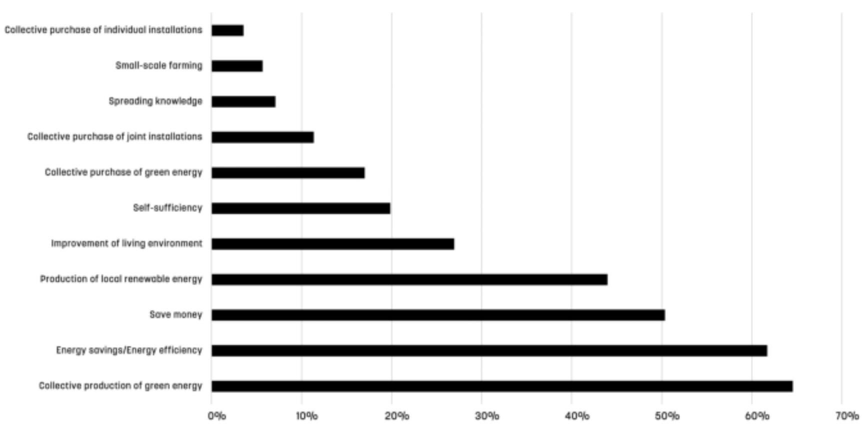

Figure 5.2 Keywords among the goals and aims of CE initiatives.

energy, energy savings and production from a local perspective. Self-sufficiency and spreading knowledge did not have a high profile among the CE initiatives, which reflects the fact that these organizations focused on their own activities. In addition, their aims were often limited to energy saving and energy production.

Financing structure

The development towards a higher share of renewable electricity production in Sweden has affected economic policy instruments profoundly. Sweden was among the first in the world to introduce taxation on carbon dioxide emissions, and many other subsequent policies strongly supported this development (Naturvårdsverket, 2012). Table 5.1 summarizes the most important policy measures.

Some conclusions regarding economic support for renewable energy can be drawn. Sweden has had significant programs since the 1990s and these programs have stimulated investment in renewable energy (Naturvårdsverket, 20042012; Jordbruksverket, 2019; Swedish Energy Agency, 2006). However, support has focused on industries and corporations, public authorities and private citizens, while energy communities have not been the main targets of the most important policy measures. I suggest that this has been an important factor in the limited development of such communities, as attention and a greater focus would stimulate these kinds of initiatives and add a different category of owners of renewable energy systems. Energy communities have not been explicitly excluded from these systems: they have been able to apply for investment support and to become a part of the green electricity certificate system. However, these initiatives have been forced to find their way among these policy measures and create possibilities for themselves, rather than "just" having to apply within existing structures. This means that the members must have the substantial knowledge and time that is needed to navigate through these structures, or other forms of support structure must be available through umbrella organizations or intermediaries.

Policy in the 1990s aimed to support development in renewable energy in general, with some technologies receiving particular attention. This subsequently shifted and came to focus even more on support for individuals. This brings into play a central question for CEs and GIs: these are based on components of collective action, but when the support structures for individual homeowners are strong, why should people work collectively? The development of the energy market leads to frames and a tradition of understanding in which public actors take control of the energy transition. However, for houseowners, who have greater economic incentives to invest in renewable energy such as solar PVs, the development of the energy market means that the very idea of coming together is rather far-fetched and the way forward contains considerable hurdles.

Few specific regulations have actively supported energy communities. One of the exceptions arose in the 1990s, when some policy measures were adopted that favored eco-villages. Berg et al. (2002) argued that the interest for eco-villages

Table 5.1 Policy measures affecting the energy sector (Naturvårdsverket, 2004; Swedish Energy Agency, 2006; Naturvårdsverket, 2012; Swedish Government, 2009.)

Year	*Policy measure*
1991	Carbon dioxide taxation
1991	Investment support for bio-based combined heat and power plants
1991	Investment support for wind power plants over 60 kW – up to 20% of investment
1991	Investment support for solar heating – up to 25% of investment
1993	Increase in support for wind power – up to 35% of investment
1994	Investment support for wind power through an environmental bonus – to cover energy taxation on electricity
1997	Investment support for wind power reduced to 15%
1997–1999	Investment support for small-scale hydro power – discontinued in 1999
1998–2002	Local Investment Program (LIP). Transition to ecological sustainability on a local level – focused on municipalities – 162 municipalities were included, and 1800 projects were conducted
1999–2003	Support for operational costs (0.09 SEK/kWh)
1999	Environmental objects – national goals, including limited climate impact
2001	Green taxation change ("Grön skatteväxling") – taxation on energy is increased and tax on labor is decreased – the industry is compensated
2002	Economic support to regional energy agencies – advisory support
2003	Green electricity certificate system – taxation on usage and support for investment in renewable energy production – investment support for e.g., wind power discontinued
2003–2012	Climate investment program – support for local projects that reduce climate impact – for municipalities, corporations and regions. 50% of energy-related investments in district heating
2005	EU emission trading system
2005–2008	Investment support for solar heating and PVs. Only public facilities
2007–2010	Planning support for wind power plants – municipalities, regions, county administrative boards
2009	Tax reduction for repair, remodeling and house extension (the so called "ROT"-reduction), – support for installation of e.g., solar PVs – supports labor costs
2009–2020	Investment support for solar PVs – maximum 60% in 2009 of the investment costs.
	Support for investment in solar heating. Replacement for previous support. Reduced in steps to 20% in 2020
2014–2020	Rural area program – support for investment in renewable energy – small corporations
2015	Tax reduction for micro production – for private owners

at this time was related to work with Agenda 21 in the municipalities and an increased interest in environmental friendly building techniques. Magnusson (2018) further argued that eco-villages were favored also due to generally increased interest in this form of habitation and that a definition by the National Board of Housing, Building and Planning in Sweden (Boverket) was a further important factor. The definition included provisions that the villages should include a maximum of 50 households, include small farming lots, include a community house and use little energy. The definition might seem technical, but it gave a "stamp of approval" that legitimized the form and made it easier for founders to approach banks to apply for loans; the definition increased interest in these villages and their legitimacy.

In contrast, some regulations have been actively unfavorable for energy communities. The most cited example is the taxation of wind cooperatives. The Swedish electricity law prevents wind cooperatives from selling electricity directly to their users. This has meant that wind cooperatives have been compelled to find other business models. One of these is to sell all the electricity to the market and pay a dividend to the members, while another is to cooperate with an energy company. The energy company would buy the electricity and sell it back to the members (often at a low price) or, since the members must be customers of the energy company, it could reduce the electricity used and charged for by the equivalent of the members' share of the production by the cooperative. The political discussions have centered on the model in which electricity is sold back to the members. This was made possible by a change in the interpretation of the taxation law, by which it was concluded that the electricity could not be sold at self-cost price to the members. The members should thus be taxed on the difference between the price and the market price (Magnusson and Palm, 2019; Wizelius, 2012).

The changed interpretation was met by substantial criticism, and it was argued that the taxation agency had not considered the capital costs paid by the members when they purchased shares in the production facilities. A parallel was drawn with housing cooperatives, which are a common form of housing in Sweden. Tenants purchase a share in the organization that owns the building and then pay a monthly fee. To be equivalent to the proposed system for wind cooperatives, the tenants would be required to pay the difference between the monthly fee and the market rent for the apartment – clearly an absurd situation (Magnusson and Palm, 2019; Wizelius, 2012).

Magnusson and Palm (2019) found that the changed regulation had minor direct effects, as the Swedish Tax Agency chose not to follow up on the tax returns. However, the taxation debacle has severely changed the prerequisites and citizen trust in long-term policy.

Another example is a change in the taxation of solar PV communities that was proposed in 2015–2016. Before this, producers of electricity from solar power had been exempt from energy taxation when the electricity was used by the producer, which meant that it was never sold to the grid. It was then proposed that facilities over 255 kW should be taxed, which was heavily debated. The regulation was changed, and producers that have installed more than 255 kW in more than one plant receive a reduction in taxation, (paying 0.005 SEK per kWh) (Magnusson and Palm, 2019). It has been proposed that the limit be changed to 500 kW in July 2021 (Government Offices of Sweden, 2021).

In summary, these findings show that it is important to establish long-term policies and that citizens have trust in the system.

Discussion: energy communities at a cross-roads

In this section, I discuss and analyze the findings from the previous sections.

The theoretical concepts of path dependence and obduracy lead us to conclude that previous decisions, investments and standardization create a path along which all future development must travel. In the development of energy systems, and in particular the Swedish energy system which has been examined here, many of the large investments were made before 1950. These investments include investment in hydro power, the establishment of a strong national energy company, the expansion of national electricity grids and the development of municipal energy companies. This led to a well-structured and organizationally mature system in place as early as 1950 and laid the foundation for the development of municipal district heating systems and, later, nuclear power. It gave cheap, universal, standardized and publicly owned or regulated energy systems that laid the foundation for the modernization of Sweden.

Energy systems in Sweden were thus highly centralized, and energy policy, especially up until the 1990s, was focused on large organizations and not on individuals and especially not on cooperatives or similar groupings. It would be a stretch to argue that this was intentional: it was rather a matter of a lack of awareness or thought about alternative ways to organize energy production. The frames and persistent traditions of the actors involved meant that technology and policy were developed along established pathways and the developing alternative movements, which at this time were principally eco-villages, were small, local and did not concern the energy system at a national level.

At the same time, opportunities to enter the electricity market were slim, due to a regulated system and – before the deregulation – the need for new actors to be awarded concessions. To even think of investing in renewable energy as a citizen or citizen group was far-fetched; support structures did not exist, and inspiring examples were not available. The development in Denmark, in contrast, was quite different, and a transition towards a different structure of the energy system took place as early as the 1970s. The restructuring was helped along the way by the first oil crisis, and several GIs were started, along with local energy offices and courses in energy management. These early initiatives mean that when it came to "choosing its path," Denmark gave precedence to renewable energy, rather than nuclear power (Kooij et al., 2018). It was also from these movements that the wind industry developed, sprung out of grassroots and technical tinkering (Ornetzeder and Rohracher, 2013). The debates in Sweden also focused on alternative pathways and considered the importance of future visions and an openness to debate (Kooij et al., 2018), but investments in nuclear power had already been approved and made, and much of the responsibility was put onto municipalities to develop municipal energy plans and oil-reduction plans (Bladh, 2020). The system remained centralized with little involvement from other groups than the actors.

It should also be remembered that these early investments created a system that was well-working, reliable and formed the foundation for the subsequent strong industrial development. The electricity system generated low emissions of greenhouse gases thanks to its extensive use of hydro power and nuclear power, and it produced cheap electricity. It should, of course, be noted that nuclear power had been politically contested for a long time and that this culminated in a referendum in 1980 about the future of nuclear power (Bladh, 2020). Nevertheless, what is to complain about from a citizen's perspective, if energy is cheap, reliant and (relatively) green?

Policy incentives are central here and taxation of CO_2 emissions was a first step in this direction, followed by major policy incentives that stimulated development and investment in renewable energy. These programs, however, focused on corporations and large organizations and not on citizens or cooperatives. The first wind cooperatives were founded at this time, and they managed to find their way through these policy programs and managed to engage interested citizens, but the policies and support structures did not favor them. The organizations needed to find their way themselves, and so quite successfully, considering the rather strong development in the 1990s.

Policies in the subsequent years expanded to focus also on citizens, but there is a vacuum at the level of cooperatives. These may be the only way for residents in rental apartments, who do not have a roof on which to place solar PVs and who are connected to district heating over which they have no control. The threshold to invest in community energy, however, is high, since there are no real economic incentives or a visible structure that supports cooperatives. Homeowners can install solar PVs with economic support and buy a heat pump, and in this case the incentives are clear, so why do anything collectively?

These initiatives must receive a political acknowledgment, if CE is to receive support. The few policy and institutional incentives that have been implemented, as in the case of, for example, eco-villages, have been positive for the development, and with an increasing focus at the EU level, a window of opportunity is opening.

This also goes back to the importance of champions and pioneers in the initiatives, and the major time investments made by these citizens need to be acknowledged and supported. As with the cases of discontinued wind cooperatives, the fact that there might be difficulties finding new champions that carries on. There is an important distinction here, between the members that have bought shares, but are rather passive, and the persons in the board with managerial positions. These organizations, especially wind cooperatives, can be rather complex and time consuming, almost run as companies, but with less economic incentives to take an active role. These persons are crucial and they need support, but they can also help in supporting others. Here umbrella organizations could have an important role, but they are not as strong in Sweden as in other countries.

Conclusions and policy recommendations

This chapter has been argued that the historical development of the Swedish energy system has led to path dependency and obduracy, and that community energy and collective initiatives have never been actively supported. They have often been neglected. Sweden has had strong and active policies to support reductions in greenhouse gas emissions and increases in renewable energy production and has been successful in these goals. It could be argued that this success allows the country to reduce its ambitions and the need for individuals to engage in CE, since the state or municipalities have taken an active role. Further, houseowners can just do it themselves through investing in solar PVs.

I put forward four recommendations to conclude the chapter.

First of all, cooperatives and collective initiatives should be actively acknowledged and supported in policy and regulations. The increased focus on the EU level has increased attention in this field and focusing specific policy measures on collective action could result in more citizens becoming involved in the energy transition. Support structures in the form of economic incentives and support to umbrella organizations as intermediaries could help this development. Decentralized electricity production is needed in Sweden now more than ever, in the face of an increasing shortfall in power supply capacity.

Second, long-term rules and regulations should be put in place, since businesses require these before investing. Several policies, such as the green electricity certificate system, have a long expected time span, which is favorable for all investments in that it makes informed calculations possible. However, on at least two occasions (taxation of wind cooperatives and the 255 kW limit for solar PVs), policy and regulations have been formed with a short perspective, which has led to insecurity and directly and indirectly worked against CE.

Thirdly, support for existing organizational structures and their ability to invest must be looked at. In Sweden, joint property units (samfälligheter) exist in most urban areas, especially for buildings that contain one or two dwellings. These may have responsibility for, for example, roads and common infrastructure. Tenant-owned associations (bostadsrättsförening) are another common form of residential organization. These are all registered organizations with a developed structure with a chairperson, board members and economic rules. This makes the threshold to do something together lower and supporting investments in these organizations may lead to substantial investments in renewable energy production.

Lastly, what can other Baltic Sea Region countries learn from Sweden? An important aspect is for policy makers at the national level to remain open for alternative pathways. The prerequisites for countries, concerning for example geography, resources and economy, obviously shapes the possible pathways, but by keeping the doors open and supporting alternative groups to invest in renewable energy, there might be surprising developments and alternative solutions. There is interest in renewable energy among citizens, but often the thresholds are often too high and other prioritizations in life may take over.

Notes

1 Eco-villages are in this instance defined by a set of criteria, which is also the definition by National Board of Housing, Building and Planning. The criteria's include for example that it should be a small community (maximum 50 dwellings), be involved renewable energy production, energy efficiency measures, have large share of voluntary work and contain a "common house" for social activities.

2 "Ekonomisk förening" in Swedish. The organization is owned by the members, who are not economically liable.

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Part III

Flexibility options for demand-side, social acceptance and community engagement

Case studies

6 From acceptability and acceptance to active behavioral support

Engaging the general public in the transition of the electric energy system in Finland

Matti Kojo, Ilkka Ruostetsaari, Jussi Valta, Pami Aalto and Pertti Järventausta

Introduction

Transition of the electric energy system is a multifaceted sociotechnical challenge. Transition requires "smart" technology and infrastructure, i.e., hardware including metering and photovoltaic cells and software for managing and optimizing millions of assets, while the planning and deployment of transition also entail socio-political dimensions. For instance, renewable energy production needs a policy supported by citizens, siting of wind farms needs to be accepted locally and residents and consumers need to be more flexible in their electricity consumption, for example through home automation. In this chapter, we focus on the social acceptance and acceptability of transition of the electric energy system. Transition of the electric energy system is understood as progress towards future sustainable energy systems, involving more decentralized assets with smart management.

Citizens and consumers are deemed to have a more central role in the future electric energy system which will be more automated or "smarter" and decentralized. This role has been embedded in the EU regulation. Recently EU Directive (2019/944) defined Citizen Energy Communities and more generally emphasized the role of the customer, while the Renewable Energy Directive (2018/2001) defined "prosumers," i.e., individuals and communities entitled to generate, consume, store or sell electricity from renewable energy sources (Antoni and Rodi in this book). The social dimension of the transition is also noted in the national energy policies. For example, the Finnish climate and energy strategy states that "while technological progress may enable energy savings without the consumers taking on an active role, many of the policies require a new type of agency of the citizens in changing living conditions" (MEAE, 2017, p. 97). These remarks call for studying social acceptance and acceptability of the energy transition.

Acceptance of single technologies, for example wind energy, solar power or power lines has been extensively studied (e.g., Leiren et al., 2020; Sütterlin and Siegrist, 2017; Horbaty et al., 2012; Wolsink, 2012) likewise the use of renewable energy technology (e.g., Kardooni et al., 2016). However, we seek to identify those dimensions of social acceptance and acceptability of the transition of the

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whole electric energy system which are potential bottlenecks demanding more attention in policymaking and which are more receptive to new policies (see also Bolwig et al., 2020). We moreover contribute to the conceptual discussion on social acceptance, acceptability and behavioral support.

The objective is to study social acceptability of transition of the electric energy system in Finland. We ask: which measures of the energy transition are currently socially acceptable in Finland? Which measures and sectors may need reconsideration and public engagement in the future? Finland, a Nordic front runner in low-carbon energy transition is used as an example. According to Sovacool (2017, p. 569) the Nordic countries offer a paradigmatic example with their progressive energy and climate policies, longstanding policy goals, binding climate targets and ambition to become entirely or largely "fossil fuel free" or "carbon neutral." However, the Nordic countries are not uniform. The Finnish energy economy is dominated by biomass and forestry products, Finland is an energy net importer, hosts heavy industry and is building new nuclear power units (Sovacool, 2017, p. 569; see Figure 6.1). The major energy utilities, heavy industry and grid operators and their organizations have influenced Finnish climate and energy policies, which have been less reform-oriented (Hildén and Kivimaa, 2020, p. 3, 16). Institutional arrangements have remained relatively stable and decision-making in energy policy has been in the hands of a closed, relatively unchanged "energy elite" for decades (Kainiemi et al., 2020, p. 3). The approach of Finnish energy governance has relied less on individuals' and consumers' activities than has Denmark, for example, making Finland an interesting case study in terms of social acceptance. Already today some of the Finnish energy expert stakeholders concur in assigning a more active role to consumers (Toivanen et al., 2017). Moreover, a green transition coalition – although not internally uniform – has been formed, affecting Finnish climate and energy policy (Haukkala, 2018; Kainiemi et al., 2020; Varho et al., 2016).

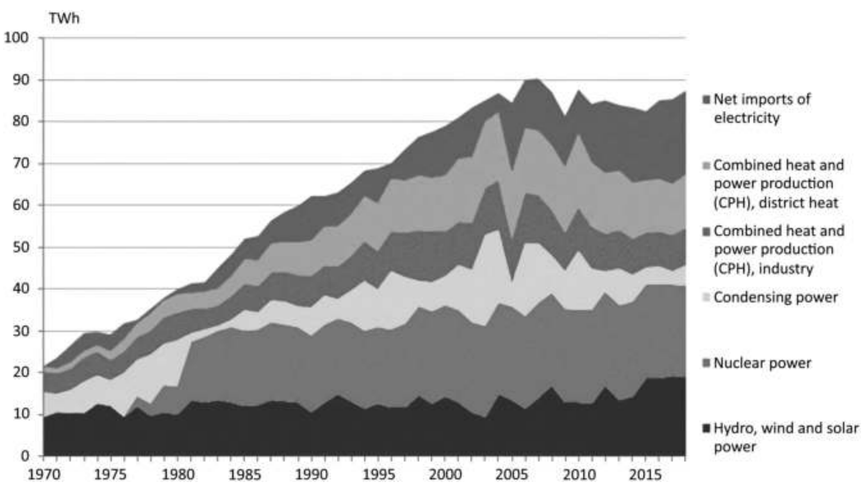

Figure 6.1 Electricity supply in Finland in 1970–2018 (Source: Statistics Finland, 2019).

However, the current prosumer base is rather thin in Finland, although the Energy Authority (2020) recently reported increasing small-scale electricity generation among households. At the end of 2019, solar photovoltaic generation capacity connected to the electricity grid was approximately 198 megawatts and 20 MW off-grid especially in holiday homes. Capacity increased annually by 64%.

In order to affect transition, the prosumer base should be more substantial. According to Kotilainen et al. (2021) prosumer base growth would bring benefits such as a greater number of renewable energy sources and distributed generation and new business opportunities. The main concerns related to mass prosumerism included a perceived threat of out-of-control microgrids that could destabilize the whole electricity system, business challenges to the existing energy sector companies and a potential off-grid movement led by consumers.[1]

In terms of technical conditions for transition, the Finnish electric energy system has some advantages, among them smart metering equipment already installed in almost every household, high share of renewable energy production,[2] distribution automation and IT solutions for network management and an efficient open electricity market as part of the Nordic electricity market (Järventausta et al., 2011). One essential source of empowerment of customers' energy transition participation is the penetration of smart meters in Finland. At present over 99% of customers have a smart meter measuring hourly energy consumption, registering (> 3 min) interruptions and enabling load control facilities under the electricity market legislation (Pöyry Management Consulting, 2017, p. 15). The authority is currently determining the functionality of the next generation of smart meters providing even more accurate and real-time data measurements for the business process and local use (Pahkala et al., 2018). Smart metering can, for example, improve competition in the electricity market by facilitating flexible change of energy retailers and enabling dynamic tariffs. The ample data offered by smart meters can also be used to develop new functions for Smart Grids, for example in low voltage network management and load modeling for more accurate network state estimation and planning purposes (Järventausta, 2015).

From the legislative perspective, for instance, the Clean Energy Package (European Union, 2019a) is not expected to result in extensive legislative reform in Finland, but some issues such as energy communities in the regulatory framework, encouragement of prosumer participation in demand flexibility and acceleration of aggregator services are considered to require either legislative "fine-tuning" or thorough revision (Penttinen et al., 2020).

Finally, it should be remembered that because many people in Finland live in housing associations, these are crucial in decision-making on energy transition and commitment to sustainability at the household level (see Laakso and Lukkarinen in this book).

The structure of the chapter is as follows. In section two, the framework of the study based on the concepts of social acceptance and acceptability is introduced. Section three focuses on method and survey data. Section four has three sub-sections, namely production, network and consumption, which compose the electric energy system. Results noting challenges in each sector with all dimensions of social acceptability are discussed in section five.

Framework: in search of active support from the general public

Public, social acceptance and acceptability have been actively discussed in relation to different (controversial) energy technologies but also energy transition in general (e.g., Järvelä et al., 2020; de Wildt et al., 2019; Lennon et al., 2019; Batel, 2018; Krick, 2018; Devine-Wright et al., 2017; Sütterlin and Siegrist, 2017; Upham et al., 2015; Kasperson and Ram, 2013; Wolsink, 2012; van Alphen et al., 2007). One reason for this interest is the lack of progress in the commercialization of technologies and strategic search for a social mandate for projects. For example, Gupta et al. (2012) note that public opposition to controversial technologies has frequently resulted in negative consequences for their commercialization. These negative consequences have served to emphasize the importance of public acceptance in the strategic development, application and commercialization of technologies. (Gupta et al., 2012, p. 783.)

Lack of progress and public opposition can also be seen to result from biased approaches applied in implementation. Acceptability therefore applies not only to the technology as such but also to its design, planning, implementation and communication (Järvelä et al., 2020). Participatory approaches and understanding of technologies as sociotechnical combinations have emphasized the role of public and stakeholder engagement in planning and decision-making (see e.g., Bergmans et al., 2014; Geels et al., 2016). However, energy transition engagement needs the public to assume a more active and personal role than merely involvement in planning and decision-making, for instance, the acquisition and use of new technology in households, such as heat pumps and solar panels or a decision to change behavior when reducing or giving up private motoring. Therefore, from the perspective of implementing an energy transition it is important to understand when mere attitudinal acceptability and acceptance (i.e., absence of opposition) is enough and when wider support and readiness for change in behavior are also required (Upham et al., 2015; Dreyer et al., 2017; Järvelä et al., 2020). Here we rely on the two-dimensional differentiation of acceptability, acceptance and support by Dreyer et al. (2017) where support, for instance willingness among end-users to adopt an energy application, embodies the behavioral dimension as opposed to mere attitudinal acceptance (see Figure 6.2). The long-term realization of such active support would be an important asset for the implementation of the energy transition, for example in demand response flexibility.

Wüstenhagen, Wolsink and Bürer (2007, p. 2684) note that social acceptance is mentioned frequently in the literature but without clear definitions. The terms (public) acceptance and (public) acceptability have also been used frequently and extensively in relation to technology issues, but they have not been rigorously defined or are used interchangeably. Wüstenhagen, Wolsink and Bürer (2007) contribute to the discussion by distinguishing three dimensions of social

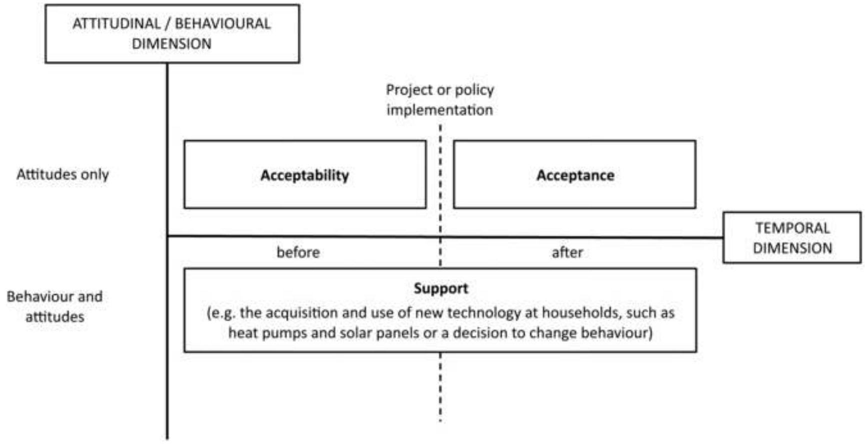

Figure 6.2 Two-dimensional differentiation of acceptability, acceptance and support (Based on Dreyer et al., 2017).

acceptance based on the analysis of renewable energy innovations. The dimensions included in their conceptualization are as follows:

- **Socio-political acceptance**, which is the broadest, most general level. It refers to acceptance of technologies and policies by the public, the key stakeholders and policymakers;
- **Community acceptance,** which refers to the specific acceptance of siting decisions and projects by local stakeholders, particularly residents and local authorities. The focus is on procedural and distributional justice and trust;
- **Market acceptance,** which, in a wider sense, refers not only to consumers, but also to investors and the intra-firm situation. The term has been equated with willingness to pay (Järvelä et al., 2020, p. 6).

Wolsink (2012) also makes a distinction between public and social acceptance. Wolsink (2012, p. 1785) defines public acceptance as "the degree to which a phenomenon is taken by the general public, the degree to which the phenomenon is liked by individual citizens" whereas social acceptance is understood as "the degree of which a phenomenon (e.g., wind power implementation) is taken by relevant social actors, based on the degree how the phenomenon is (dis-)liked by these actors." In Wüstenhagen, Wolsink and Bürer's (2007) definition different dimensions of acceptance refer to different publics, namely stakeholders.

Another distinction in the discussion is made between terms acceptance and acceptability. Wolfe, Bjornstad, Russell and Kerchner discuss technology acceptability and technology acceptance. They define acceptability as "the willingness to consider the technology in question as a viable alternative" (Wolfe et al., 2002, p. 140) whereas acceptance refers to the decision to deploy, i.e., "the formal decision to implement the proposal" (Flynn, 2007, p. 16). As evidence of acceptability Wolfe et al. (2002) see willingness to negotiate about a technology, which may be conditioned by various concerns. Sütterlin and Siegrist (2017) also note excessively positive imageries of new technology and therefore call for a more reliable acceptance rating taking account of drawbacks (concerns) in technology. They state that assessment on the basis of an opinion poll is too abstract as respondents do not think about drawbacks when contemplating from a general perspective. On the other hand, a survey is a cost-effective method for gathering information from a large number of respondents.

We define *social acceptability* as a term subsuming different thematic dimensions (socio-political, community and market) whose priority is subject to constant societal debate and negotiation between the policymakers and other stakeholders including the general public (see e.g., Toivanen et al., 2017). Thus, we adopted the categorization of dimensions from Wüstenhagen, Wolsink and Bürer (2007) but instead of acceptance, which is the term used by Wüstenhagen and colleagues we refer to Wolfe et al. (2002). Moreover, the behavioral dimension in the form of active support is important in the transition to an electric energy system.

Wolfe et al. (2002, p. 140) perceive their approach as a process rather than being outcomes oriented. Acceptability is seen as a continuum, not a dichotomy. Part of the process-like nature of acceptability is that it may vary over time, positively and negatively. Acceptability can therefore be seen as a social process in which actors influence each other through various types of interaction (Huijts et al., 2007, p. 2780).

Method and data

Our data is based on a citizen survey. Although survey as a method for assessing public acceptance was criticized by Sütterlin and Siegrist (2017), the method is important for building a holistic picture regarding people's opinions on energy transition at the national level. The questionnaire was used to elicit the opinions of people in Finland aged 18 to 75 concerning energy policy. A stratified sampling procedure ensured that the sample covered all socio-demographic groups and geographical regions of Finland, excluding the province of Åland. The survey, including one reminder round, was implemented in August-October 2016.[3] Although the response rate was relatively low (33.6), this is not unusual for postal/internet surveys.[4] The large size of the sample (N = 4,000) ensured that the data adequately represent the Finnish population at large (Ruostetsaari, 2020).

However, the data deviates in minor respects from the population at large as reported in a detailed loss analysis by Ruostetsaari (2020). The gender distribution of the data corresponds well to the population, but the youngest cohort of 18–29-year-olds is underrepresented, whereas respondents aged 45–59 and 60–75 are clearly overrepresented. Compared to the Finnish population at large, the highly educated were overrepresented, whereas individuals with only basic education were underrepresented. In terms of educational field, people from the engineering and service branches were somewhat underrepresented. Regarding occupational positions, lower functionaries were underrepresented, whereas managers and upper functionaries, blue-collar workers and pensioners were somewhat overrepresented. Individuals living in detached houses were clearly overrepresented, and those living in apartment buildings were underrepresented. Also, people living in small municipalities were somewhat overrepresented, while those living in large municipalities were underrepresented. However, the respondents represented the various regions of Finland (provinces) with an even distribution. Due to these minor deviations, it could have been expected that the respondents were more interested than the general population in energy issues. However, this does not appear to have been the case. For instance, 48% of our survey respondents had never changed their electricity supplier, which is almost the same proportion (50%) as that reported by another survey conducted among the general population (TNS Energiabarometri Q1, 2016). Because our data represents the Finnish population at large relatively well, the data was not weighted in our analyses.

There are also some other recent surveys on attitudes to energy policy in Finland. However, these surveys were focused on households' willingness to participate in demand response and energy-saving behaviors (Ruokamo et al., 2018; Ruokamo et al., 2019; Umit et al., 2019). Moreover, Finnish Energy (2019) publishes survey results on Finnish energy attitudes annually.

In this chapter the electric energy system is seen as a combination of production, network and consumption (see Table 6.1). Each element of the electric

Table 6.1 Social acceptability of electric energy system in Finland

	Components of electric energy system		
Dimension of social acceptance	*Production*	*Network*	*Consumption*
Socio-political – acceptance of technologies and policies	Finland will shift to entirely renewable energy production forms by 2030.	I am ready to pay higher transfer payments to the distribution companies than today if power outages in my household become less frequent.	Personal emission quotas should be deployed.
Community – acceptance of siting decisions and projects	I accept building of wind power in the vicinity of my home.	I am satisfied with the current reliability of electricity supply at my household.	My home municipality will be climate neutral by 2030.
Market – the process of market adoption of an innovation	I am ready to shift to dynamic pricing in which my electricity bill is based on hourly market prices.	I am ready to hand over the control of some electricity intensive equipment to the service provider against reimbursement.	I prefer using renewable energy in my household.

energy system is assessed from the viewpoint of three dimensions of social acceptability (socio-political, community and market). For example, on the socio-political dimension of production, respondents were asked to react to the statement "Finland will shift to entirely renewable energy production forms by 2030." The five response options were as follows: I totally agree, I somewhat agree, I somewhat disagree, I totally disagree and I cannot say. In order to ascertain the differences between various population groups we focus on themes for which there is a statistical dependence (Pearson chi-square < 0.05) between background variables and the statements. The effect of background variables on the endorsement of statements was tested statistically ($\chi 2$ test) but in the interests of a concise presentation the results of tests are not presented in terms of every single background variable and statement. Comparison between various population groups helps to create an overall picture of people's opinions on energy transition and their own role in it. Although Finnish energy governance has not been based on the activity of individuals and consumers, it is vital to explore this potential as well, as the development of decentralized energy system and forthcoming emission reduction targets will necessitate the introduction of new measures calling for more active energy citizenship (Kotilainen, 2020; Ruostetsaari, 2020).

Results

Socio-political dimension

As regards the socio-political dimension, the statement concerning production was as follows: "Finland will shift to entirely renewable energy production forms by 2030." and 42% of all respondents agreed with the statement whereas 46% disagreed (see Figure 6.3). Men were more opposed to this aim than women as only 38% of men agreed and more than half (55%) disagreed. In terms of age, the respondents aged 18 to 29 were most frequently in favor of the shift towards renewables (50% of the age group agreed) whereas the age group from 45 to 59 was most skeptical towards the shift to renewables (51% disagreed). Regarding educational background, those with university education most frequently supported the shift to renewables. However, the most enthusiastic supporters of the shift were those with no vocational education at all as 16% of them totally agreed with the statement compared to 10% of the respondents with university education, who were the second most enthusiastic supporters.

In terms of field of vocational education, the respondents with educational background in the humanities or arts were most frequently in favor of renewables (62% agreed), likewise the majority of respondents with education in pedagogics (52%) and social sciences (50%) whereas, for example among those with education in engineering 36% agreed. Respondents with education in natural sciences disagreed (51%) most frequently. Political affiliation was also related to respondents' opinions.[5] Supporters of the Greens (75%) and the Left Alliance (54%) most frequently agreed with the shift towards renewables. A clear majority of the supporters of the right-wing populist political party, the Finns Party (61%)

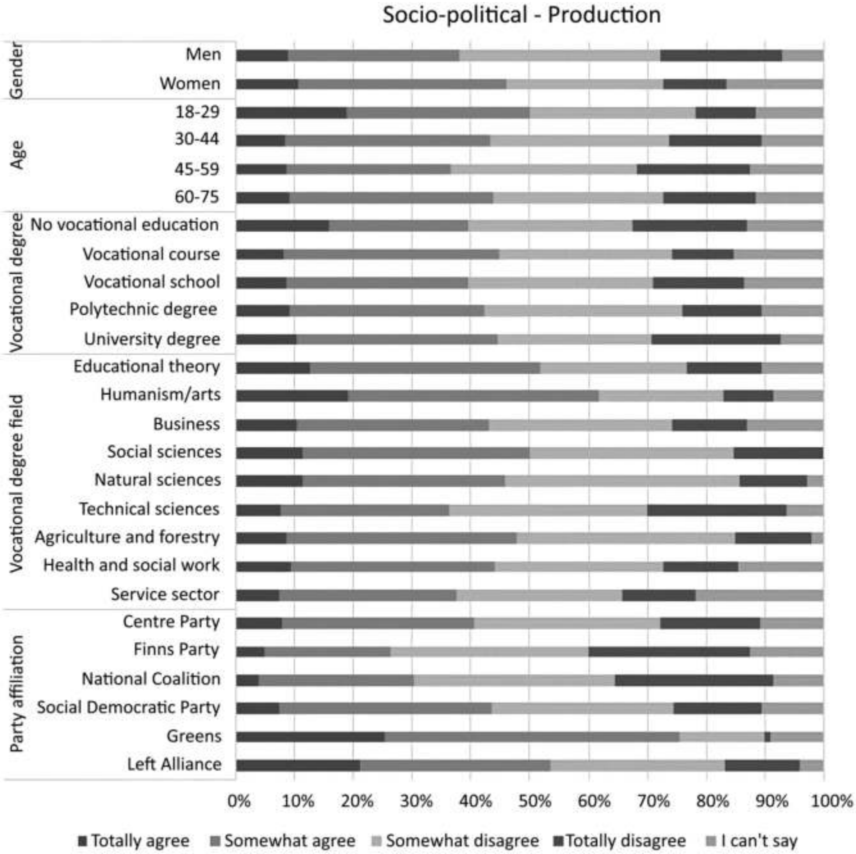

Figure 6.3 Respondents' attitudes on the statement "Finland will shift to entirely renewable energy production forms by 2030."

and the National Coalition Party (the conservatives) (61%) disagreed with the statement. Almost one out of three of them was totally against them.

As regards the socio-political dimension, the statement concerning the network reads as follows: "I'm ready to pay higher transfer payments to the distribution companies than today if power outages in my household become less frequent." The respondents clearly rejected this statement. Only 12% agreed whereas 80% disagreed (see Figure 6.4). Furthermore, it should be noted that 50% of respondents disagreed totally. Women and men had very similar views on higher payments. Although the share of undecided respondents was higher among women (12%) than men (5%). In terms of age those aged 18 to 29 were most willing to pay higher transfer payments. The older age groups were less eager to pay. According to another survey 28% of respondents in Finland agreed and 66% disagreed with the statement "I'm willing to pay more for electricity than today to avoid power outages" (Pitkänen and Westinen, 2017, p. 13). The

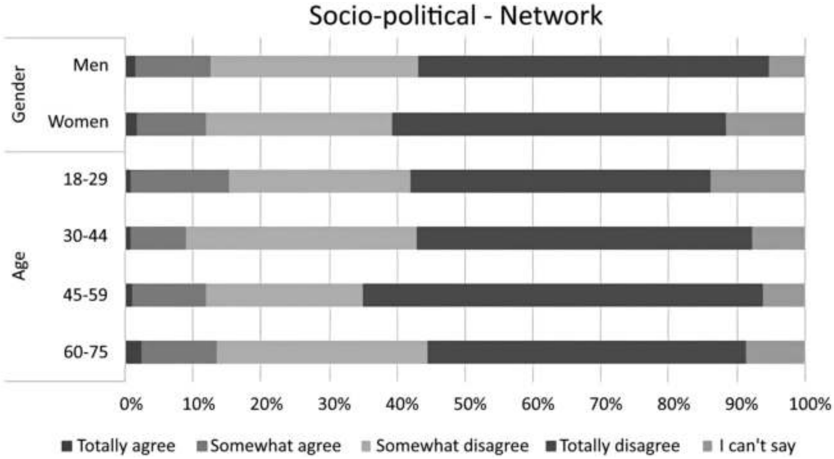

Figure 6.4 Respondents' attitudes to the statement concerning willingness to pay more for power transfer.

average interruption duration in disturbances in Finland is at present at a level of 1–1.5 hours (h/customer, year), excluding years of extreme weather conditions.[6]

The statement concerning consumption on the socio-political dimension stated that "Personal emission quotas should be deployed." This was also rejected by the majority of respondents (62%) (see Figure 6.5). One out of five (21%) reported support for personal emissions quotas. Men were more critical than women. Of women almost one in four (23%) agreed whereas less than one in five (19%) men agreed. 70% of men disagreed (40% disagreed totally) whereas 52% of women disagreed.

Deployment of personal emission quotas was most frequently supported by respondents educated in the humanities and arts (38% agreed) whereas respondents having educational background in engineering (74%) and agriculture and forestry (70%) disagreed most frequently.

In terms of political affiliation, supporters of the Greens (43%), the Left Alliance (30%) and the Social Democratic Party (25%) were most often in favor of personal emission quotas, whereas supporters of the Finns Party (71%) and the National Coalition Party (71%) most clearly disagreed with the statement on personal emission quotas.

Community dimension

According to our survey, 71% of respondents were in favor of increasing the share of wind power production, but if production were to be located in the vicinity of the respondents' homes, the acceptance decreased. However, support for wind power was still fairly high as 48% agreed and 45% disagreed with the statement (see Figure 6.6). Women were more tolerant than men. In terms of age groups, the

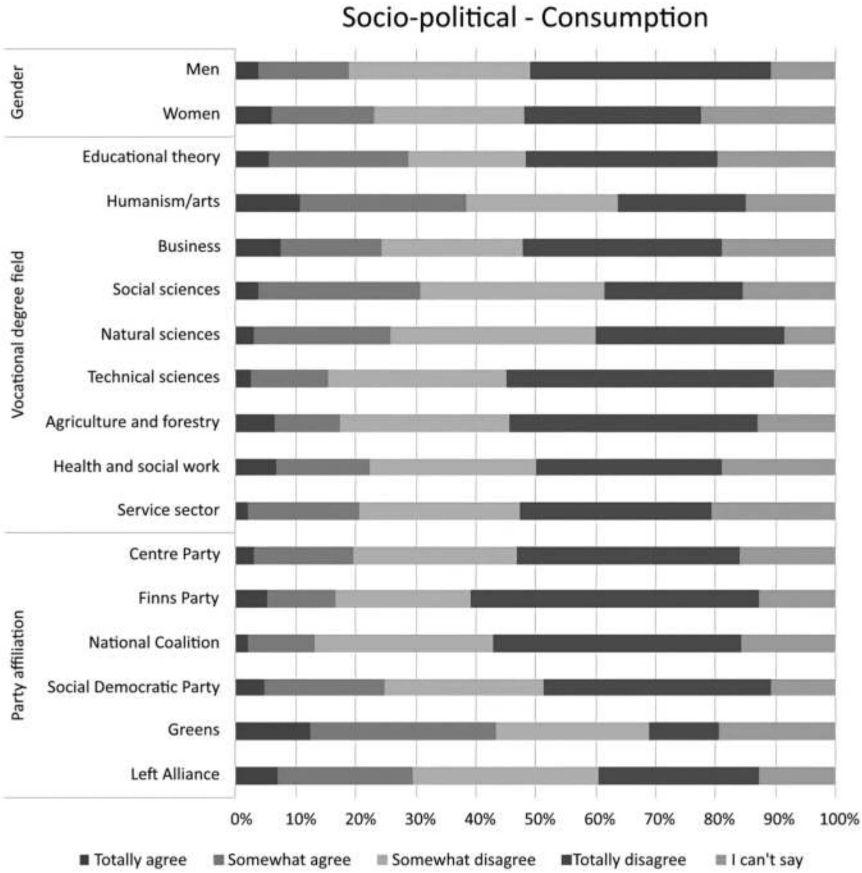

Figure 6.5 Respondents' attitudes on the statement "Personal emission quotas should be deployed."

youngest generation, i.e., those aged 18 to 29, were the most tolerant of building wind power in the vicinity of their homes. The support for wind power decreased in the older age groups. In terms of political affiliation, supporters of the Greens (70% agreed and 25% disagreed) and the Left Alliance were most frequently in favor of building wind power. At the other extreme were supporters of the Finns Party (40% agreed and 55% disagreed).

The respondents were very satisfied with the reliability of electricity supply as more than nine out of ten (91%) agreed with the statement "I'm satisfied with the current reliability of electricity supply to my household." In terms of age groups, the oldest group, i.e., those aged 60 to 75, were most frequently satisfied (94% agreed) (see Figure 6.7). Most dissatisfied were the respondents aged 30 to 44, but of these, too, 87% agreed and only 12% disagreed. Presumably the respondent's place of residence influenced opinions because the quality of electricity supply

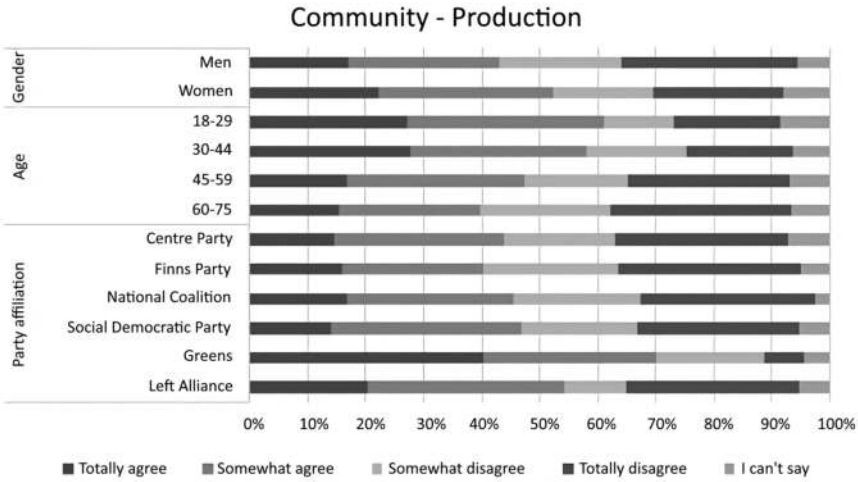

Figure 6.6 Respondents' attitudes on the statement "I accept building of wind power in the vicinity of my home."

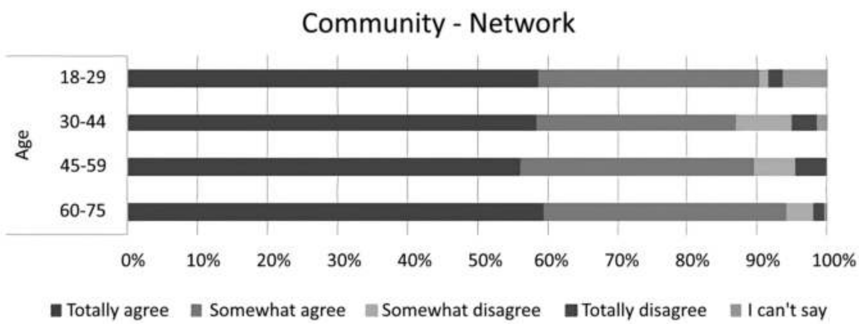

Figure 6.7 Results of the survey on satisfaction with the current reliability of electricity supply at households.

in conurbations is better than in sparsely populated areas. The high satisfaction rates are also an explanation for unwillingness to pay more for transfer to the distribution companies for less frequent power outages in households.

The respondents gave only some support to achieving climate neutrality in their home municipalities by 2030 as 47% disagreed and 24% agreed with the statement on this. (see Figure 6.8). The fairly large share of undecided respondents (30%) may reflect the novelty of the issue at the time of the survey. Men were more critical of this aim than women, and women (36%) were more often undecided than men (24%). In terms of age groups, the youngest (50%), i.e., those aged 18 to 29 and the oldest (51%), aged from 60 to 75, supported climate neutrality most frequently. 20% of the youngest and 22% of the oldest disagreed

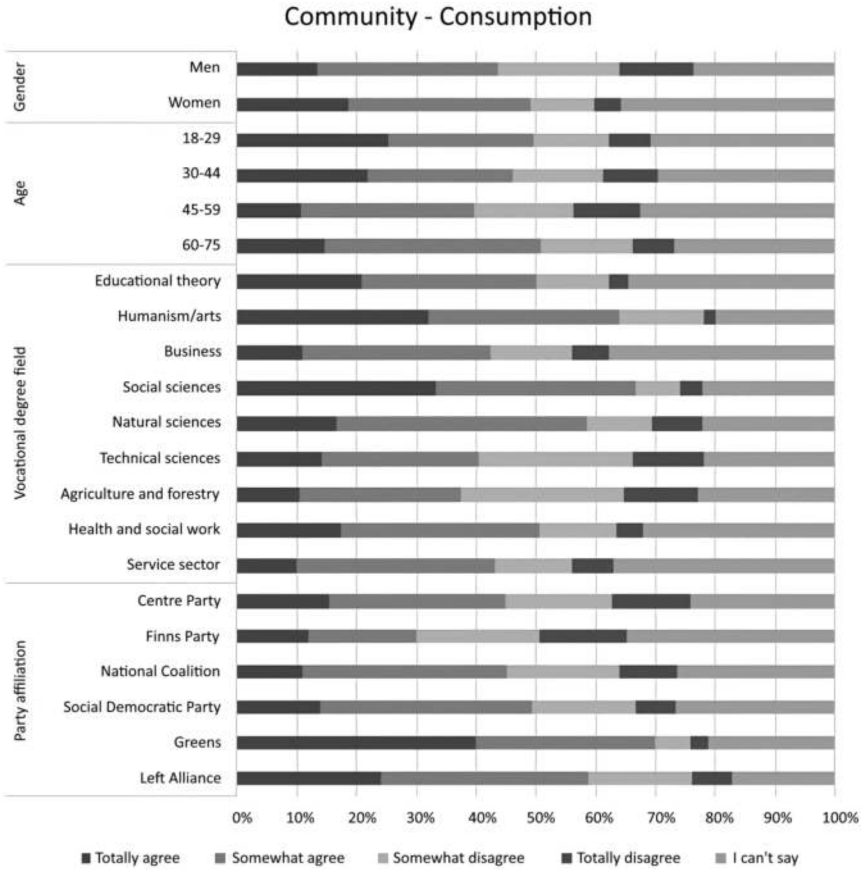

Figure 6.8 Respondents' attitudes on the statement "My home municipality will be climate neutral by 2030."

with the statement. In terms of field of education, those respondents having education in social sciences (67%) and the humanities and arts (64%) were most frequently in favor of being climate-neutral by 2030, whereas respondents with education in agriculture and forestry (40%) most often disagreed with this aim.[7] Supporters of the Greens (70%) and the Left Alliance (59%) were clearly in favor, whereas supporters of the Finns Party (35%), the Centre Party (31%) and the National Coalition Party (28%) were most often against this statement.

Market dimension

As regards the market sector, the statement concerning production was as follows: "I'm ready to shift to dynamic pricing in which my electricity bill is based on hourly market prices" (see Figure 6.9). The respondents were rather skeptical

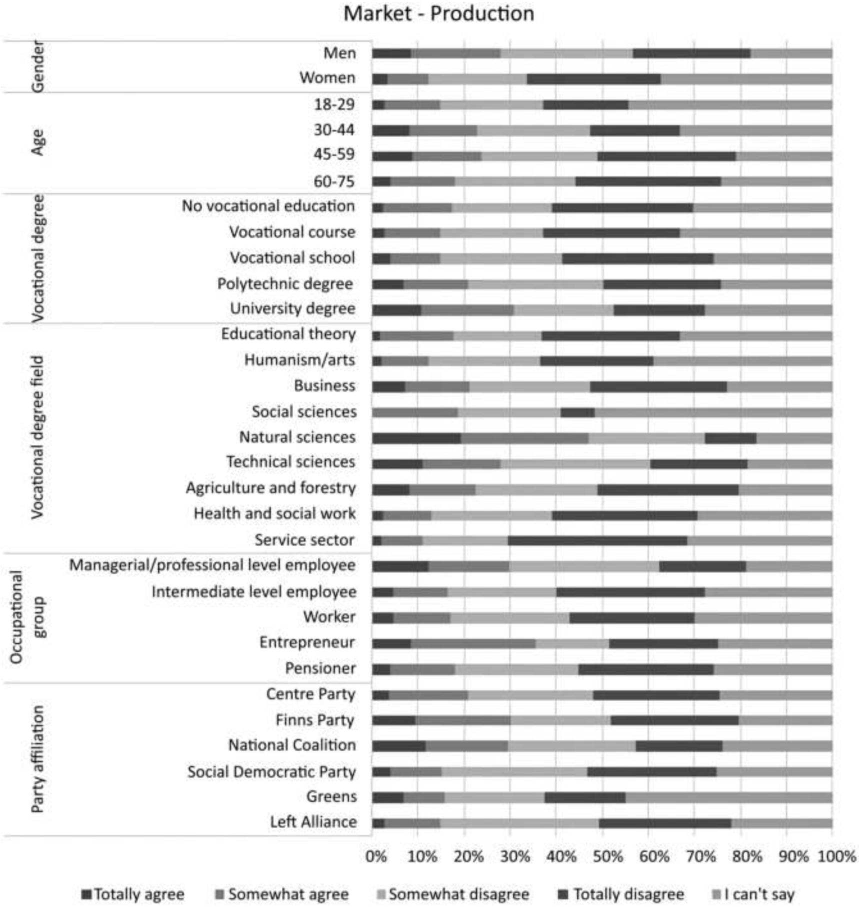

Figure 6.9 Respondents' attitudes to the statement "I'm ready to shift to dynamic pricing in which my electricity bill is based on hourly market prices."

towards shifting to dynamic pricing as 53% of the respondents disagreed and only 20% agreed with the statement. Over a quarter of respondents were undecided about it.

More men (28%) agreed with the statement than women (12%). Women were also much more uncertain as 37% of them could not state their opinion. In terms of age, the oldest group (age 60–75) was most skeptical towards shifting to dynamic pricing: 58% of them disagreed with the statement and only 18% were ready to shift to dynamic pricing. Younger age groups were more tolerant since almost every fourth of the age groups from 30–44 and 45–59 agreed with the statement. Yet the majority of them also rejected the statement. When looking at the education of the respondents those with a university degree were the most supportive of a shift to dynamic pricing in their electricity bills. 31% agreed and

41% disagreed with the statement as the corresponding numbers for respondents with short vocational education were 15% and 59%. In addition, respondents with educational background in engineering or natural sciences were most frequently in favor of the statement. Up to 47% and 28% of them supported the statement when the corresponding figures for other respondents were decidedly lower. Managerial and professional employees stood out as the most supportive and pensioners as the most disapproving respondents regarding the statement. 30% of the supporters of the National Coalition Party and the Finns Party agreed and slightly less than half of them disagreed with the statement. Instead, the supporters of the Social Democratic Party and the Left Alliance rejected the statement most frequently as approximately 60% of them opposed the statement.

Moreover, on the network dimension the statement was "I'm ready to hand over control of some electricity intensive equipment to the service provider for reimbursement" (see Figure 6.10). Typically, this could be, for example, a water heater or comfort underfloor heating. This statement was strongly rejected by the respondents since 71% of them disagreed and only 29% agreed with it. The youngest age group, from 18–29, was most favorable towards handing over control of some electricity intensive equipment as 35% of them agreed with the statement. Most unwilling to hand over control was the oldest age group, of whom 35% totally disagreed with the statement. Again, managerial and professional employees were the most supportive respondents and pensioners the most disapproving respondents. 76% of the pensioners rejected and 24% supported the statement while 65% of the managerial and professional employees rejected and 35% supported the statement. The responses to these two abovementioned statements may also reflect a more general attitude towards market-based policy measures.

As regards the last dimension of social acceptance, consumption, the statement was as follows: "I favour the use of renewable energy in my household" (see

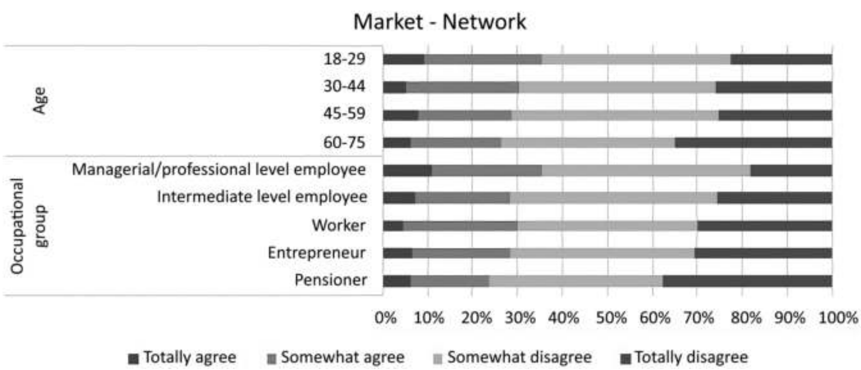

Figure 6.10 Respondents' attitudes on the statement "I'm ready to hand over the control of some electricity intensive equipment to the service provider for reimbursement."

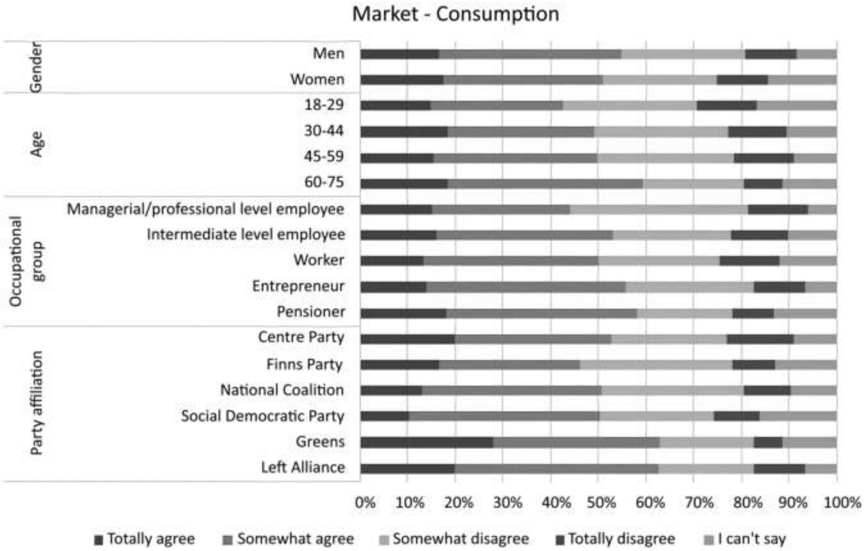

Figure 6.11 Respondents' attitudes on the use of renewable energy in their household.

Figure 6.11). This statement was more frequently supported by respondents than the market sector statements concerning production and network. Over 50% of all respondents agreed with this statement and slightly more than a third of them disagreed with the statement. The share of those who were undecided was 12%. In terms of gender the views were quite similar, but men appeared to be slightly more frequently in agreement with the statement. The majority of all age groups agreed with the statement yet the oldest age group, those aged 60–75, was the most supportive. 59% of them favored the use of renewable energy in their households leaving only 29% of them to disagree with the statement. Pensioners were the most supportive occupational respondent group regarding this statement as 58% of them agreed and 29% disagreed with the statement.

Supporters of the Greens and the Left Alliance favored the use of renewable energy in their households most. The least supportive of this statement were the supporters of the Finns Party, the National Coalition Party and the Centre Party of Finland.

Discussion

The objective of the chapter was to study the social acceptability of the transition of the electric energy system in Finland. Conceptually the study relies on a two-dimensional differentiation of acceptability, acceptance and support where support embodies the behavioral dimension as opposed to mere attitudinal acceptance (see Dreyer et al., 2017; see Figure 6.1). The long-term realization of such active support would be an important asset for the implementation of the energy transition although the economic control of electricity use at household level is thought to be increasingly based on automation. Implementation of support can be monitored and scrutinized if there are statistics available on the subject. For instance, how many households have switched to dynamic pricing in electricity billing.

Social acceptability was ascertained by focusing on three dimensions of acceptability, namely the socio-political, community and market dimensions of the electric energy system, consisting of production, network and consumption sectors (see Table 6.1). On the basis of the survey each sector faces challenges on all dimensions of acceptability, which also stresses the importance of public communication and engagement in energy transition.

Earlier Bolwig et al. (2020, p. 11) noted that low social acceptance of two key technologies (onshore wind power and electricity transmission lines) "have important system-wide effects, notably distributional effects regarding electricity prices and revenues, effects on the installed capacity of different RE technologies and effects on the consumer costs of electricity" in the Nordic-Baltic energy region.

Our respondents' opinions regarding production were somewhat divided on all dimensions. At the policy level 42% of respondents supported the shift to entirely renewable energy production by 2030, but 46% disagreed with the statement.[8] It should be noted that electricity production in Finland is currently heavily dependent on nuclear power and in recent years increasing nuclear power generation has received support in surveys (Finnish Energy, 2019). Two new nuclear reactors with an expected operational lifetime of 60 years are under construction. Prematurely phasing out nuclear power production would entail costs, which were not mentioned in the statement. On the community dimension of production almost half of the respondents were willing to accept building wind power in the vicinity of their homes. Another challenge on the production side seems to be the adoption of dynamic pricing for households, i.e., a bill based on hourly market prices. More than half of respondents disagreed with this, but the share of those undecided was fairly high (27%). However, this is somewhat in line with earlier reports (Fell et al., 2015). Similar to home automation, dynamic pricing was also supported. According to Eurelectric (2017, p. 4) approximately 10% of Finnish customers had chosen this tariff (i.e., about 340,000 customers).[9] Thus, despite the Finnish legacy of centralized electricity production (see Varho et al., 2016) there are consumers who are potentially interested in being front runners in energy transition at the level of households, which also underlines the importance of both behavioral and attitudinal support instead of mere favorable attitude to the transition to an electric energy system.

The network sector seems to face challenges in both socio-political and market dimensions. The respondents are not willing to pay more for electricity transfer even if they would benefit by having less frequent power outages. Rising transfer payments have faced a lot of public criticism and media attention since 2013, when the new Electricity Market Act came into force. The Act required the construction of a weather-proof electricity distribution network which should be available to all customers within a certain period of time to ensure continuity of supply. More recently the debate and policy measures have focused on the rationalization of transfer payments and success of regulation. The goal is also recorded in the current government program. In this sense, the lack of support for higher payments is no surprise.

However, this could open up an opportunity for the development of individual and collective self-consumption and even microgrids, particularly if such projects were perceived as locally driven (von Wirth et al., 2018). The desire to avoid higher transfer payments may also increase public interest in investments in decentralized electricity production systems at the level of households. At the same time, home automation needed for the development of demand response flexibility in households seemed to be a less attractive option for the majority of respondents even if reimbursement were offered. The advantages of large-scale deployment of home automation for the future electric energy system are perhaps still rather unfamiliar to the general public. Data protection issues were not measured in this survey but may explain the result at least in part (de Wildt et al., 2019). It should be noted that the majority (91%) of the respondents stated that they were satisfied with the current reliability of electricity supply. Thus, interest in the development of the network is lacking among the general public. In terms of policymaking this means that the pressure to invest in building underground cabling for improved electricity distribution in the event of disturbances is not currently high. However, Lienert et al. (2015) note that acceptance of grid expansion is higher in the context of energy transition and that different types of expansions should be distinguished. Also, it remains to be seen how consumers react to the capacity-based network tariffs which are currently being introduced in Finland. At present three Finnish Distribution System Operators (DSO) have started to apply tariffs that include a demand charge, in addition to fixed and volumetric charges to some of their small customers. One DSO operates in the metropolitan area. It is likely that other DSOs will start to impose similar changes in their pricing in the near future (Lummi et al., 2019).

In the consumption sector respondents supported activities towards climate neutrality in their home municipalities but disagreed with the deployment of personal emission quotas. Thus, when personal commitment is required, the respondents become more reluctant. However, support for the use of renewables in households is high (i.e., 53% of respondents). In practice, the solutions of many households depend on the actors and decisions of the housing associations which manage the apartment buildings (Laakso and Lukkarinen in this volume). On the basis of the respondents' opinions, we share the view that there is potential for developing a decentralized energy system in Finland (Ruostetsaari, 2020). In more general terms, different opinions concerning different aspects of energy transition between population groups indicate potential barriers that may become an acceptability issue. On the other hand, the results also revealed topics where certain population groups have a greater interest in and perhaps even support adopting new energy applications and moving forward in energy transition. Such information on population groups helps to identify potential front runners and on the other hand to focus communication and stakeholder engagement activities on issues that may require more discussion with the affected parties. Therefore, the results show how the level of acceptability and support varies between population groups depending on the topic. This may help to understand how an acceptability issue calls for the identification of case-sensitive "publics" and their concerns in energy transition projects. Differentiation of acceptance among user groups becomes even more central in the case of the Citizen and Renewable Energy Communities that are being introduced in Finland following the EU's new Internal Electricity Market Directive (2019/944) (European Union, 2019b) and Renewable Energy Directive (European Union, 2018/2001). These initiatives require wider community acceptance and engagement than individual choices. On the other hand, a community-owned model has the potential to address many of the issues raised in this study (von Wirth et al., 2018).

Conclusions

Energy transition requires both attitudinal and behavioral support from the general public. Finland has notable technical conditions – such as smart metering equipment installed in almost every household – for energy transition, but as Finnish energy policy, and particularly production, has been based on centralized technical-economic solutions activating and engaging small consumers and individuals can be a blind spot – even an object of hostility regarding new renewable energy actors and policies (Varho et al., 2016, p. 36). In this respect, Finland should look at the policy approaches and measures adopted in other countries. If Finland aims at large-scale electrification of society in order to achieve decarbonization, the smart control of electricity loads in households will require new business and service concepts, automation and active support from individuals and consumers. Smart meters, which are indeed currently available, play an essential role, but Finland will also need more advanced and comprehensive automated systems having open and interoperable interfaces to run the whole flexibility market in almost real-time. More generally, the question is what policy instruments should be introduced to accelerate the energy transition (see Aalto, 2021).

One task to empower customer participation in the electricity market is to incorporate more widely into the national legislation the new Directive (EU) 2019/944 of the European Parliament and of the Council on common rules for the internal market for electricity. The new directive determines energy community as a new actor in the electrical energy market. The concept of energy community may activate customers and prosumers to participate in the electricity market and to offer flexible services. In this, housing associations, which are managed by professional real estate managers, play a key role in Finland. In terms of policy instruments, the development of management concepts and engagement campaigns in energy communities would be needed to raise the awareness of small consumers. Moreover, fixed-term regulatory sandboxes would encourage experimentation and examination of tariffs and incentives in energy communities. Better engagement of households and small consumers would also facilitate cost-efficient sector coupling between the building and transport sectors in the Finnish electricity system. In practice, this could mean, for example, the proliferation of load control and Vehicle-to-Home systems which would be a valuable asset for energy transition based on electrification.

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Notes

1 In developed countries, off-grid solutions are linked to norms of independence, self-sufficiency and environmental friendliness (Hojčková, Sandén and Ahlborg, 2018).
2 Renewable energy sources account for about 40% of energy end-consumption in Finland, the most important forms of renewable energy being bioenergy, hydropower, wind power and ground source heat pumps.
3 Respondents’ address information was purchased from The Population Register Center on 1 July 2016 (Ruostetsaari, 2020).
4 For instance, in a choice experiment survey of demand side flexibility in Finnish households, conducted in October 2016, the response rate was 9.5% (Ruokamo et al., 2018, p. 14). In a survey of Finns’ images of a sustainable energy transition the response rate was 15.3%. Data was collected in 2017 through an online questionnaire using a consumer panel (Vainio et al., 2019, p. 608).
5 Political affiliation of the respondents was inquired as follows: “If parliamentary elections were held now, which political party’s candidate would you vote for?” Response options listed all the political parties represented in Parliament, “I would not vote at all,” “I can’t say” and “I don’t want to disclose.”
6 Looking more closely at winter storms, Janika in 2001 caused interruptions in electricity distribution for over 400,000 customers, storm Tapani (2011) for 300,000 customers and the latest winter storm, Aapeli, in 2019 for 120,000 customers. In these major disturbances customers had interruptions which continued over days or even weeks. (Seppälä and Järventausta, 2019).
7 Those having education in the humanities most often rely on the ability of science to solve the problems of halting climate change (Kiljunen 2019, 65–66).
8 It should be noted that no distinctions between the various forms of renewable energy are made in this statement. Wind, solar and biomass are all sources of renewable energy, but there can be notable differences, for example, in their respective GHG emissions. Therefore, in the context of this chapter no inferences on the acceptability of different forms of renewable energy can be made.
9 By February 2017 spot based pricing was available to residential consumers only in the Nordic, Estonian and Spanish electricity markets (Eurelectric, 2017, p. 3).

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7 Engaging the public for citizen energy production in Norway

Energy narratives, opportunities and barriers for an inclusive energy transition

Karina Standal and Mariëlle Feenstra

Introduction

In recent years there has been an emerging policy attention to how people can engage with energy production, either as prosumers with their own energy production system at home or through participation in community energy systems. The recast Renewable Energy Directive (RED II) is one of the latest examples, which include requirements for EU Member States to provide enabling frameworks for renewable community energy empowering them to participate in the energy market. Further, several countries have provided economic incentives (e.g., Feed-In Tariffs, subsidies and tax schemes) to increase the attractiveness for citizen energy production in the form of prosumerism where decentralised energy production from households (or business sector) are integrated into the grid supply (Standal et al., 2021; Inderberg et al., 2018). Furthermore, the current technological innovation and opportunities for decentralised renewable systems for production and energy storage enable the rise of new collective forms of energy citizenship. These distributed energy systems are viewed as a potential grassroot transformation of national electricity systems (Seyfang et al., 2014; Schleicher-Tappeser, 2012). In this chapter we focus on the linkages between dominating energy narratives and on injustices in the energy system in terms of social and gender difference in engaging citizens in energy producers at household and community level. We place our observations in the context of Norway.

The backdrop of policies and incentives for engaging citizens to become energy producers is the need to accelerate the low-carbon energy transition. Citizens who engage in energy production and storage may be important components in electricity systems as future electrification of society puts new demand on energy production, supply and flexibility. Community energy has also been identified as an important step towards increasing social acceptance of renewable energy resources as it enables trust and influence over processes (Linnerud et al., 2019; Linnerud et al., 2018). RED II's stringent definitions of renewable energy communities, including open democratic participation, proximity, and primary purpose to be environmental, economic or social community benefits rather than financial profits, align well with increasing social acceptance of renewable energy technologies and bottom-up transformation. Promoting citizen energy production

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constitutes a blurring of the consumer-producer distinction and attributed benefits and responsibilities. Achieving a transition that enables the rise of new collective forms of citizen energy production also includes a shift of power within the established electricity system. In this context it is problematic that, as found in research in the Northern countries, energy policies are incorrectly considered neutral by policy makers, neglecting the differential impacts these policies have on socio-economic and cultural groups, including different genders (Clancy and Feenstra, 2019; Standal, Winther and Danielsen, 2018). This policy gap suggests that it is not sufficient to investigate "first-order" questions of whether citizens have formal rights and access to needed resources to become energy producers (see Fraser et al., 2004). To ensure a just energy transition that provides the trust and attractiveness for citizen participation, which is needed for making significant change, we need to also engage with dimensions of gender and other intersecting identities that provide more subtle, but efficient mechanisms of exclusion.

As outlined above, scaling up the low-carbon energy transition with citizen energy production forwards an urgent need to recognise how people can equitably engage in the energy transformation. A sustainable energy system needs to address how to satisfy human needs, ensure social justice and respect environmental limits (Holden, Linnerud and Rygg, 2021). The present research literature has mainly put an emphasis on technical and managerial issues of decentralised energy systems and integration into the centralised grid supply (Olivier, Marulli and Fonteneau, 2017; Parag and Sovacool, 2016), whereas some literature provides insights in motivations for citizens to engage in energy production on household or community level (Inderberg et al., 2020; Palm, 2018; Winther, Westskog and Sæle, 2018; Olkkonen and Grönberg, 2017; Juntunen, 2014) or explored whether citizen-driven distributed systems impact social acceptability (Leiren et al., 2020; Linnerud et al., 2019) and even fewer have explored gender dimensions (Allen et al., 2019; Standal, Talevi and Westskog, 2019; Fraune, 2015) or different actors roles and interactions (Inderberg et al., 2020; Skjølsvold et al., 2018).

As a response to this knowledge gap, we explore from a justice perspective how Norwegian energy narratives reinforce and produce structures of gender and intersectional social differentiation hindering citizen energy production from becoming more mainstream. Norway stands out as an interesting case to investigate as the government and the electricity sector has expressed high ambitions for electrification of society as a main factor in the low-carbon energy transition. Further, Norway seemingly has an abundance of renewable energy resources from hydro- and wind power, making such ambitions technically feasible. Furthermore, the general population in Norway has high material well-being and a high level of gender equality. Through a "narrative approach" and justice theory lens, we explore how institutions (in broad terms) generate and reflect citizen energy production in the general discourse and in regulations and incentives. In this process, we draw on policy and media material, and in-depth interviews with prosumers and representatives from the electricity sector from new and previous research conducted by the authors.

The chapter is structured as follows. In the next section, we present and discuss the core concepts of energy justice that we apply as a justice lens in our analysis. In the following section, we discuss the main narratives of the Norwegian electricity system and what actors and perspectives are recognised as legitimate in the low-carbon energy transition. We pay particular attention to regulations and policies relevant to prosumerism and renewable energy communities. The next section explores the "citizen" narrative based on the lived realities of prosumers experience in Norway (Standal et al., 2021; Standal, Talevi and Westskog, 2019; Standal et al., 2018). We then proceed to discuss how these narratives may be understood in terms of access to types of capital and the larger debates of politics of redistribution and politics of recognition of different groups in society. In our concluding section, we discuss how knowledge on how people can engage in energy production needs to encompass broader than access to resources and formal rights to scale up an energy transition for the people and with the people.

Citizen energy production and the energy justice lens

The quest for a just energy transition is rooted in the energy justice debate. Energy justice is an emerging framework in energy social science that has developed to analyse energy transition and energy policy. Three main tenets of energy justice are articulated as distributional, recognitional and procedural justice (Sovacool and Dworkin, 2015). Energy justice has three functions: (i) conceptual, (ii) analytical framework for energy policy feeding into the use of energy justice and (iii) a decision-making tool to enable a move towards a just energy transition (Sovacool and Dworkin, 2015). The aim of energy justice is to contribute to a just energy transition with a just distribution of rights, recognition of needs and just decision-making within the energy system (Sovacool et al., 2016).

The energy transition takes place within a specific governance context, which has implications for energy justice. The key policy goal of energy transition is decarbonisation: moving from fossil fuels to renewable energy sources and increasing energy efficiency, a goal agreed collectively by EU countries and beyond. The process of decarbonisation requires to pay close attention to distributional justice: in order to prevent unequal distribution of risks, cost-benefit and rights, a key aspect needing attention is monitoring and measuring energy poverty. The second point of attention is an expectation that decentralised self-generation will play a greater role in meeting decarbonisation targets. It is expected that the energy transition will include a policy shift from supply-oriented towards demand-driven energy policy. The EU, for example, envisions an internal energy market where citizens take ownership of the energy transition, benefit from new technologies to reduce their bills and participate actively in the market. In short, it places citizens central to empower households to self-generate, sell or store necessary supplies, participate in citizen energy communities or enter into dynamic price contracts which will allow (and require them) to respond to peaks in (cheaper) renewable energy at any time of the day (Diestelmeier and Hesselman, 2018). This will be made possible by new (smart) technologies and demand-driven policies. With this shift, it thus becomes important to ask who will become the energy providers, who will (chiefly) remain end-users and who will be able to navigate all these new options and invest in relevant technologies (e.g., solar panels, batteries, smart home systems etc.). These questions are also key in considering recognition justice: who may face specific challenges in participating and reaping benefits of the transition fully and how to ensure that a range of interests and needs are represented in decision-making and policy action (McCauley et al., 2013).

This goal of decarbonisation is set within a larger shift in energy systems. A governance shift in energy systems from governments acting as public service providers, in pre-liberalised areas, to governments becoming regulators as markets opened up, to governments becoming facilitators of energy transition and various partnerships of corporate, government and civil society actors. Energy projects are increasingly characterised as public-private-partnerships collaborating in a triple-helix (corporate, government and society). In this context, more actors are entering the energy market pushing the government into the role of broker between the energy sector and consumers. This governance shift challenges procedural justice in the energy sector because with an increase of actors and entanglement of roles and mandates, energy governance becomes less transparent and fair procedures could be at jeopardy (Jenkins et al., 2016). The possibility for procedural justice in governance of the energy transition relies on the governance structure within a country being open to collaborative working strengthened by the legal frameworks and institutions enforcing and implementing such processes. Furthermore, the existence of a well-organised and collaborative civil society and space for stakeholder participation in the energy system relies on recognition of the needs and rights of actors within that system.

The above articulation of the policy and governance context of the energy transition in light of the energy justice framework suggests that several justice issues need close attention here. First, from a perspective of recognition and participatory justice, citizens are vital to the process of energy governance, given the potential for that process to have positive or negative consequences for them. The energy transition might open new ways for citizens to participate in energy governance. This might also be a pathway for marginalised groups to shape energy policy and secure better outcomes (Feenstra and Özerol, 2021; Standal and Feenstra, 2021). Secondly, while placing the consumer as central in policy-making is important, it also risks suggesting that responsibility for the transition is transferred from government to individuals. The consumer is often black-boxed in policy (Ellegård and Palm, 2015), and there are risks associated with the assumption that the end-user derives from a homogenous entity that responds equally to policies and has the same recognition and ability for participation, decision-making and benefits to participate in the energy system and is able to claim the role of an actor in decision-making processes.

With regards to people's agency to take on new roles in the energy transition, we draw on concepts of material and immaterial capital such as financial resources (economic capital), social networks that provide benefits and security (social capital), and skills and knowledge (human capital). We combine this with Bourdieu's (1986) concept of symbolic capital, which means that resources accessible to an individual are based on the recognition the person holds within a socio-cultural context. The power derived from symbolic capital is usually hidden as it is obscured in practices portrayed as natural; produced and legitimised through history or religion (Bourdieu, 1986; see also Ahlborg, 2017). We find symbolic capital relevant to understanding gendered roles and work divisions that are often internalised as socio-cultural norms where activities tied to the "masculine" are assigned a higher economic and social value than "feminine" ones (e.g., domestic work, informal and unskilled labour) existing beyond discourse or argumentation. This gendered division of labour has led to a skewed distribution of resources between men and women and lack of recognition of women as stakeholders in many contexts, including energy-related (Lieu et al., 2020; Standal, Winther and Danielsen, 2018). As a result, women have been disadvantaged in terms of economic, social and symbolic capital (Standal, Winther and Danielsen, 2018).

Methods

In this chapter, we draw on empirical material from previous studies conducted by the authors. In-depth interviews with prosumers in Norway (Standal, Talevi and Westskog, 2019; Standal et al., 2018) and interviews with representatives from the Norwegian energy sector (Standal et al., 2021) are combined with a mapping of media, advertisement, policy and regulatory framework conditions on household and community energy prosuming in Norway. We analyse this material using a "narrative approach" and justice theory to understand how institutions (in broad terms) generate and reflect citizen energy production in the general discourse and framework conditions and the impact for engaging the Norwegian public towards citizen energy production. The energy transition is an emerging field in policy, practice and research with new actors bringing different concepts in their narratives. The understanding and knowledge on energy transition are growing bringing new insights into perspectives of energy actors. Drawing on several studies conducted over time provides the benefit of a holistic and longitudinal overview that capture changes in discourses over time in the public and policy debate on energy transitions. It also provides opportunities to link user perspectives and practices with policy and energy system perspectives. An overview of the data material is listed in Table 7.1.

The dominating system narrative: the blessings of natural resources and cost-efficiency

The dominating energy narratives in Norway focus on the natural resources and cost-efficiency of the system (Standal et al., 2021), resulting in a resounding absence of gender perspectives and social inequality which is observed in many European countries with a neo-liberal background (Feenstra and Clancy, 2020).

Table 7.1 Interviewees information

Informant ID	*Gender*	*Position/Occupation*
S1	M	CEO small-scale RES systems company
S2	M	Financial director small-scale RES power production company
S3	M	CEO Member association for small-scale RES energy production
S4	F	CEO grid company
S5	F	Employee grid company
S6	F	Employee grid company
S7	M	Employee grid company
H1	F	Homemaker
	M	Energy sector
H2	F	Care sector
	M	Consultancy/energy sector
H3	F	Educational sector
	M	Energy sector
H4	F	Artist
	M	Farmer
H5	F	Farmer/educational sector
	M	Farmer
H6	M	Environmental NGO
H7	F	Educational sector
	M	Educational sector
H8	F	Energy sector
H9	F	Retired (prev. educational sector)
	M	Energy sector
H10	F	Nature conservation
	M	Energy sector
H11	F	Energy sector
H12	M	Energy sector
H13	F	Retired (prev. librarian)
	M	Retired (prev. educational sector)
H14	F	Health sector
	M	Sales
	M	ICT

Northern European countries have a long-standing tradition of a free-market economy and non-discrimination rooted in their law, leading to the assumption that formalisation of equal rights will effectively ensure equal outcomes, overlooking social differentiation. From a policy perspective, energy is often attributed to national security and positioned in the technical and economic domain and as a consequence, energy policy has persistently been viewed as gender-neutral domain. However, research identified energy as a "male-domain," meaning that energy policy decision-making and energy-related employment, and even in some cases access to energy, are unequally distributed among men and women to (Feenstra and Clancy, 2020; Lieu et al., 2020; Standal, Winther and Danielsen, 2018).

The main imagery of the Norwegian electricity production and supply centres around Norway's abundance of natural energy resources, hydro and wind, and how the Norwegian electricity system managed in a rational economic way, which provides Norwegian citizens with environmentally friendly and reliable electricity at a fair price. Norway as a nation is almost completely self-sufficient in renewable electricity supply. Hydropower is the main energy resource, both in numbers and historically, and constituted 92% of the energy mix in 2020 (Statistics Norway, 2021a). A significant part of the hydropower is sourced from small-scale plants owned by farmers or landowners with waterfall rights (Standal et al., 2021). From 2016 the Norwegian government signalled onshore wind power as the "new big thing" (GoN, 2016), and the wind power share has gradually increased to about 6.4% alongside a small share of thermal power of 1% (Statistics Norway, 2021a).

The main foundation of the Norwegian Energy Act is to ensure that production, transformation, transmission, sale, distribution and use of energy takes place in a socially rational way. Norway was early in liberalising the electricity sector in 1991 and joined the power exchange marked Nord Pool AS in 1996. Norway has an open electricity market, integrated with the other Nordic countries. Norway often imports power when the price is low at night-time while exporting at daytime when the price is higher (Linnerud et al., 2018). Despite liberalisation, the grid companies are under regulated monopoly and frequently owned by municipalities. The idea of the electricity system as cost-efficient is upheld by the fact that the delivery reliability is high, despite challenging climate conditions, especially during extreme weather events. However such events are unevenly distributed geographically, and Norway has "cold spots" in the electricity network (Wethal, 2020). Though the fluctuations of the electricity prices are duly noted in media in the winter season (freezing of waters and higher demand lead to increased prices), the trust in the electricity system is high, and electricity is a "low interest product" among consumers (Interviews S4–S7). As a continuation of the dominating Norwegian energy narrative, the government has put an emphasis on the electrification of society, particularly the transport sector, in the low-carbon energy transition in Norway (Holden et al., 2020; GoN, 2016).

Social dimension aspects only figure in the dominating narratives in terms of distribution of the wealth deriving from Norwegian energy resources. A striking feature of the Norwegian electricity sector is that the majority of natural energy resources and the supply chain of grid companies are under public sector ownership. According to the Norwegian Water Resources and Energy Directorate (NVE) 90% of the hydropower plants are owned by municipalities and the state (NVE, 2021). A large part of the income of production thus benefits the citizens (Breitschopf, Grave and Bourgault, 2016). This is also highly reflected in the dominating energy narrative where energy resources (hydro, wind and oil) are understood as commons or shared resource. Therefore, oil and hydropower production are subjected to a ground rent (Standal et al., 2021). Norway's ambitions for a low-carbon society relate to the electricity sector almost exclusively in terms of the services it may provide (providing input for electrification of transport) and not the substance of electricity production. Technologies such as solar photovoltaics (PV) and bioenergy, as well as decentralised energy solutions have a minimal role in the energy transition.

In recent years, a highly visible counter-narrative to the hegemonic presentation of Norway's energy system as environmentally friendly and fair has emerged in the increasing opposition to onshore wind power. Environmental degradation of pristine nature with consequences for wildlife, landscape and humans, as well as lack of acknowledgement for the Sami indigenous population rights (in relation to reindeer herding) and lack of trust in the processes of giving concessions has been raised in the opposition (Standal et al., 2021; Leiren et al., 2020; Linnerud et al., 2018). The resistance of the Sami population has included a strong criticism of how national policies overlook issues of local resource management and indigenous livelihoods, of which gender roles often are an important dimension. The value of land has different meanings to different stakeholders, reducing the recognition of those with less power. Further, the interest and needs concerning different social roles (care work in the household) and cultural aspects (Sami livelihood as a bearer of tradition) are not seen as relevant. This has also been found in other studies (e.g., Lieu et al., 2020). Today all wind concessions are halted, pending new legislation and procedures. The arguments above are further underscored by the common claim that onshore wind power development depletes Norway's ownership and control to parts of its natural energy resources due to foreign investment and ownership (Jensen and Aamodt, 2020). Compared to hydropower only 33% of the onshore wind power plants in Norway are under public sector ownership, while 62% are owned by foreign investors (NVE, 2021). In addition, given Norway's self-sufficiency with hydropower, government support for onshore wind power is considered to be subsidisation of other countries in Europe for them to reach their RES targets (Jensen and Aamodt, 2020). As with wind power, Norway's integration with Europe and development of transmission cables for exporting electricity to Europe is faced with significant opposition (ibid).

As shown above, the dominating Norwegian energy narrative does not highlight aspects of social inclusion and how socio-economic, gender and cultural groups have access to participation and decision-making as well as impacts of the energy transition. As mentioned in the introduction of this section, energy policy in Northern European countries with a strong legacy of neo-liberal policies, are considered to be (gender) neutral and benefitting their citizens equally based on the strong non-discriminatory legal framework (Johnson et al., 2020). As an example, research has found that energy poverty exists in Norway, but the issue is not understood as a problem concerning energy and is assumed to be dealt with under other policies (Bredvold, 2020). This poses a problem for the just transition as dominating narratives impact people's opportunities and impacts on the process. As shown in previous research, this assumption of neutrality is false and, as a consequence, hide existing injustices and inequalities in the energy system (Feenstra and Clancy, 2020; Johnson et al., 2020; Standal, Winther and Danielsen, 2018). In terms of activating the public for citizen energy production, the energy narrative has justified (through national policies) an electricity system dominated by traditional actors and constrained other narratives, which have limited the opportunities for citizen energy production.

Framework conditions for prosumers and renewable energy communities

The dominating understanding of Norway's electricity system (environmentally friendly shared resources operated in a cost-efficient and reliable manner) has impacted the framework conditions for citizen actors to engage in the electricity sector as energy producers. Firstly, such framework conditions are not a high policy priority since there is a lack of momentum for change (the electricity supply is already fully self-sufficient in renewable energy) (Jensen and Aamodt, 2020). Further, the lack of focus on social inclusion has enabled policy blindness towards social differentiation (including gender), resulting in "one size fits all" support schemes and regulations (Standal, Talevi and Westskog, 2019). These have consequences for the uptake of renewable energy production in households and communities.

Prosuming constitutes a new frontier in the Norwegian electricity system. Prior to 2010, there were no regulations concerning prosuming in Norway, though some individual customers had informal arrangements with grid companies for integrating their own PV production into the grid supply. In 2010, the Norwegian Water Resources and Energy Directive (NVE) issued light regulations that provided private households with energy production some right as prosumers, but the most influential change was the "plus customer scheme" implemented in 2017 (Inderberg, Tews and Turner, 2018). A "plus customer" is defined as an end-user that consume and produce energy "behind the meter," from which the power put into the grid does not exceed 100 kW at any time (Standal et al., 2021). Participants of the "plus-customer" scheme may use self-consumed electricity free of charge and are exempt from grid tariffs concerning electricity production and self-consumption. The plus customers can also sell their excess production to an electricity supplier without a trading license. It is also possible to be a prosumer from which the power put into the grid ranges between 100 kW and 1 GWh. Such prosumers are subject to pay a regular tariff and a tariff for feeding in electricity (ibid). This scheme has also been helped by the mandatory roll-out of smart meters in Norwegian households (by 2019), which allows two-ways communication on production and consumption with grid operators.

The plus customer scheme has been influential in advancing prosuming among households in Norway, though the number is still much lower than neighbouring countries, Sweden and Denmark (Inderberg et al., 2020). One framework condition barrier discussed in the next section is the related transaction costs for households to engage in prosuming (Standal et al., 2021). The plus customer is responsible for complying with all technical requirements of the installation (often arranged through certified third-party companies). The grid companies are obliged to provide information on needed technical requirements and to facilitate the feed-in of electricity as part of its ordinary services, but there is a variation of practices among the grid companies making this more difficult for the prosumers, especially those that engage local energy communities (Interview S3). Further, the regulation concerning metering is an impediment to establishing energy communities as it excludes joint production facilities. NVE and the government have signalled that a new regulation is in the process to allow households within the same building to establish joint energy production projects (through virtual metering) and inclusion in the plus customer scheme set to start in 2022 (GoN, 2021). However, this might exclude citizen energy production in sparsely populated areas where community energy could provide local growth and hinder depopulation (Standal et al., 2021). The joint metering regulations make certain exemptions for farmer communities with their own low-voltage grid, and there are a few of them scattered in Norway. As presented above, it requires a degree of skills to familiarise with current regulations and possible support schemes. This threshold is perpetuated by the gender gap in the fields of science, technology, engineering and mathematics (STEM) (Standal and Feenstra, 2021; Fraune, 2015).

Another framework condition barrier is the limited opportunities for economic incentives. The most important subsidy scheme for households has been the rights-based national level economic support by the state-owned enterprise Enova.[1] Household prosumers are guaranteed a refund of part of their investment costs (up to 2700 euro) through a standardised digital system, but this scheme is scheduled to end July 2021 as it is only meant to promote developments of new markets. In economic terms, recovery of costs of installations of solar household systems ranges from 10–15 years, because most of the household electricity consumed is not during the sunny parts of the year and because the tariff for selling excess produced electricity to the main grid is low (Standal, Talevi and Westskog, 2019). This excludes households that are not able to pay the up-front costs, and the existing regulations also exclude households that are not self-tenants in semi-detached or detached houses. It is worth noting that community energy is presented as an opportunity for citizens who lack the financial abilities or who live in apartment buildings to join citizen energy (GoN, 2021), but Enova does not operate with support for the category renewable energy communities. Instead, private entities can only apply for support in competition with commercial actors. Further, the projects must guarantee that they will be implemented regardless of whether they receive Enova support, which induces a high burden of responsibility on non-commercial actors. Some municipalities and grid companies have their own short term support schemes, but information is not as easily accessible and standardised as Enova's.

Although Norway has implemented both the plus customer scheme and the EU Energy Market Directive and included them in the newly released revised National budget 2021, renewable energy community, as defined in RED II (art. 2), is not on the policy agenda yet. Since Norway is not an EU member but only part of the European Economic Area (EEA) directives and EU policy does not automatically apply to Norway but depend on individual procedures and negotiations between the EU and the EEA/EFTA for each policy. It can take several years from the EU decision is made until it is included in the EEA agreement. For instance, the Third Energy Package was not included in the EEA agreement until 2017 and adopted by the Norwegian Parliament in April 2018. The RED

II (Directive (EU), 2018/2001) is still under review by the EEA/EFTA. Norway is not part of the EU reporting obligation of National Energy and Climate Plans and makes separate plans for energy and climate (Standal et al., 2021).

There are no regulations that actively prohibit such forms of energy installation, though individualised metering and lack of economic incentives are an important barrier. But, as a consequence of not implementing the RED II yet, there are no plans for implementing an enabling framework (Art. 22) to promote and facilitate the development of renewable energy communities. As a minimum requirement, the RED II enabling framework would ensure that unjustified regulatory and administrative barriers to renewable energy communities are identified and removed; that participation is accessible to all consumers, including those in low-income or vulnerable households and that tools to facilitate access to finance and information are available.[2]

From the electricity sector stakeholder perspective, citizen-driven distributed energy systems in the electricity systems challenge the principle of cost-efficiency and shared responsibility for grid supply (Interviews S1–S7). In the Inderberg et al. (2020) study, all grid company interviewees were concerned with the technical requirements needed to connect prosumers to the grid and ensure phase-frequency stability. Further, the exemption from electricity fees and the extra costs for grid companies for securing integration entails that more costs are transferred to all customers (Standal et al., 2021).[3] A result is that these costs are also shifted to those who do not have the ability to invest in household or community energy production. It also involves a radical conceptual break with the general understanding of solidarity in paying for grid supply (Standal et al., 2018). Several grid companies are, however, implementing their own pilot projects with storage and distributed energy systems to provide flexibility and better load management in their grid area. There are also examples of arrangement between prosumers and grid companies to provide flexibility. Recently, there has been attention towards measures for flexible electricity consumption as seasonal variations and peak-hour demands and new trends in household devices (e.g., electric vehicles) challenge grid capacity. NVE are currently developing a new grid tariff structure that will be capacity-based (NVE, 2019). Consumers that have a high energy consumption at times of peak load will be charged more. The suggestion has been met with opposition from companies selling PV systems for household prosumers as well as housing associations.

The technocratic narrative and shared understanding of electricity manifested in policy and regulations impact who are recognised as legitimate stakeholders. In general, the regulations are made with consumer rights in mind, but without addressing consumer differentiation in terms of gender and social class. The government and NVE thus still sees itself as a regulator and not a facilitator of an energy transition encompassing a range of actors participating on equal terms. There are no strong voices in policy arguing for economic incentives, and the tariff for selling surplus electricity is low. Renewable energy communities could also provide flexibility in the grid system as well as provide opportunities for local growth (grid expansion to rural areas is costly and falls on the commercial sector)

(Standal et al., 2021). Still, the focus is on new grid tariffs and a continuation of the present system that privileges conventional players.

The prosumer narrative: the educated, middle-class environmentalist with technological interest

To fully understand how the dominating energy narrative reinforces and produce structures of gender and intersectional social differentiation, we draw on qualitative studies that have investigated the narratives of citizens who have engaged with energy production, including the interviews drawn on in this chapter (see also Standal, Talevi and Westskog, 2019). The narrative of prosumers in Norway is markedly different than the electricity system imaginary depicted above, where citizens partake as end-consumers and do not step into roles of electricity production and supply. Instead, their narrative depicts citizens who deeply engage with their electricity consumption and technology that enables this engagement; but the narratives also suggest that there are considerable transaction costs that exclude on the basis of economic capital, skills and networks (which are unevenly distributed in terms of class and gender). Further, this narrative reveals the different distribution of needs and interests between women and men in prosumerism.

The high up-front cost has probably been a major barrier for households, and in the Inderberg et al. study (2020), this was given as the main reason for households not investing in becoming prosumers. Further, transaction costs (e.g., handling solar companies, regulatory procedures and grid companies) were seen as another major hurdle, both by prosumers themselves, but also as a reason to not invest in solar PV (Inderberg et al., 2020; Standal, Talevi and Westskog, 2019).

Due to the limited economic incentives and policy commitments, the prosumers themselves have been the main driver for prosuming in Norway (Inderberg et al., 2020). The drivers for becoming prosumers were found to be environmental reasons; the prosumers interviewed wanted to contribute to the energy transition by using solar PV for their electricity consumption and to promote a market for prosumerism (Inderberg et al., 2020; Standal, Talevi and Westskog, 2019). Another main driver to become prosumers in Norway has been technological interest. In the interviews drawn upon in this study, more than half of the households worked in the energy sector (six men and two women) (Standal, Talevi and Westskog, 2019). Becoming prosumers was seen as means to get more experience with the technology out of professional or personal interest. Several of them also had reduced costs from the installation since either their employer had subsidised part of the equipment, or they could handle most of the installation on their own or with help from their network.

These findings correlate well with the dominating narrative of the general prosumer: middle-class, educated, environmentally conscious, techno-savvy person (Standal, Talevi and Westskog, 2019; Strenger, 2014). This imagined prosumer, very often attributed the male gender, was depicted by both the women and men interviewed. As described by a woman informant: "I picture a man, with at least four years education, or maybe self-taught, with an electric car. And politically oriented towards the left" (Interview with woman H9). In terms of gender, the reason given was that men were more interested in technology than women and, therefore, more enthusiastic to participate in the uptake of new domestic energy technology.

But there were also clear gender roles in the energy narratives of the prosumer households. In the Standal, Talevi and Westskog (2019) study, it was almost exclusively men who brought prosuming on the household agenda and who took care of the process concerning finding relevant information and dealing with the necessary vendors, grid companies and etc. Most of the women preferred leaving these tasks to their husbands as "this was his thing" and he had the know-how and technological interest. Several women expressed that they did not feel comfortable or capable of dealing with finding the right information and communicating with suppliers and electricians. A notable exception was women working in the energy sector who had the needed social networks and particular knowledge in the field. In these households, women were the main initiators, and the investment was based on their decision. Despite women being reluctant to participate in the uptake of new energy technology in their homes, decisions to become prosumers were always stated to be taken jointly by the couple in line with Norwegian values of gender equality. Nevertheless, a few women felt they had "given in" to their partner's wish even though they initially had other priorities for the money being spent (Standal, Talevi and Westskog, 2019).

Even after the technology was implemented in the prosumer households interviewed, there were clear gender roles in the tasks performed. All the households interviewed in the study of Standal, Talevi and Westskog (2019) had taken a keener interest in their energy consumption after becoming prosumer and encouraged the other household members to shift their energy consumption to the daytime and days with sunny weather to consume most of the energy they produced (the price for selling excess electricity back to the grid is less than the price for consumption). But, it was mostly men who reported checking on the electricity production and consumption. Women, on the other hand, committed to change their household-chores practices by checking weather forecasts and doing laundry or vacuuming on sunny days to make the most of the energy they produced:

> When I want to put the washing machine on, I check [electricity production] and if we're not producing enough, then I think OK, I'll wait a bit and see if it's sunny later. Or, I generally know if it will be good weather because I check the weather forecast.
>
> (Interview H4)

Women who were more time-flexible during the day (e.g., housewives, retired or living on disability benefits) experienced this adaptation of their household-chores practices to be easier than women working outside the home. Studies find that women do most of the energy-related domestic work also in Western contexts (Standal, Winther and Danielsen, 2018; Bell et al., 2015). This reveals the different distribution of needs and interests between women and men in prosumerism. Women assume a higher burden of responsibility for changing energy practices (time of housework) while they felt less control of the decision-making and technology-implementation process to become prosumers. Despite women not being engaged in the "technicalities" of becoming prosumers, they did identify themselves with being prosumers when engaging with neighbours, friends and colleagues. This identification suggests that prosuming was important to these women.

Research has pointed out that community-driven renewable systems provide opportunities for women, unskilled and different class groups to participate in the energy transition and energy ownership (Standal and Feenstra, 2021). However, due to the lack of policy instruments and current regulations, Norwegian citizens who want to establish energy communities face an even higher threshold of meeting financial, human and social capital than household prosumers. Citizen-driven community energy is still rare in the Norwegian context, with only a few low-voltage grids in farming communities, grid company pilots and housing collectives.

As shown, the citizen narrative depicted above reveals that even though prosuming provide a new energy narrative, the imagined prosumer reveals that the category is limited to men with the right capital and that becoming prosumers produced/reproduced a gendered division of labour in the household where men took care of the process of becoming prosumers, while women carried out most of the work to change their energy practices to optimise the gains of their solar PV investment.

Discussion

As shown above, the dominating narrative of Norway's electricity system and their materialisation in regulations are not well-aligned for a more demand-driven energy transition where there is a shift of power from traditional actors and towards large-scale citizen energy production in households or communities. This may compromise the needed energy transition as grassroots initiatives remain a niche that does not challenge the existing system (Seyfang et al., 2014). The regulators NVE have been preoccupied with removing regulatory barriers, but this is not the same as a policy agenda that promotes citizen energy production for all and address the social dimension of an inclusive energy transition. This is in contrast with the pressing policy concern to expand renewable electricity production (e.g., based on political ambitions of electrification of the transport sector) where onshore wind power was signalled as "a new resource." As an example, enabling onshore wind power-based energy communities before developing large wind power parks in nature landscapes could have increased social acceptance of renewables.

Exploring the energy narratives of the Norwegian electricity system reveals that there is a lack of momentum for citizen energy production, as well as addressing people's access and ability to participate in such a grassroot transition. Alternative narratives are marginalised due to the existence of abundant fully renewable electricity supply and the ideology of a cost-efficient rational energy system. When viewed through a justice lens, it becomes clear that there is a social differentiation in access to capital in terms of participating on equitable terms in the energy transition as a household or community energy producer. This relates to the politics of distribution (where certain men have more access to necessary material and immaterial capital). As shown, the problem becomes apparent in material and immaterial capital needed for engaging citizen energy production as such capital is unevenly produced. Further, women are underrepresented in STEM education and occupations in Norway (Statistics Norway, 2021b) and thus lack the human and social capital that have characterised the pioneers of Norwegian prosumers (Inderberg et al., 2020; Standal, Talevi and Westskog, 2019). As decarbonisation will entail a future increasingly reliant on new technological innovations and automatisation in the household sphere, there is a risk of increased social differentiation, including class, gender, age, as some have more capital to adapt to such a context. However, economic, human and social capital is not equally distributed among men either. In general, underrepresented groups are facing obstacles (e.g., financial capital, language barriers and housing types) to participate in the energy transition. This is perpetuated by the fact that energy communities often do not know how to approach marginalised groups in society, too (Guyet, Hanke and Feenstra, 2021).

Where the previous paragraphs demonstrate distributional and procedural injustices hindering participation of new prosumers in the Norwegian energy system, also recognitional injustices are observed (where women and marginalised groups' interest and needs are not recognised on equitable terms). Misrecognition can be understood as devaluation of certain activities based on (androcentric) norms and how this plays out in maldistribution:

> To be misrecognized, accordingly, is not simply to be thought ill of, looked down upon or devalued in others' attitudes, beliefs or representations. It is rather to be denied the status of a full partner in social interaction, as a consequence of institutionalized patterns of cultural value that constitute one as comparatively unworthy of respect or esteem.
>
> Fraser (2000, p. 113)

An important contribution of this chapter is also to show how inequalities concerning access to energy resources need to be understood in intersection with culture and discourse (Fraser, 2000). As demonstrated, women's lack of symbolic capital entailed that they did not see themselves confident to fully participate as prosumers. Those women among our respondents that took the initiative in their households to become prosumers were employed in the energy sector, hence feeling more capable to make energy-related decisions.

A more gender balanced employment in the energy sector (and STEM education) would likely have significance in women being recognised as legitimate and competent in all aspects of becoming a prosumer. However, as this chapter suggests, the subtle mechanisms of exclusion also matter, as prosumerism is unlikely to become mainstream if it only appeals to those that are understood as technically competent (e.g., Strenger, 2014). To overcome such "subordination," there is a need for increased recognition of underrepresented groups in society and a redistribution of power in the electricity system for other actors such as communities or households. A potential step would be to link energy policy more closely to other policy areas such as gender equality and preserving Sami livelihoods (in conjunction with the value of Indigenous knowledge and practices in addressing climate change issue).

Another potential step would be to secure framework conditions that promote the development of business models that lower the threshold for engaging in citizen energy production. In recent years, a few PV companies in Norway have developed business models that facilitate the entire process of becoming a household prosumer, which to some extent has been an intermediating factor in increasing the number of prosumers (Inderberg et al., 2020). Still, these companies are clustered around city areas and require high up-front costs and are thus only available to middle- or upper-class families who reside in urban areas. As a result, it is evident that without a justice perspective on the policy arena to provide an enabling framework, legal support and financial resources to overcome unequal access to citizen energy production, the participation level (including currently underrepresented groups) will not change (Guyet, Hanke and Feenstra, 2021). European policy, like RED II, stimulates local energy initiatives to contribute to just transitions and access to clean energy for all Europeans. However, as demonstrated in the Norwegian profile, if the national government is not obliged to report the process of implementation to the European Commission, the progress of creating and enforcing a policy agenda might be slow.

Conclusion

This chapter contributes to deepening the understanding of prosumers as emerging actors in the energy transition by demonstrating the narratives of the Norwegian electricity system and identifying the obstacles and opportunities for women and men to become prosumer. We engaged with the energy justice literature and explained inequalities in the light of capital approaches. Norway provides a distinct context concerning engaging citizens as energy producers. There is a strong emphasis on the reliable, cost-efficient energy system, and the momentum for change is weak since the energy production and supply is almost entirely renewable, cost efficient, and the dividend is distributed to the population. Increasing the share of prosumers and renewable energy communities is therefore almost absent among the public and the policy agenda. Since Norway is not an EU member, RED II is also not being transposed or implemented in line with the EU Member States. The result is that citizen energy production constitutes a "niche" market in the electricity system. Since there are no real economic incentives and the transaction costs are high for citizens, it requires a high degree of economic, human and social capital of individuals to engage with prosumerism. In sum, the outcome is that though there is a growing interest in distributed energy systems among traditional electricity sector actors (e.g., grid companies) or "big players" such as property owners, the scale-up grassroot citizen energy production is going slow (Standal et al., 2021). When looking beyond the material structural factors that limit the access to become energy producers, we find more finetuned nuances where certain groups of people are inhibited from full participation. This misrecognition in energy participation has roots in cultural norms that value certain activities and attributed identities over others. Even though the Nordic countries are considered having high gender equality in society, this Norwegian case study observed gender inequalities in engaging in prosumerism and the uptake of domestic renewable energy technologies due to social gender roles and relations that result in social differentiation in access to relevant human, social and symbolic capital. This is revealed in the perceived "lack of interest for technology" attributed to women and the produced lack of self-confidence to be knowledgeable enough to participate in the uptake of new energy technology. However, more empirical research is needed to analyse whether all underrepresented groups are experiencing the same challenges and whether these gendered differences are decreasing as policies, regulations and commercial actors take a more facilitating role towards citizen energy production. Insights in how policy interventions can facilitate and stimulate participation in renewable energy initiatives could contribute to furthering just transitions.

Notes

1 In 2019, Enova provided of 5.6 billion NOK (520 million euro) to energy and climate projects (Standal et al. 2021).
2 Article 22 (4) of RED II includes several more requirements. For more information see Standal et al. (2021, p. 9).
3 In Norway, households are both customers to grid companies (under regulated monopoly) and power production companies and they pay both for the use of the transmission grid and for the amount of electricity consumed.

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8 Revitalization: Living Lab as a format for accelerating energy transition in Polish rural areas

The case studies of metropolitan outskirts of Gdańsk-Orunia and Lubań

Bartosz Pietrzykowski, Gabriela Rembarz and Adam Cenian

Introduction

The collapse of the socialistic regime in Poland revealed the need for revitalization of neglected regions. Later, the neoliberal paradigm of the country's socio-economic development posed numerous challenges, in terms of the energy transformation that is broadly understood as a necessary change in the lifestyle of European society. The scope of this transformation should involve constructive social dialogue, which allows, firstly, identification of reliable and committed stakeholders, secondly, to develop public trust and, consequently, gain the local community's acceptance for modernization. Analyzing the changes emerging during the last three decades of continuous system transformation, one observes certain phases of city planning and management development, which are essential for energy transition:

- Phase of Decay (1978–1989): loss of confidence in public planning and management, so called centrally planned economy and growing demand for infrastructure modernization;
- Phase I System Transition (1990–1994): development of new economic system and principles for state based on self-government under strong social support and unstable economy; adoption of neoliberal paradigm in city planning and management;
- Phase II Radical Management Overhaul (1995–2004): restructuring of communal entities management; privatizing of public services and energy market; initiation of modernization processes under dynamic growth of building market; suburbanization; priority for large cities development and regress of rural areas;
- Phase III Stabale Modernization Process (2004–2015): adaptation of EU standards and policy supported by structural funds; implementation of large key projects defined as civilization leap, enabling entry to the developed country circle (e.g., FTSE Russell[1]); growing social polarization resulting

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from neoliberal reforms and globalization; growing public distrust under increasing civic and ecological awareness;
- Phase IV New reforms (from 2016): superficially pro-social systemic changes inhibiting modernization processes and economic development; growth of public awareness related to ecology and social responsibility; detrimental conditions for energy transition.

The dysfunctional planning system, in which the public sector is not a strong player in terms of urban space quality and lack of a modern legal framework that would address the operation of local governments, inhibit the development of effective participatory planning and the implementation of contemporary organizational solutions based on public-private partnership. This not only significantly obstructs the development of high-quality compact cities, but also effectively supports irrational space management. The escalation of suburbanization (NIK, 2017) as well as the fact that public support for the revitalization processes has been delayed by two decades, including the related socio-political and legal gaps (Przywojska, 2016), are the main reasons behind the lack of a systemic solution to the issue of thermal modernization in urban structures, which has been a significant challenge for all European countries indiscriminately. Development of such methods of action as Revitalization: Living Lab (R_LL) and others, which enable effective acceleration of city revitalization, along with energy transition, has therefore become increasingly important (Rembarz, 2018d; Cenian et al., 2019).

The Princeton's WordNet dictionary defines revitalization as the "bringing again into activity and prominence,"[2] while the Cambridge dictionary additionally characterizes it as "the process of making something grow, develop, or become successful again."[3] So, urban revitalization takes into account aspects of social, urban-infrastructure and economic challenges, and its activities are aimed at reversal of the negative trends (Revitalization Act, 2015). It encompasses modification of energy, and other infrastructure, but is not limited to technical issues. It also involves consideration of the local people's well-being and should entail the local community's participation.

This chapter aims to present the experience gained from the cooperation under an informal format of R_LL, against the background of the conditions underlying the implementation of energy transformation in Poland. The R_LL implemented under the rural and semi-rural conditions of the metropolitan fringes of Gdańsk should be considered as an alternative to the routine practices of local administration and politics, which are quite cautious when it comes to the risk of experimenting with and implementing progressive changes (Dziemianowicz and Szlachta, 2016). The development of R_LL, under the voluntary cooperation of local entrepreneurs and/or urban activists together with the representatives of the local community and the scientific community, enables feedback transfer of knowledge and experience. The thermomodernization thread embedded in the revitalization carried out as a bottom-up activity strengthens the catalytic effect of the change process. It not only becomes the carrier of technological change, but also a factor supporting the development of social capital.

Energy transformation, understood as the change in the lifestyle of individuals and communities, requires special catalyzing solutions that take into account the importance of the social dimension, in terms of the technological change introduced. Community involvement is crucial when the level of social trust is low, which is a characteristic of public-life relations in young democracies, such as Poland (Sztompka, 1996; CBOS, 2020). Activities of local authorities related to energy transition tend to be ineffective, even though they enjoy higher public trust than those of central government (Sześciło, 2019; CBOS, 2020). This state of affairs results from the following:

a. The low level of social trust in the public sector and in institutionally promoted technological innovation;
b. The low, though increasing, social awareness of the correlation between issues of environmental quality (smog) and energy efficiency;
c. The skepticism on the part of voters who prioritize the issues of thermal modernization farther down the list of current needs;
d. An outdated perception of the issues associated with municipal energy supply;
e. The municipal authorities' limited resources and competence to negotiate with external entities regarding the coordination of the energy transformation processes constituting an integral part of revitalization.

The issue of heat supply modernization became the subject of intense public debate in Poland after 2015, mainly owing to the social initiative of the Polish Smog Alert [Polski Alert Smogowy].[4] The publication of daily data on the level of air pollution[5] authenticated the need to define and supplement the regional and municipal environmental and climate policies with special documents called anti-smog resolutions.[6] Under pressure of social expectations, a number of programs had been launched, which developed the legal and financial framework, mainly for replacement of coal-fired boilers and thus accelerated implementation of the provisions of Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (CAFE).[7] Currently, the "Clean Air"[8] initiative is one such program, which more than 80% of Polish municipalities have signed up for. It distributes subsidies for thermomodernization of houses and replacement of old heat sources with more ecological solutions (Portal Komunalny, 2021). Eight commercial and cooperative banks have recently joined the National Fund for Environmental Protection and Water Management [Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej], in order to support the financial servicing of not only the "Clean Air" program itself, but also the entire anti-smog initiative (NFOŚiGW, 2021).

In the last five years, an increase in the energy standards offered by multi-family commercial housing has been observed (new condos). Similar changes have been taking place in middle-class single-family housing. The market demand for technologies and products offering alternative, more efficient heat supply solutions has been triggered. Both types of activity are, however, addressed to the investor communities having the resources and competences necessary to apply for the aid funds. This sets barriers to the dissemination of the modernization process, which has been limited by the low level of public funding and the administrative approach to the cooperation with the local community that is too narrow and strictly understood as the private sector. This results in the preference for random partial investments, which do not fully correspond to the scale of the needs nor to the necessary complexity, both in terms of thermal modernization itself as well as the broadly understood revitalization (urban regeneration).

Analysis of the municipal development policies implemented in the Pomeranian Voivodeship after 2015 substantiates the list of the nationwide shortcoming impeding the undertaking of comprehensive activity, in the context of urban structure revitalization and the historical rural assumptions (Jadach-Sepioło et al., 2018). According to Polish law, revitalization is

> A process of recovering degraded areas from the state of crisis, implemented in a comprehensive manner, through integrated activities for the local community, space and economy, concentrated territorially, carried out by the revitalization stakeholders on the basis of the municipal revitalization program.[9]

The central authorities' insufficient support for the local activities is manifested by the lack of effective legal and financial instruments, including the public-private partnerships (PPP) formats that are necessary when it comes to the energy issues constituting the domain of commercial activity (Tang et al., 2010). This results in fear, on the part of municipalities, of initiating long-term urban processes that require durable involvement of significant financial resources and advanced-level execution of integrated planning and implementation. This results in defective elimination of the difficult aspects from the scope of revitalization. Some of these aspects, such as energy and heat, are moved to the further stages of implementation or qualified as part of the private sector domain (Wis-Bielewicz et al., 2018). Under the veil of revitalization, the delays in the implementation of the national social policy (social revitalization), which in the previous stage had been pushed aside by the classic renovation activities, are now compensated for by abandoning a more comprehensive approach (Przywojska, 2016). Moreover, the concept of energy poverty has been now introduced into the Polish public debate. The 2017 diagnoses carried out by the independent Institute for Structural Research [Instytutu Badań Strukturalnych] indicated that multidimensional energy poverty affects approximately 1.3 million out of the 13.57 million Polish households (9.8%), which is equivalent to 3.35 million out of the 38 million people living in Poland (Sokołowski et al., 2021). These data show that the existing methods of supporting thermal modernization, mainly through financial subsidy programs dedicated to individual middle-class investors and municipalities, bypass one of the key problems in the country.

The fact that the issue is understood in sectoral terms has transformed the public debate on revitalization, which has been dangerously reduced to the technical and renovation dimension. This mainly stems from the possibility of obtaining EU funds. It should be remembered that in the leading EU countries, the fundamental processes of urban regeneration are already being addressed, while the issues of energy and technological change have become the core of current urban policy and are implemented with the awareness of the importance of a comprehensive approach and the ability to achieve synergistic goals. In Poland, where habits of revitalization have not been developed; this provides another incentive to detach this issue from the core of revitalization policies and formulation of a defective concept of energy revitalization, dealing with only technical thermal modernization. In view of the enormous needs, this logic focuses the public sector initiatives on energy-efficient improvement of its own (municipal) resources, as opposed to being oriented at development of systemic municipal programs that would steer the process of the private sector actors' broad involvement in the transformation. Such exceptional cases as the national leader in revitalization – the City of Sopot (ESCO, 2017) or the developing Geotermia Podhalańska S.A. (Bujakowski, 2010; Pająk et al., 2020) – validate this thesis by illustrating the possible scale of acceleration not only through implementation of projects, in a public-private partnership format, but also through the use of the scientific community's potential to act as the catalyst for the change.

Insufficient dissemination, among the municipal authorities and local communities, of knowledge on the methods and solutions used in the national initiatives characterized by the parameters of complex pilot projects has been another problem affecting the implementation of integrated spatial policy and the energy change (Jadach-Sepioło et al., 2018). The experience of urban labs, (e.g., the urbanlab.gdynia.pl active since 2019) that are dedicated to revitalization process, constitutes a special category, still poorly scientifically documented. The dissemination of the know-how and the constant support by academic entities are often the reasons behind the innovative activities on the part of local communities and private business (Martyniuk-Pęczek and Rembarz, 2016). This long-term activity, the foundation of which is social trust, places the multi-faceted renewal of the local community and the environment at the center of its mission. Creative organizational schemes as well as transfer of the know-how take place under the assumption that the local community is an equal, active partner and the main beneficiary of the changes (the subject in the process). In this context, it is necessary to develop new, alternative organizational models that would facilitate the implementation of systemic solutions as a commonly available good. Only this may cause a change in the social attitudes and, consequently, reform the central policy, moving it towards stabilization and activation of support for energy transition.

Energy transition under Polish settings

The complexity of actual conditions, both political and technical, in reality results in the process of energy transformation in Poland remaining in the early phase. The most important issues that should be taken into account here are the following:

a) The fundamental disparity in the characteristic of urban structure with its strong spatial outline of the post-socialist development phase: the dominance of large-scale multi-family housing cooperatives (industrialized technologies, district heating, modernist form) as against the single-family housing dynamically emerging in the liberal processes of suburbanization after 1990 and the historical buildings from before 1945 (largely rebuilt), which was covered by the policy of structural revitalization as late as 2015;
b) The weak position of the public sector in the process of shaping the city and its infrastructure (neoliberal socio-economic development paradigm), combined with a lack of experience in public-private-partnership implementation and weak status of participatory planning in the decision-making processes (the urban activism emergent first after 2010). The incoherent Polish model of urban planning, constantly experiencing changes to its legal framework, addressing a series of ad hoc issues, has resulted in a failure to implement forward-looking modern development strategies that are based on the results of in-depth analysis and modern knowledge;
c) Privatization of municipal technical infrastructure and of council and cooperative housing (modernistic large-scale housing districts of the 1970s), taken over after 1990, have introduced market principles to the broadly understood urban energy sector. This process has deepened the state of low integration of municipal planning and the possible range of public investment into infrastructure systems, that are of key importance for the current phase of energy transformation. In the situation of constant shortages in local public finances, the initiatives undertaken by local authorities are dependent on the possibility of obtaining external funds, mainly via EU programs. The ongoing differences in the range of modernization needs, which characterizes urban structures in the leading EU countries as compared with Poland, leads to difficulties in making the most effective use of the available EU funds;
d) The use of scientific research results in Polish city planning is not a common practice. Strong limitations to this cooperation are mainly the pace of the spatial changes and the legal regulations concerning public finances. The practical experience of the last three decades also reduces openness of the public administration bodies towards the implementation of projects requiring innovation burdened with unknown technical and political risk (Rembarz, 2018a). The practice of applying public funds for implementation of model or pilot projects, not only universal ones, but also those adapted to regional or even local conditions, is not common. Rare examples of such a practice devoted to the issue of urban renewal are mainly initiated by researchers performing grass-root activities, e.g., replacement of coal-fueled boilers with biomass-fueled cogeneration units in Żychlin (Cenian et al., 2015a, 2015b), innovative poultry feeder gasification in Olsztyn (Dudyński

et al., 2012), modernization of the district heating system in Łomża (Cenian et al., 2019), implementation of geothermal heating systems by Geotermia Podhalańska (Bujakowski, 2010; Pająk et al., 2020) or waste heat utilization (Duda and Cenian, 2013).

The small number of such developments also results from the existing model of science financing in Poland, which does not support fruitful cooperation in the field of research implementation for local authorities (Orłowski, 2013). The experience of EU countries shows that innovations (technological changes) are stimulated by public funds, due to the high risk, which the small-scale private sector is not able to bear. The public sector in the EU countries is therefore committed to the development and testing of new technologies as part of pilot projects, which are essential if model solutions are to be designed. The road to successful innovation leads through the technical and commercialization-related difficulties, the so-called "death valley." Owing to the public patronage and promotion, credibility and market critical mass are achieved, which activates private business and the large-scale implementations providing these entities with the necessary profit and risk minimization. Due to low public support, the innovation pilotage carried out by the Polish private sector must bring measurable profit right away. An attempt is therefore made to jump from the idea to actual implementation, reducing the time and costs, which theoretically is supposed to be more beneficial. In practice, however, it often leads to bankruptcies and a growing distrust in national innovations and the cooperation with science in general as well as confirming the assumption that it is better to purchase proven foreign technologies. Ultimately, domestic innovation is relatively weak and focused on the problems of adapting foreign solutions to local conditions, which is not tailored to the local needs and conditions. These circumstances affect the local authorities' attitude towards innovation, who, by wanting to bypass the period of pilotage and implementation research, bear too much risk and suffer the consequences of setbacks or, by not wanting to take the risk, become the main obstacle in the implementation of local innovations. That is why it is so important to change the public sector's modus operandi to one which would allow for wider participation of local communities, and of local business in particular, in the creation of a climate for technological and social changes.[10]

For this reason, innovation in the field of research implementation must include efforts toward formation of new partnership models. These tools now accelerate creation of platforms, helping institutional entities to come together and enable implementation of new large-scale technical solutions in an urban environment. The issue of setting functional public-public partnerships between traditionally non-cooperating entities from the public administration sector constitutes a core task. This can be a real catalyst for realization of the EU energy-transition agenda that requires a complex interdisciplinary approach.

The issue of energy transition in rural areas constitutes a specific topic. The conditions that exist there illustrate the fundamental neglect by the State over several decades. The socialistic regime placed focus on industrialization. After the "Solidarity Revolution," the focus has again been placed on urban metropolitan areas (due to the EU agenda). The lack of public support resulted in wider openness towards potential public-private partnerships, which are supported and encouraged by local communities.

This is beneficial for implementation of projects, requiring close cooperation of the public administration and strong support of the social side. Projects presenting a coherent and clearer vision corresponding to the scale of rural areas are favored, which suit the perspective of the political agenda and the community social perception. In peripheral communes (even those operating in the shadow of metropolitan urban-core cities), individual initiatives – of economic entities, social activists or innovative business – are becoming more visible. This can trigger processes of more extensive change; first, of social awareness, second, of space, also in its economic and cultural dimension of metropolitan cities.

The role of EU programs in the support for energy transition in Poland should not be ignored. On the one hand, they pertain to the development of research and dissemination of knowledge among local governments, and on the other, they allow for the execution of implementation programs. The funds allocated to the implementation are of particular importance here, as they constitute a significant incentive for local governments and local heating companies, not only to modernize the existing networks or optimize the energy consumption in private buildings, but also to expand these networks and introduce new products and services, using renewable energy or heat recovery. The EU financial programs, covering up to 80% or more of the investment costs, constitute the main incentive for undertaking innovative activities (Dworakowska, 2018). The condition of an established partnership and the requirements regarding the scope of socialization, underlying acquisition of these funds, constitute an important factor softening the neoliberal business attitude of both the public and the private sector. In Poland, the apparently obvious and simple synergistic activity at the public-private crossways has been slamming into the imperfect public procurement law and the inflexible, in terms of the investment specificity in revitalization zones, legal framework defining financing and organization of cooperation. The amount of the formalities associated with micro-scale activities, just as in the case of much more complex and significant projects, has been largely discouraging officials from undertaking any initiatives that would support the residents' property modernization activity. In spite of these problems series of Baltic Sea Region (BSR) and South Baltic Programs (SBP) projects contributed significantly to energy transition issues in cities and rural areas in Pomerania Region, e.g., LowTEMP: Low Temperature District Heating for the Baltic Sea Region, Act Now: Action for Energy Efficiency in Baltic Cities and BP: Bioenergy Promotion (Krug et al., 2015; Cenian et al., 2019; Pakere et al., 2018; Feofilovs et al., 2019; Konkol et al., 2020).

Revitalization: Living Lab (R_LL)

In the field of urban renewal, the energy aspects are most commonly associated with the concept of the Smart City, which can be equally legitimately implemented both in modern and historical urban districts, as well as in rural settings (Bevilacqua and Pizzimenti, 2016). As shown by the experience of the more technologically advanced European countries, a permanent and effective energy transition is achieved when it facilitates the choice of a pro-ecological lifestyle for individuals and communities. This requires innovation in both the technical-organizational and psychological-cultural dimensions.

The concept of a *Revitalization: Living Lab* as a research method is a kind of hybrid approach. It uses typical urban planning tools, such as design or planning lab (United Nations Human Settlements Programme, 2016), used mainly in the promotion of participatory planning, in conjunction with the Living Lab method derived from technical sciences, mainly Information Technology (IT).[11] ENoLL – the European Network of Living Labs,[12] specifies that

> A Living Lab is an open innovation environment in real-life settings in which user-driven innovation is the cocreation process for new services, products and societal infrastructures. Living Labs (LL) encompass societal and technological dimensions simultaneously in a business-citizens government-academia partnership.

Current application of the Living Lab in Smart City research defines this concept in two different ways. Firstly, as a derivative of urban infrastructure, i.e., an early technological version (the so-called beta version) requiring testing, verification and technical modification arising from user experience. Secondly, as a socio-infrastructural environment, i.e., a democratic social concept in which the bottom-up processes resulting from local needs and expectations shape the technical solutions. In this concept, the LL model is used in three different forms (Bergvall-Kåreborn and Ståhlbröst, 2009):

(1) As a permanent activity fully adapted to the local context of the place, with limited possibilities of repeating the solutions obtained under different conditions;
(2) As a form of temporary activity, dependent on the changing of the project phases, technology and financing cycles, exposed to the loss of the features of the creative connection with the place (place-making) and the transformation into a temporary event with solutions replicable in other settings;
(3) As a multi-stakeholder platform where the role of local partners (residents, activists) is to balance the top-down solutions that are purely technical, initiated by influential commercial forces.

There is a tendency to ambitiously perceive the potential of LL to transform (in the third approach) into a kind of participatory management model, enabling the local community to exercise political and expert supervision over technical infrastructure (Cardullo et al., 2018). This approach is particularly dedicated to the urban structures representing traditional spatial parameters and corresponding social context, i.e., revitalization areas, also those with a typically rural profile (Rembarz, 2018b).

The possibility of using the LL format for research on revitalization is clearly proven by the APRILab project team: Action Oriented Research on Planning, Regulation and Investment Dilemmas in a Living Lab Experience[13] "the living lab means any kind of user-centered research and development in an open-innovation ecosystem, that has a territorial context (e.g., city, agglomeration, region) and that integrates concurrent research and innovation processes within a public-private people partnership" (Wallin, 2014, p. 6). Three main issues illustrate the genesis and application of the Living Lab format in current research: (1) a research environment for technological solutions, (2) a distributor and active base of knowledge and tools and (3) a platform for self-organization of groups and communities. While developing the Guidelines to Define and Establish an Urban Living Lab, the APRILab team has indicated that the concept of Living Lab in urban studies is strongly conditioned by the context of the problem field and may modify its definition depending on the research profile (Wallin, 2014).

The introduction of the high technology dimension, derived from the Smart City scope, to everyday practice of urban planning, has been carried out in Poland under a neoliberal planning paradigm, which assigns to the public sector a weak partner role. Polish local authorities rarely undertake the initiative towards establishing new or alternative development strategies addressed to privately owned land. The enormity of the challenges associated with the constantly intense cross-country development dynamics means that local councils are not pre-prepared to deal constructively with the subject of technological, and thus social, changes. A strong threat has been observed connected to the issue of new technology implementation, not conditioned by any special urban policy and modern legal framework. Weak expertise means that local communities confuse the notion of "Smart City development strategy" with plain "public consumption" of the commercial offer on technological products (Rembarz, 2018d). In this context, both the very idea of Smart City and the implementation of research Living Labs may too often lead to their use only as technical and modernization tools on the basis of a simple commercial calculation. Without proper respect given to the local public participatory involvement, it may enforce a neoliberal format of management and planning, deepening the social divisions and expanding the sphere of exclusion, that is, limiting civil liberties and destroying local democracy (Cardullo et al., 2018).

The R_LL method applied here has been adapted to the current local conditions and needs of the Pomerania Region. It was not possible to implement a long-term functioning R_LL of a similar profile, as a pilot project, programmed with the indication of strict goals in the envisaged time perspective. This is a countrywide universal problem in Poland. Both of the cases described below of R_LL Lubań and R_LL Orunia are examples of a process initiated by bottom-up impulses coming from outside the public sector. The first one was started by an individual fascinated with both the historical site and the usage of renewable energies. The second has come from a group of local activists (founders of GFIS

Gdańsk Foundation for Social Innovation[14]), who have become engaged in the social development of Orunia, a deprived district of Gdańsk.

Both R_LLs are also examples of a new way of implementing interdisciplinary research on Polish cities. In this alternative approach the external partner for the two-way feedback transfer of knowledge is not a public institution, but the local activists: the voluntary council advisory board (sc. district council), informal representatives of the local community, locally acting NGOs or the local entrepreneur(s). The beginning of cooperation, through non-binding scientific advice, led to the development of undertakings that could translate into further model pilot projects. Both examples have become a unique environment conducive to the generation of complex innovation, making clearer in the R_LL structure the importance of the large-scale spatial dimension: territory and community (metropolis, city, village). The possibility of participation and, at the same time, initiating and observing the subsequent stages of the transformation process of Lubań and Orunia, allows both cases to be included in the R_LL formula. In turn it allows the scientific processing of the results recorded there. Adoption of such an understanding of the R_LL format corresponds to the main parameters of the revitalization concept. R_LL operates as a multi-faceted, long-term process of change, restoring the original vitality to the degraded historical structures – the ability for independent socio-economic functioning with appropriate protection of historic values. Adoption of this method results from three premises:

1. A series of activities, aiming at the know-how transfer to the practice, undertaken by the researchers in Poland (in the disciplines of urban studies and engineering), encounters a lack of interest on the part of the local councils and the municipal administration, who are distrustful of urban innovation that is open to public involvement. Direct cooperation within community planning formats towards developing the "bottom-up initiative" creates a favorable environment for bringing changes into practice and assuring increased political support from the local authorities for such projects;
2. An organized public involvement in research addressed to urban development, especially the implementation of innovative technical solutions, is a new approach in Poland. It is all the more valuable as investments assuming interdisciplinarity in the field of innovative urban engineering are still rare in the country. In the revitalization process which requires synergistic effects, energy transformation means not only technical modernization introducing the latest solutions, but far more innovation in management accelerating positive social change;
3. Energy transition, under Polish conditions, is only possible when citizens, especially the young generation, support it and exert pressure on the local and national administration. Their participation in the regional and national programs devoted to prosumer ideas, such as "Mój prąd" (My electricity) or "Czyste Powietrze" (Clean air) is crucial. The first program has already enjoyed great success: around 508,000 new prosumers connecting to grid (till March 2021) 3,293.8 MWe in PV installations (Czechowicz, 2021).

Between slow and smart: R_LL localization in the Gdańsk-Gdynia-Sopot metropolitan area (OMGGS)

The Pomeranian region is polarized concerning population density. The urban core developed around the metropolitan area of three cities Gdańsk-Gdynia-Sopot. The so-called Tri-city with its functional urban area forms a one and a half-million-strong metropolis with a vibrant cultural and economic center (see Figure 8.1). The metropolization process generates dynamic local migration (Sejmik Województwa Pomorskiego, 2021), resulting in a depopulation of the remaining rural and semi-rural sub regions of Pomerania. The expansion of the urbanizations in limits of OMGGS (11,610 km^2) does not mean its high quality. Urban peripheries with their "net-city" structure are causing enormous problems in terms of infrastructural systems. New urbanizations perform as a cluster of individual ventures, fulfilling minimal standards of planning requirements. Local interpretation of spatial plans avoiding rational, modern and coherent vision, works against an increase in energy efficiency. It is therefore urgent to present alternative development scenarios. Unilateral promotion of the Smart City image in the very center of the metropolis, brings too much expectation

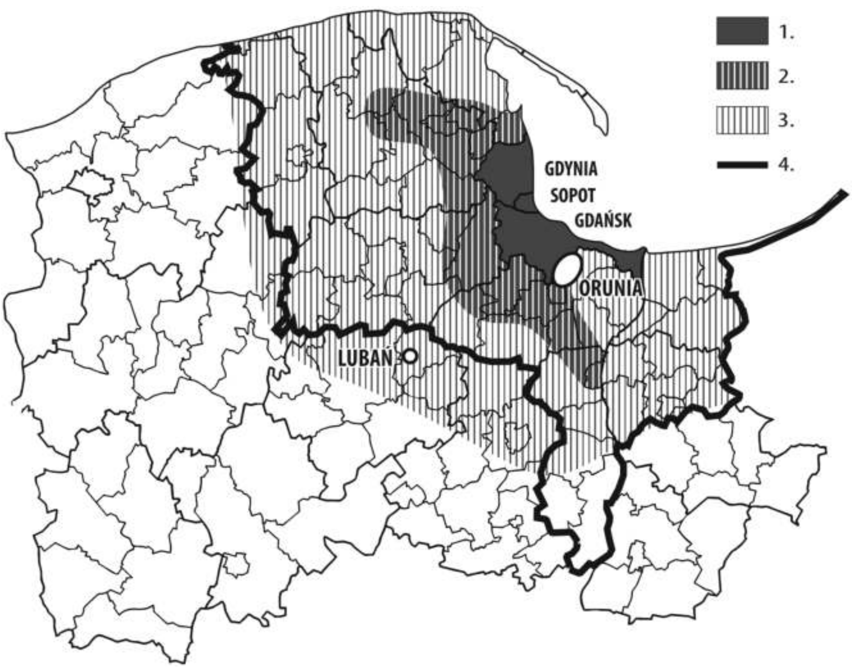

Figure 8.1 R_LLs Lubań and Orunia in the Pomeranina Region (source: the authors, graphics B. Labuhn). Key: 1. metro core area sc. Tricity agglomaeration Gdańsk-Sopot-Gdynia, 2. functional urban area: range of suburbanization (developed after 1990), 3. functional urban area: exurban rural and semi-rural peripheries, 4. Metropolis Gdańsk-Sopot-Gdynia OMGSG – union of municipalities.

towards slow-life environments, suiting alternative vision of the development in the ex-urbs (Rembarz, 2019b). The process of quality increase of urban sprawling is the response to the acceptance of the fact, that the *netcity* is the current model for development of a contemporary metropolis (Rembarz, 2019a). The issue of energy management has potential to stimulate the imagination of actors participating in the creation of the contemporary sub- and exurban areas. The use of the historical developments inselbergs in the rural landscape, to visualize the existing transformation possibilities, teaches how to obtain synergistic effects (Rembarz, 2018c). It is not a routine practice for peripheral local authorities in Poland, neither in the private nor the public sector. Such an approach, however, currently is the key goal of a comprehensive revitalization policy. It is also an obvious assumption of the entirety, of the current urban-planning paradigm in Europe, which is only just breaking through the practices of the Polish administrative system, that have been shaped under rapid transformational conditions.

The Lubań Revitalization: Living Lab I

The Lubań R_LL I is located in the Kashubian village of Lubań (kasz. *Lëbòniô*) the history of which dates back to the Middle Ages (first mentioned in 1280). The population of the rural community in 2019 was about 2,000 inhabitants (Urząd Gminy Nowa Karczma, 2020). Till the end of World War II, the village was a manor grange with a XIX century mansion and an extension housing a distillery, surrounded by a historical park. The complex, holding the status of a state-owned farm during the communistic regime, was a renowned regional agricultural innovation center ensuring work and basic services like grammar and agricultural schools for over 3,000 people, along with the village church and shop options. Already at the beginning of the 1990s, the village was equipped with an independent sewerage system and a district heating grid supplying heat and domestic hot water to the housing quarters, the grange, the mansion and the Pomeranian Agricultural Advisory Center (PODR), adopting the former agricultural school buildings. The system was powered by a culm-fueled boiler house located in the old distillery. Later, two 900 kW coal boilers were located in an adjacent building. The historical heritage of this place had been significantly damaged, which was the common fate for most manor estates nationalized after 1945. After the system changes of 1989, over many years, Lubań was an example of the slow degradation and depopulation of rural areas, hopelessly waiting for a public development strategy (see Figure 8.2).

In 2012, the Institute of Fluid-Flow Machinery Polish Academy of Sciences (IMP PAN) supported by the Energy Department at the Marshal Office in Gdańsk, initiated cooperation with the PODR, for development and promotion of new technologies in the field of distributed energetics for rural areas. The PODR Center, the largest employer in the region, actively supports both agricultural innovation and the energy prosumer ideas in rural areas. Nowadays, Lubań is known mainly for the Kashubian Agricultural Autumn Fair (attracting up to 50,000 visitors), a platform to promote ecoenergies and Lubań as a model of ecoenergy solutions. In 2015 in

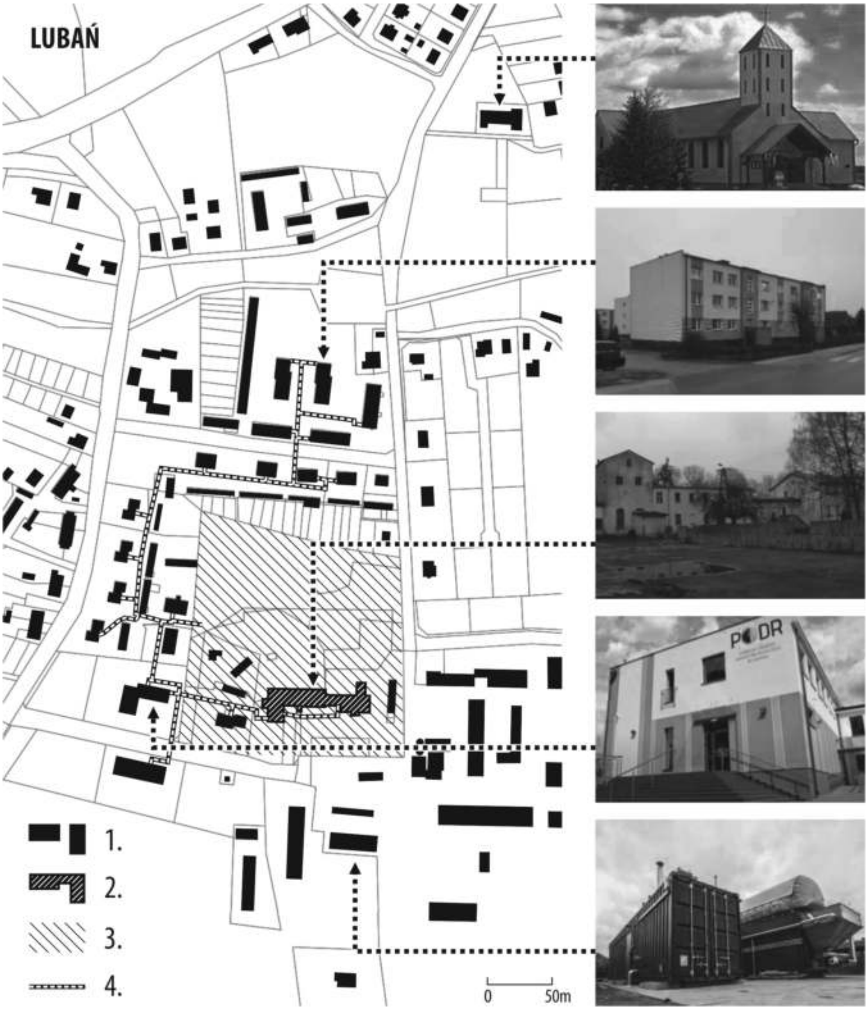

Figure 8.2 Lubań the R_LL I. On the left: map of Lubań housing structure; on the top right: photos of (A) the village church, (B) the former PODR workers housing estate from 1960s, Lubanianka Housing Cooperative (LHC), after the thermomodernization in 2016, (C) the mansion with the distillery, (D) the former agriculture school building in Lubań, renovated and turned into the new PODR headquarters, (E) the biogas microinstallation (source: the authors, graphics B. Labuhn).

active cooperation between the IMP PAN, the Gdańsk University of Technology (GUT) and the private Eco-Construction company, the first microbiogas plant was built as a new educational infrastructure on the PODR plot. This pilot installation of the project "*Integrated Technologies for Fuel and Energy Production from Biomass, Agricultural Waste, etc.*" in the *Strategic program – Advanced Energy Technologies* of the Polish National Centre for Research and Development (NCBR) was used as a Living Lab for subsequent investigations and biogas promotion by scientific institutions and the PODR till 2020. Gradual improvements have led to changes in both technical and socio-economical domains.

During the interaction and discussions with the local community and the main public-sector stakeholders (especially PODR), the first author of this chapter, as the CEO of Eco-Construction Ltd., recognized the significance and the high potential of this historical yet degraded village. Its revitalization can be an exemplary subject of energy transition in rural areas. As early as 2015, the company therefore designed (in cooperation with IMP PAN) a new, energy plus PODR headquarters (Lubań) (see Figure 8.3.D), while the PODR decided to move its headquarters from Gdańsk. The design included a 40 kW solar installation on a field (executed on and connected to the grid), a solar parking area (still a concept), a 40 kW wind turbine and 140 kW ground source heat pumps (already executed, supplying two PODR office buildings). In July 2017, a new (totally refurbished) PODR Centre was opened.

In the meantime, a series of interactions and discussions with local citizens and activists led to the development of plans for revitalization of the entire village, including the mansion with the distillery as well as an energy supply system. In 2016, as the first step, Eco-Construction Ltd. initiated the Revitalization: Living Lab I activities aimed at energy transition towards an energy plus village, which involved development of plans in cooperation with the residents and the local administration as well as IMP PAN participation. The revitalization plan included a solar parking (see Figure 8.3.A), the renovated mansion house with an historical park and the educational path (see Figure 8.3.B), a new private housing estate (see Figure 8.3.C), a new 250 kW biogas plant exploiting the biowaste available locally (i.e., pig, cattle and poultry manure, grass and municipal biowaste, etc.) (see Figure 8.3.D), a 40 kW photovoltaic microinstallation and a windmill (see Figure 8.3.E), the Education and R&D Centre (see Figure 8.3.F) and an innovative, low temperature, fourth generation district heating system with a boiler house (located in the old distillery, in the left wing of the mansion). Meanwhile, as a part of the preparation, Eco-Construction Ltd. bought and invested in an old dilapidated distillery, where the new innovative heating system is being designed, including a biogas/pellet fueled boiler, supported with a PV installation, solar panels and air source heat pump; it should replace the oversized 900 kWt boilers fueled by highly polluting culm (coal waste).

The Revitalization: Living Lab I activities included a series of meetings related to:

(1) The design plan for an energy cluster – developed by Eco-Construction Ltd. in cooperation with the IMP PAN and the GUT (especially LINTE 2)[15];
(2) Presentation of the design plan during several meetings with local citizens and activists, the municipality and the PODR administration, as well as members of the Polish Parliament;
(3) Development of the Low Temperature District Heating (LTDH) idea with participation of Lubań citizens and the Lubanianka housing cooperative;

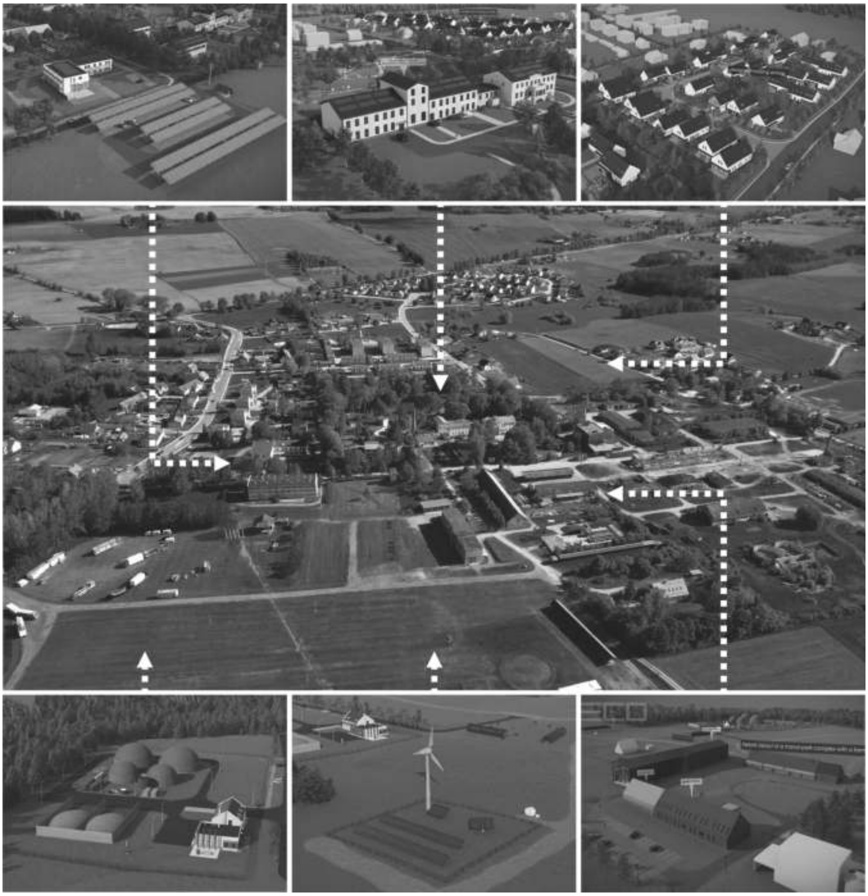

Figure 8.3 Aerial photo 2019 of Lubań and the village revitalization concept, with the Pomeranian Energy Cluster infrastructure designed by Eco-Construction Ltd. (Source: Eco-Construction Ltd). From the top left: (A) solar parking in front of PODR headquarters, (B) renovated mansion house with historical park and the educational path (revitalization finished in 2020), (C) private housing estate. From the lower left: (D) biogas installation, the wind mill turbine, (E) a 40 kW photovoltaic microinstallation and a windmill, (F) the Education and R&D Centre.

(4) The signing of a Letter of Intent (LoI) with the local cooperative, in order to refurbish an existing common heating system;
(5) Presentation of a design plan during various project meetings with companies, regional and national authorities, and lobbying with the decision makers;
(6) Development of an Educational Path as part of the Living Lab on RES and waste management.

These activities led to the signing of an LoI related to the Pomeranian Energy Cluster (located in Lubań), between Eco-Construction Ltd., local authorities, the Linte2 (GUT) and the IMP PAN (2016). In 2017, Eco-Construction Ltd. presented the first draft of the revitalization plan for Lubań, developed in cooperation with IMP PAN and local activists, with emphasis on RES (see Figure 8.3). Wide promotion of the Revitalization: Living Lab I and the designed plan began.

Meanwhile, Eco-Construction Ltd., upon the request of the PODR, also designed the revitalization plan, including thermomodernization of other, older PODR buildings, with implementation of a ground source heat pump (140 kW) and 10 kWp PV modules on the roof. At the same time, the company developed, along with another investor, a concept for a new eco-profiled kindergarten. The building permits are ongoing.

In 2019, the designed micro PV farm (40 kWp) was built by the PODR. Simultaneously, the activities aiming at replacement of the old, oversized coal boiler house supplying the heating to the Lubanianka Housing Cooperative (LHC) began. It is well-known – see, e.g., (Cenian et al., 2019) that after the thermomodernization, the heat demand for houses should drop drastically and the heating systems should work more efficiently when it is matched to the heat demand. However, the existing boiler house is equipped with two large 900 kW coal boilers, although the average heat demand is a maximum of 350 kW in winter and drops to 60 kW during summer. It has been estimated that the yearly average efficiency of the system approaches 50% and drops to 20% during summer, when only domestic hot water is in demand.

The assessment results were presented to the LHC administration and during a housing cooperative gathering. After a series of meetings and clarifications, an LoI was signed in May 2020 between the LHC, Eco-Construction Ltd. and IMP PAN which has opened the road towards the LTDH system implementation in Lubań. A new online monitoring system of heat demand and supply is being designed, which will enable better assessment of the existing grid and boiler house. The design for a new location for an appropriate pellet/gas boiler has been developed and sent for a building permit. It takes into account the possibility of heat supply for new housing estates, hotels and restaurants in an Education and R&D Centre (see Figure 8.3), implementation of various RES, including heat-storage systems enabling appropriate heat-demand response. This would be one of the first LTDH systems in a Polish rural area and a showcase benchmark for similar systems.

The municipality of Nowa Karczma (which includes the village of Lubań) strongly supports the concept of the Lubań revitalization. In the years 2018–2019, the municipality designed and implemented a new street plan in Lubań, taking into account the revitalization plans. Additionally, in 2020 as part of the Wasteman project of the South Baltic Program,[16] the municipality implemented an educational path, as part of the R_LL I, in relation to waste management and RES.

The Orunia Revitalization: Living Lab II

R_LL I in Lubań represents results and experience, which is of importance for the further development of the R_LL II defined for the semi-rural suburb in Gdańsk – Orunia, populated by ca. 14,000 inhabitants (Rembarz, 2018c). Ultimately this initiative could transfer into the model of the unique agrihood, such as the Energy Improvement District located in the zone threatened by the effects of the sea level rise (Fischer et al., 2020).

Located 3 km south of downtown Gdańsk, Orunia has been serving as a town-village gate since the Middle Ages. The existing orchards and farms continue their activities dating back to the mid-16th century, when Dutch Mennonites, engineers and settlers, came to be involved in draining the Vistula Delta swamps. The post-war population exchange as well as the decades of underinvestment and neglect, has resulted in today's Orunia/Św. Wojciech districts, characterized by complex social problems, leaving an imprint on the image of this semi-rural, green, idyllic suburb. Despite this profile, one can find in Orunia all types of urban tissue-samples from the over 200-year-old farm-houses in Dutch-like style to the modernistic large-scale modular housing of the 1970s.

The R_LL II zone was chosen due to its unique profile representing all types of urban structure that is characteristic for rural suburbs and villages as well as for small and medium sized towns. With its location at the urban edge and prominent location at the main entry road to Gdańsk City Center, Orunia represents all the best possible features to become an experimental laboratory and a display area of revitalization characterized by a strong energy transformation profile. Despite these features, it is not an elite district. Orunia always has accommodated newcomers, but since the 1970s it has become a district of a lower social status (see Figure 8.4). The structure of land ownership is dominated here by communal properties of the City of Gdańsk, which until 2016, has minimized any obstacles to the implementation of publicly supported investments.

The decision to define the whole process of ongoing change in recent decades in Gdańsk-Orunia as a R_LL, arose out of the studies on modern research methodology. Direct transfer of the R_LL formats designed for American or German conditions meets inevitable obstacles. The foreign experience in implementation of similar actions i.e., introduction of technical and organizational advancements to improve the quality of life in degraded urban environments, illustrates the difference in scale and program assumptions. In the specific Polish context, the most difficult to overcome is the weak and underfinanced position of the public planning and revitalization incentives. That in turn influences the character of the research, limited by the profile of the public partner.

The Orunia R_LL II was initiated owing to the informal cooperation between the GUT (Gdańsk University of Technology) and the GFIS Foundation, operating locally in Orunia. The foundation acts as a facilitator of the local community. Starting from 2010 in the "Hospitable Haven" community house run by GFIS and leading debates on the vision of the district development in the series "I

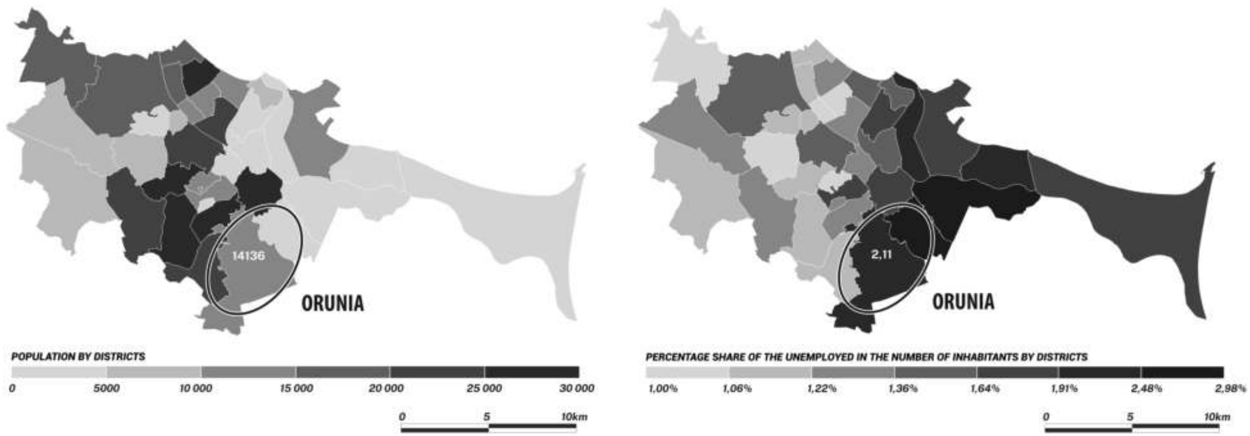

Figure 8.4 The Orunia Suburb in the context of the City of Gdańsk: (left) population density (right) unemployment rate (source: City of Gdańsk, graphics J. Depczyk).

see Orunia as Great." The series touched on problems of energy costs, which threatens the disadvantaged groups of metropolitan society, including those from the rural suburbs like Orunia. The GFIS became the key actor for consolidating the mature attitudes of the councilors of the then newly formed district council – the social advisory body of the city mayor. One of its main areas of activity entails improvement of the quality of the district's public space. Placemaking has become a tool to get people participating in community planning together, helping to mature local discussions about the future. The GUT team (led by the Second author) participated in this process since its very beginning, seeking cooperation in the long-run and applying the research-based design method. The cooperation-consolidating project of 2011, entitled: "17,000 sunflowers for Orunia," became the inspiration for the "Courtyard Revolution" project implemented by the GFIS in subsequent years, in cooperation with the City of Gdańsk and selected housing communities from Orunia (GFIS, 2013). The campaign, facilitated by the GFIS, mobilized the inhabitants to act as a neighborly self-help group. A kind of Orunian model of revitalization was developed, which has been proceeding owing to an alternative scenario – the strengthening of the grassroots self-organization, the building of internal and external bottom-up partnerships for the district, through implementation of self-help projects. Improvement of the spatial development of the backyards has developed into cooperation regarding other critical renovation issues, mainly related to the thermal modernization of the buildings. In this way, the solutions to synergistic problems, with the involvement of significant private financial resources, have been promoted.

In the following years of the R_LL's formation in Orunia, research and design studies were carried out, which examined the district's potential for the possibility of fusing two seemingly different concepts of city development – which would accelerate owing to the Smart City technological solutions (see Figure 8.5), with the Slow City model focused on balancing the pace of life. The concepts developed in the series "SlowSmartOrunia," which exploit ten different main problems including energy transition, became the source of an inspiring discussion, both among the local community and professionals. Showing the main features of the district, which were criticized or not perceived as assets, contributed to the progress in the involvement of the local community in the process of constructive participation for the renewal of their own living environment (Rembarz, 2019b).

The focus on the main potential of the district – the rural landscape and agricultural context – allowed presentation of the scale of the new possibilities in the shaping of the district's future, both in the placemaking solutions and in general microstrategic theses postulating the development of Orunia as a district of "renewable resources." The working planning hypotheses were visions that were ahead of the consciousness of the local authorities and the residents at that time, regarding the preservation of the district as a prototype of the metropolitan "slow suburbs" (Rembarz, 2018c, 2019a). The fusion of the agrihood model producing energy and healthy local food, in the spirit of the Milan Charter (Expo Milano, 2015) and the "Energy Improvement District" concept, creatively developed the country's routine revitalization assumptions.

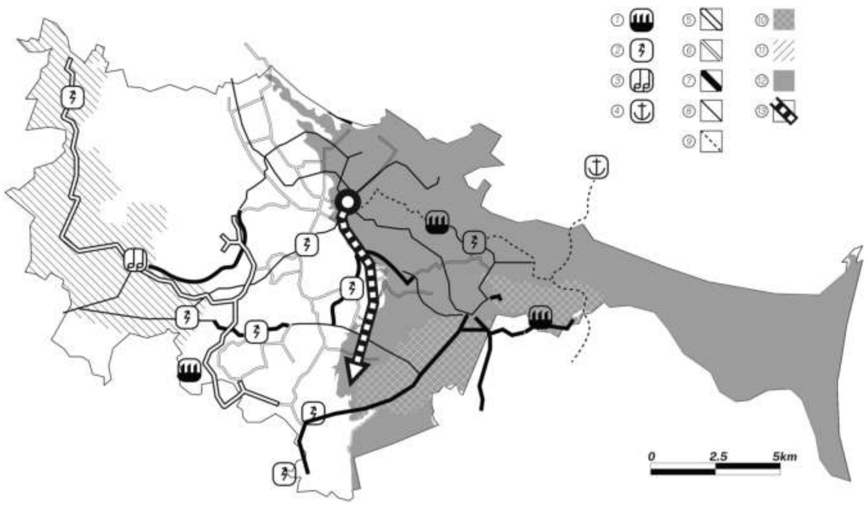

Figure 8.5 The City of Gdańsk counteracting climate change, records of commune-level planning studies (source: City of Gdańsk data, graphics J. Depczyk). Key: existing (6) district heating grid, (8) main high voltage line. Planned (1) combined heat and power plant, (2) transformer station, (3) pressure boosting station, (4) gas unloading station, (5) main heating station, (7) electric power line, (8) high pressure gas pipeline, (9) high voltage electricity lines, (10) RES equipment deployment zone, (11) district heat network development area, (12) area of flood risk due to the sea level rise.

The results of the research were submitted to the GFIS, district council and the Revitalization Department at the Municipal Office of Gdańsk, with the hope of using them, when updating the municipal policy in this area – mainly when formulating the assumptions of the district revitalization strategy. Due to the lack of a constructive interest in grassroots initiatives, on the part of the municipal services, the results of the R_LL II were used for preparation and implementation of the "Quo vadis, Gdańsk? The citizens are planning their district" project, financed by the Stefan Batory Foundation from the EEA fund through the program "Citizens for Democracy." Its main goal was to prepare the social side for conscious participation in official formats of socialization discussions regarding the future of the district. The Community Planning Academy started its activity, working in the format of urban mentoring, to formulate a microstrategy to improve the quality of the public space in the Gdańsk Orunia district (Martyniuk-Pęczek and Rembarz, 2016). The one-year workshop results, developed by a professional planning team became the document supporting the integration of the vision of the future of the Orunia region with its community representatives from the district council. The material officially submitted as an application, for the official municipal planning documents, was only partially processed by the municipal services. The revitalization plans developed under the regimes of modest budget and the legal framework that is unfavorable for comprehensive revitalization, directly used only selected threads of the microstrategy, implementing a classic (not risky and maximally economical) set of revitalization projects.

The main permanent effect of the cooperation with the local community is the development of local awareness, of both the local community representatives and the officials. Owing to this, the debate on the official city plans could be more constructive and secured against manipulation attempts. The revitalization plan from 2016 includes a clear vision exhibiting the agricultural identity and profile of the suburbs as well as including the possibility of joining the energy modernization of the municipal buildings located in the district, in the second phase of the process.[17] The preliminary identification of the needs and the basic potentials in this respect, carried out as part of the revitalization activities, is a strong prerequisite for provision of the *Energy Improvement District* status for the Orunia district, in its second phase of revitalization. There is no doubt that the preparation of the local community (activists, councilors, representatives of communities and housing cooperatives) for substantive cooperation in this aspect of revitalization is much better than in other, often potentially socially stronger districts of the city.

The revitalization planned provides an excellent opportunity to include the activities related to energy transition measures. These may be based to introduce experience gained in R_LL. First action includes recognizing the opportunities and weaknesses of the district in relation to attainable energy/heat resources. The Gdańsk district heating (DH) grid reaches Orunia and presents the opportunity to develop a fourth generation DH system using the low temperature heat from return flux. Low temperature DH grid presents a series of advantages, which include:

- Reduction of heat losses in DH pipes;
- Enabling easy inclusion of other RES e.g., solar thermal collectors, geothermal sources, etc.;
- Easy integration of low temperature waste/surplus heat;
- Reduction of thermal stress in grid pipes and prolonged DH-grid life;
- Lower return flux temperature, which enables its application for flue gas condensation in Combined Heat and Power (CHP) plant.

Where the Gdańsk DH grid is absent (due to economic reasons) one may consider replacement of traditional coal burners with renewable alternatives, such as biomass systems or heat pumps powered by the electricity produced in a prosumer regime.

Revitalization: Living Labs – lessons learned

It should be underlined that the role of a bottom-up approach is crucial in the Polish setting: from local activists, scientists to entrepreneurs, who acknowledge the need for energy transition, which cannot be ignored, considering the growing population, its energy needs and the depletion of fossil fuels.

The experience gained over a decade, owing to the participation in the development of the R_LLs in Lubań and Gdańsk-Orunia, allows for a diagnosis of the phases characterizing the process of social awareness change, taking into account the issues of energy transition implemented in the context of revitalization. There is a clear shift from a reasoning characterized by traditional renovation criteria, through a modernization approach, to the vision of a fundamental change at the technological level. This process takes place in a strong social context, in which the prevailing attitude of hopelessness and a lack of crisis-overcoming concepts, evolves, thanks to the participatory process, into a constructive state of cooperation, which allows for effective use of the available financial aid programs. In each phase of this peculiar evolution, the search for alternative solutions, both technological and organizational, constituted the fundamental assumption. The activation of the social energy was one of the main factors determining the activation and the duration of the state of change. In order to be able to tap into this endogenous resource, social trust needs to be gained, developed in a stable, staged process of dialogue and cooperation. Full implementation of the revitalization and energy transformation objectives means a permanent, constructive change in the lifestyle of the local community.

The R_LL I in Lubań has extended the Living Lab's technical format which was dedicated to energy issues, by including additional dimensions which are typical for comprehensive revitalization. A simple administrative decision to adapt the buildings of an agricultural school as a regional agricultural advisory center, owing to the cooperation with academic centers, the established partnerships with the local business and the socialization, has turned into a vision of a model solution promoting rural development in a multi-faceted manner. In addition to the gaining of social trust and the selection of reliable partners to the transformation, an environmental change took place in the culture of cooperation based on a transfer of knowledge.

In Lubań-sized rural centers and the local managing municipalities (Nowa Karczma), the gaining of social trust is expressed more clearly than in large-city centers. The R_LL I shows that the public partner, by providing long-perspective support for the project, has reflected as well as strengthened the positive social assessment. The success of the local agreement worked out has also become an argument favoring the strengthening of the supra-local function in Lubań and the expanding of the revitalization vision. The durability of involvement in the project, on the part of the public partner representing the supra-local level, has become the guarantee of continuation and transition to the next level of development.

The R_LL II in Gdańsk-Orunia brings into attention the fact that this format, more than the R_LL I, has been an observation of the process rather than a project implementation. R_LL II is an example of format expansion, from a Social Innovation Living Lab, broadening its activity through social and spatial projects that facilitate the development of multi-faceted revitalization. The GFIS organization's activity in the environment of a deprived district, using the potential of cooperation with an academic center, has again indicated that revitalization is an integrated process. The district dialogue about space, which had been years ahead of the city's activity, was based on the assumption of knowledge expansion and harmonization. It was not so much about designing a specific vision of development and gaining support for it, but about preparing the local community and its representatives – activists, district and city councilors – for constructive cooperation, as part of the municipal renovation and revitalization processes. The cooperation between GFIS and GUT translated, firstly, into an intra-district dialogue, moderated via a local social network; secondly, into the strengthening of the district's position in the municipal authorities' policy and administration; and thirdly, into the building of the district's new image, so as to break away from its stigmatizing external perception. Transition to the next stage of revitalization will require access to financial programs dedicated to energy transformation, and therefore it will change the argumentation and the narrative used in the dialogue with the city administration. In terms of the R_LL II, this may mean cooperation regarding the launch of Living Lab projects testing the possibilities of new technological solutions. Their presence in the local community environment being prepared for cooperation has the potential to strengthen the achievement of synergistic effects.

Both private entities (small business) as well as communities operating with the support of local NGOs can be partners in the cooperation aimed at energy transformation, the primary goal of which is to increase the quality and the public "benefits." Nevertheless, both R_LLs affirm that the sense of social mission, shared by both the initiators and the broadly understood transformation facilitators, is the key factor in the achievement of a lasting socio-technical development change. It shapes the nature of the involvement of the partners in the transformation as well as the understanding of the multi-faceted vision organizing the process. The R_LL I and II provide the experience illustrating the scale of unrealized potential due to the lack of a habit of cooperation between public administration and academic centers. The lack of trust that exists here often leads to a wastage associated with the loss of the synergistic effects arising from the integration of knowledge and the acting with awareness of the pursuit for complexity in modernization activities. Academic centers have the competences and resources that go beyond the scope of the routine activities of municipal offices, not only in small centers. In addition to the strictly technological innovations, they gather and disseminate the organizational knowledge enabling activity aimed at initiation of innovative solutions in an alternative manner, independent of the current political trends and administrative habits.

Conclusions

Over 45 years of socialistic regime left Poland in great need of reforms and revitalization of neglected regions. Moreover, revitalization has not been the focus of the new liberal government. The new liberal policy also limited the role of local administration in supporting the rejuvenation activities. So, the citizens of degraded and forgotten municipalities and regions, alienated and left alone with life-critical problems, acquired negative and critical relations towards most of the authorities and their new ideas. In order to implement the energy transition measures one needs to address the issue of how to renew dissipated social capital and to involve the citizens in the revitalization of their own region.

As a metropolitan area located along the Gdańsk Bay, still constituting a coherent organism, the union of OMGGS has been gradually striving to establish a sufficiently strong platform for cooperation in the midst of unfavorable development trends. The slogan Smart City (Smart Metropolis) is a key element in the debate taking place under the shadow of the dynamic reality, inscribed in the global economy of speculative investments, concentrated in the core of the metropolitan area (Bisello et al., 2018). The experiences of the projects represented by the above-described examples of the R_LL in Lubań and in Gdańsk-Orunia can serve as examples of pilot solutions – important from the perspective of semi-rural and rural communes, both in the OMGGS and the entire Pomeranian Region. The key aspect here is to show not only the technical and organizational solutions, but to indicate the political barriers to cooperation that must be overcome between the public parties to the issue (the government) and the social (local community) party, which initiates a change both from the perspective of pure non-profit activism or as a model with the features of an entrepreneurship incubator. In the activity under the cooperation developed here via the R_LL format regarding the issues of energy transition greater potential for effective financial assembly, within the PPP framework, is made possible.

Development of a formula for cooperation within the informal R_LL allowed the development of results which, owing to the scientific publications, led to the expansion of the interdisciplinarity of the team cooperating, unconventionally connecting energy specialists with urban planners (in Poland). The comparison and combination of the experiences promise possible use of the hitherto developed R_LL research practices at the next stage of implementation research. Initial talks with the city authorities regarding the possibility of taking the next step towards the implementation of an energy-sufficient model of a *SlowSmartSuburb* in Orunia are ongoing. The role of a bottom-up approach in the Polish setting should be stressed: from local activists, scientists to young entrepreneurs, who are convinced about the need for energy transition, which cannot be ignored taking into account a growing population, its energy needs and depletion of fossil fuels.

The experience gained from the cooperation within the R_LL I and II highlights a number of systemic deficiencies in conducting revitalization processes, the most important of which include:

1. Ineffective mechanisms of cooperation between the public sector, the civic-social and business-social initiatives concerning spatial and organizational innovation;
2. Ineffective legal and financial instruments inhibiting the development of integrated planning and the implementation at the interface of the public (municipal) and the private sectors, including PPP;
3. A perceivable stratification between the declarative implementation of far-reaching EU development priorities and the real everyday needs associated with the unfinished convergence of quality and standards;

4. Underestimation of the time factor in the planning of urban processes and in the introduced sudden and unprepared changes generated by ad hoc initiatives and political decisions – priority for implementation activities that have been insufficiently recognized in analytical and planning studies;
5. Lack of experience in the generation of innovation derived from the balance of successes and failures rather than the sum of successes. Local-level innovation cannot be limited to the adaptation of foreign solutions to the local conditions.

Notes

1 www.ftserussell.com.
2 www.definitions.net/definition/revitalisation.
3 https://dictionary.cambride.org/dictionary/english/revitalization.
4 In operation since February 2015; for more see: polskialarmsmogowy.pl.
5 European Air Quality Index.
6 The so-called anti-smog resolutions, i.e., Plans for Low-Emission Economy, more broadly the 2020 Climate Change Adaptation Plans, with a perspective of implementation by 2030, have been drawn up by municipalities since 2015.
7 https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32008L0050.
8 Alior Bank, BNP Paribas Bank Polska, Bank Ochrony Środowiska, Bank Pocztowy, Bank Polskiej Spółdzielczości, Credit Agricole Bank Polska, Santander Consumer Bank and Bank Spółdzielczy SGB
https://czystepowietrze.gov.pl/.
9 The Revitalization Act of 2015 Article 2.1– 2.
10 It should be remembered that the family small and micro enterprises, fundamentally associated with the local community, constitute a significant part of the Polish economy (Martyniuk-Pęczek et al., 2020).
11 The method of working in the real user's environment (in situ), represented in the applications of the Living Lab model, is crucial in technical and engineering sciences. However, the concept itself is currently closely associated with the development of digital technology applications, mainly in connection with the work of MIT (Westerlund et al., 2018). LL has become the main instrument for the practical implementation of the demand-driven approach to innovation in the field of IT applications (Rembarz, 2018b).
12 https://enoll.org/.
13 JPI Urban Europe Project, 2013–2016.
14 http://gfis.pl/.
15 https://eia.pg.edu.pl/linte/main.
16 https://southbaltic.eu/-/wasteman.
17 City of Gdańsk revitalization program was started in 2016 and approved in 2017 as a strategic document addressed to four problem areas of historical districts with complex social issues – Orunia is one of them.

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9 Energy clusters in Poland

Towards diffused green energy communities

Izabela Surwillo

Introduction

Mobilizing society to actively partake in sustainable energy transitions is often a daunting task in the Baltic Sea Region and the track record of Polish bottom-up citizens' projects in renewable energy has been rather mixed so far. Recent years have been marked by the stagnation of the wind energy sector due to unfavorable regulations, whereas the first renewable energy cooperative in the country, "Cooperative Our Energy" (*Spółdzielnia Nasza Energia*), is still in its early development stages despite initial plans to open in 2020. Simultaneously, the development of photovoltaics and a growing number of prosumers show vivid societal interest in renewable energy sources (RES) that needs an appropriate financial and legal framework to grow. In this light, energy clusters are becoming crucial platforms for the involvement of local actors in sustainable energy solutions. First introduced into the Polish law in 2016, they are based on agreements of local entities involved in the production, consumption, storage and sale of local energy sources such as renewables (Ministerstwo Aktywów Państwowych, 2018). They aim at meeting the energy needs of the local communities while mobilizing the latter to actively engage in green energy production. Given the newness of the initiative, the actual impact of energy clusters on the involvement of local actors in energy transformations has not been extensively studied. Some broad studies looked into energy clusters' characteristics and challenges across different geographical locations (e.g., Jaegersberg and Ure, 2017; Lowitzsch et al., 2020; Bergal, 2020), while a number of scholars have conducted some preliminary analysis of energy clusters in Poland, for example, discussing the necessity of flexible cluster models (Moszkowicz and Bembenek, 2017), most suitable locations for RES-based clusters (Szewrański et al., 2019), their energy balance and potential for self-sufficiency (Wiktor-Sułkowska, 2018) or clusters' impact on city's air pollution (Czaplicka-Kotas et al., 2020). This chapter seeks to add to this emerging scholarship by conducting an in-depth study of Słupsk's Bioenergy Cluster in Pomorskie, the northern district of Poland. Although still in the early stages, the initiative has been recognized twice by the Polish Ministry of Energy as a national model and ranked among the ten top pilot energy cluster projects in Poland in 2018 (Sołtysik, 2018). For this reason, Słupsk's Bioenergy Cluster constitutes a

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good case study to identify and analyze energy clusters' model characteristics as well as best practices for active stakeholders' engagement at the local level, while identifying the remaining challenges.

This chapter does that based on semi-structured interviews with the local producers, energy consumers and larger entities that are actively engaged in the Słupsk's Bioenergy Cluster's operation. The analysis is steered by two main research questions: what key features determine the energy clusters' success in the Polish context, as illustrated by the model characteristics of the Słupsk Bioenergy Cluster? And, what are the key challenges to the energy cluster initiatives in Poland? The argument unfolds as follows: first, the general background of the energy cluster initiatives in Poland is outlined; second, the discussion zooms in on the Bioenergy Cluster in Słupsk, scrutinizing its formation process, model traits as well as the existing legal, economic and societal barriers to its development.

Background

The potential for developing consumer co-ownership in Poland remains rather limited, despite growing interest in RES among the population. The recent 2016 RES Act amendment favored the medium-size projects, at the expense of both large-scale RE projects and individual prosumership among households, farmers and micro-enterprises (e.g., the abolishment of favorable FIT for small installations) (Ustawa, 2015, 2016). Moreover, the development of energy cooperatives – so popular in Western Europe, is still in its initial phases in Poland. Although energy cooperatives were defined already in the Cooperative Law from 1982 (Goebel, 2019) and the 2016 RES Act additionally specified the scope of their potential electricity production from RES (Art. 2 §33a RES Act), only one cooperative has been established so far. The "Cooperative Our Energy" (*Spółdzielnia Nasza Energia)* is the first renewable energy cooperative in the country, established in 2014 in southeastern Poland as a joint project of Bio Power Sp. z o.o., Elektromontaż Lublin Sp. z o.o. and four municipalities: Sitno, Skierbieszów, Komarów-Osada and Łabunie. It involves the construction of over a dozen biogas plants, that will supply electricity and heat to local public buildings and households at prices lower than the national system (gramwzielone.pl, 2014). However, despite initial plans to open in 2020, it is still in the early development stages. This delay partially owes to the fact, that energy cooperatives suffer from the lack of dedicated support, as the recent RES legislation focuses rather on the development of energy clusters.

Energy clusters (*klastry energetyczne*) were first introduced into Polish law in 2016 by an amendment to the 2015 RES Act (Ustawa, 2015, 2016). According to the 2016 RES Act, the energy cluster is defined as a civil law agreement, which may include physical persons, legal persons, units and research institutes or local government units. The purpose of the energy cluster is the production and balancing of demand, distribution or trade in energy within the distribution network with a rated voltage lower than 110 kV (ibid.). The cluster's area of operation may not exceed the limits of one poviat[1] or five communes (ibid.). Clusters are an initiative with a local territorial scope, and therefore their primary aim is to meet local needs with the use of renewable sources and modern technologies. For a number of reasons, they are becoming a favored model for the development of self-sufficient local energy initiatives and crucial platforms for the involvement of societal actors in sustainable energy solutions in Poland.

Their role, as envisioned in the Polish Ministry of Energy regulations at the time, is to stimulate local communities' cooperation in renewable energy production for local needs, develop prosumer energy, improve local energy security and increase the competitiveness and efficiency of the local economy (Moszkowicz and Bembenek, 2017). Having a share from renewable energy, cogeneration or waste energy in the energy consumption of cluster members is one of the formal criteria of the clusters' establishment (Błażejowska and Gostomczyk, 2018). Not surprisingly then, among the most common declared goals of the recently formed energy clusters in Poland are the production of renewable energy and improvement of local energy efficiency measures, as well as the development of cooperation between science and the economy, development of new energy technologies and R&D facilities, improved local energy security and reduction of the negative impact of energy production on the environment (Burzyńska, 2016). Energy clusters also seek to provide specific business and financial benefits, e.g., through reducing operating costs and costs of building or modernizing power infrastructure, better identification of local energy needs or new investments (Czarnecka, 2018). In the long-term perspective, they are meant to utilize local entrepreneurship potential and available raw materials and facilitate the implementation of new technologies and business models at the local level (ibid.). If successful, energy cluster initiatives should be able to improve the living standards of local communities, not only in the technical and economic dimensions, but also in the social dimension – by activating societal actors and facilitating multilevel cooperation of various entities operating within a cluster.

The Ministry of Energy has actively encouraged the formation of local energy cluster initiatives and the development of their action strategies, which form the basis for applying for specific public support. So far, developments suggest that the concept met with a favorable response from market participants. Namely, the Ministry of Energy announced the first competition for a certified energy cluster in 2017 and 115 clusters from 15 voivodeships entered the competition, representing approximately 17% of all municipalities in Poland (Sołtysik, 2018). In Spring 2018, an expert panel chose 33 clusters from 12 voivodeships that received the Pilot Energy Cluster Certificate and ten clusters with the highest scores were additionally honored with the distinction (ibid.). The competition for a certified energy cluster contributed to the popularization of the concept. Additionally, the chosen pilot clusters can serve as a basis for identifying the best local practices that could be replicated nationwide. Currently, energy clusters meet around 27% of local electricity demand, by producing energy from renewable (16%) and cogeneration (11%) sources. It is expected that within a decade the average energy cluster would meet 99% of local electricity demand – with 53% coming from RES (ibid.).

However, several barriers remain. The formal and financial obstacles to the development of energy clusters and the use of renewable energy sources include, for example, the economic risk resulting from financial expenditure, the cost of connecting to the transmission network, project profitability or the return on investment (Moszkowicz and Bembenek, 2017). Finding sources of funding in the initial stages of cluster operation at the regional, national or EU level is particularly challenging, as in most energy clusters in Poland a stable self-financing system has not yet been developed and the main source of financing comes from membership fees, which are set on different principles (ibid.). Moreover, the literature on the subject highlights several factors that are likely to be decisive in the energy clusters' relative success and that constitute a challenge to the newly emergent initiatives. Some of these factors are successful vertical and horizontal integration into the energy industry, development of technological and organizational innovations, good cooperation with scientific/research units that will help in the elimination of barriers, a viable marketing strategy to promote clusters' activities (Pylak et al., 2017) or successful mobilization of the local societal actors. All these factors are key for achieving a potential synergistic effect, where diffusion of know-how and staff rotation within the cluster could increase productivity, lead to more innovation or attract resources and enterprises (Burzyńska, 2016).

Having those factors in mind, the emerging empirical studies on the subject have attempted to identify common characteristics and challenges to the clusters' establishment, governance and the policymaking process. Some have analyzed the recurring barriers to cluster development in the renewable energy sector while looking into examples from five continents and focusing on the stakeholders' relations on the ground (Jaegersberg and Ure, 2017); others compared RE clusters with renewable energy communities as defined by the European Clean Energy Package 2019 drawing on a dataset of 67 best-practice cases of consumer (co-)ownership from 18 countries (Lowitzsch et al., 2020); still others attempted to create a system of interactive data on energy clusters in the leading energy powers in the world that would allow, among others, to assess the impact of clusters on economic development (Bergal, 2020). However, although the cluster-based policy is the focal point of local and regional policy implemented by governments in many countries around the world, no single cluster model is universally applicable to different policy settings, but rather each country adapts it to its unique political and socio-economic context (Gronkowska, 2017). This warrants in-depth empirical investigations into single case studies across different national settings.

As far as the Polish case is concerned, local analysts noted that the pioneering nature of energy clusters requires the development of an effective and flexible model that would be suited for the Polish legal, economic, social and technological conditions (Moszkowicz and Bembenek, 2017). Several authors have analyzed the emerging energy cluster initiatives in Poland from a broader perspective, e.g., by exploring Polish Small and medium-sized enterprises (SMEs) main motivators to join the clusters (Pamula, 2020); discussing the potential of energy clusters in Poland vis-à-vis the experience of German energy cooperatives while highlighting the need for flexible structures (Gostomczyk, 2018); or mapping the most suitable areas in Poland for the development of biomass, solar and wind energy to aid the decision-makers in sustainable energy cluster allocation and management

(Szewrański et al., 2019). Based on calculations of clusters' energy balance some have also speculated whether RES-based energy clusters can become independent from external energy sources while pointing to the need of supplementing with more stable conventional energy (Wiktor-Sułkowska, 2018). Additionally, a couple of studies zoomed in on the concrete energy cluster initiatives. Using the "willingness to pay" (WTP) method to calculate the impact of air pollution on the tourist city of Zakopane and comparing it with the Polish average, the case study of the Zakopane energy cluster analyzed the influence of the initiative on the city's development and drew further conclusions for the local transformation to RESs (Czaplicka-Kotas et al., 2020). Another study zoomed on the Mazovian Energy Cluster to compare the classical theory of clusters with the principles of energy clusters' formation and gave recommendations on the cluster's desired structure, operation and cooperation with the Polish Energy Group (PGE) (Adamiak and Viswanathan, 2018). Although the study mentioned some of the existing challenges to cooperation (e.g., lack of motivation amongst the cluster's members, lack of flexible structure or a specific strategy) it did not discuss them further (ibid.).

This chapter seeks to contribute to this growing research on energy clusters by identifying mechanisms that facilitate the effectiveness of the energy cluster initiatives in Poland at the example of an in-depth study of Słupsk's Bioenergy Cluster's formation process and operation. This pilot cluster, located in Pomerania, the northern district of Poland with a population of 90,000, was ranked among the ten best out of 33 pilot energy cluster projects in Poland in 2018 (Sołtysik, 2018). It was also among three clusters that prepared presentations during the conference on energy cluster financing organized by the Polish Ministry of Energy (Lipiecka, 2017). The presentation emphasized the strong orientation of the Słupsk Bioenergy Cluster on local conditions and needs, and the potential for scaling and multiplication of the experiences of the Słupsk cluster in the context of other cluster initiatives (ibid.). Moreover, the potential of the Słupsk Energy Cluster to create a model for the operation of water supply and sewage enterprise within the energy cluster was highly rated by the Chamber of Commerce "Polish Waterworks" – the only organization of the economic local government (*samorząd gospodarczy*) of the water and sewage industry in Poland, associating 480 enterprises on the water and sewage market. The Chamber recognized innovation in the operation of Słupsk Waterworks and saw it as a partner in the process of developing a model for the participation of a water and sewage company in an energy cluster that could serve as a road map for other enterprises of this kind in the country (ibid.).

For these reasons, Słupsk Bioenergy Cluster constitutes a good case study to identify and analyze best practices for active stakeholders' engagement in the energy cluster initiatives, while identifying the remaining challenges.

Methodology

The analysis is based on the document analysis (municipal strategies, cluster's documentation) as well as one hour-long semi-structured interviews with 12 participants from the main entities of Słupsk's Bioenergy Cluster. The interviewees include the leader of the cluster Słupsk Waterworks (*Wodociągi Słupsk*), heating company Engie Słupsk, the Pomeranian Regional Development Agency (*Pomorska Agencja Rozwoju Regionalnego*), city council (*Urząd Miejski w Słupsku*), local wind turbine owners (Baltic Wind) as well as other types of local initiatives engaged in the promotion of renewable energy and sustainable energy solutions such as informational "green points" in the city of Słupsk or Słupsk's Technology Incubator. The analysis employs thick description – a qualitative research method that gives detailed descriptions and interpretations of situations and their background context, as observed by a researcher (Ponterotto, 2006). The thick description provides background information necessary for understanding the relevance, meanings and intentions that underpin social interactions in a given setting (Holloway, 1997). In this case, the chapter draws heavily on the interview material to provide detailed accounts of the Słupsk's Bioenergy Cluster formation process, operation and background, which also shed light on the wider national context of the pilot energy cluster initiatives in Poland and their challenges. Given that the cluster is still in the formative stages, the chapter assesses cluster's potential role in sustainable energy transition, by taking into account, in particular, the process of its establishment and organization, usefulness to the local stakeholders, significant innovation, so far diffusion of know-how, the long-term development plans and the remaining challenges.

When it comes to assessing the potential for societal involvement in the energy cluster operation, the literature on the subject suggests that several factors should be considered: first, the existing socially rooted connections, long-standing traditions of a given activity in a region and significant resources of social capital that would aid in the cluster's development (Burzyńska, 2016); second, the kind of organizational and financial support received on the governmental and local level, as well as collaborative research and support from the educational/research institutions that could enhance inter-sectoral collaboration (McCauley and Stephens, 2012); third, the framing of the cluster strategy, which if inclusive enough, has the potential to facilitate social learning and social change in addition to technical innovation and change (ibid.). And lastly, the regional "buzz" created around local sustainability initiatives that contributes to collective learning, as "actors are surrounded by a milieu of rumors, impressions, recommendations, and strategic information" (ibid., p. 213). The above factors serve to streamline the analytical focus and assess the potential of the Słupsk Bioenergy cluster to serve as a trigger of the local sustainable energy transition with societal involvement.

Słupsk's Bioenergy Cluster

Background

When discussing the formation process of the Słupsk's Bioenergy Cluster, it is worth considering the general favorable local context of the initiative. In the years 2014 to 2018, the city was governed by a leftist politician Robert Biedroń who was an outsider with political experience gained during his term as a parliamentarian (2011–2014). Biedroń surrounded himself with a couple of energy experts from Warsaw who advised him on his pro-ecological local policy and some smaller initiatives introduced by his team attracted much publicity and created a certain local "buzz" around the topics of green energy and sustainability that increased social environmental awareness.[2] During Biedroń's term, the city council was allocated special funds for green projects[3] and, among others, realized the thermo-modernization of public buildings, made investments in photovoltaics and engaged in several smaller initiatives, such as the free of charge replacement of old lighting systems into LED and thermostats by inhabitants, which resulted in savings and reduced energy poverty (Błażejowska, 2019). At the institutional level, Słupsk became the first Polish city to establish a post for a plenipotentiary for sustainable development and the green modernization of the city. A number of "green points" were also opened to serve as informational and ecologic education centers for the inhabitants. There were also plans to establish the Green Energy Institute in Słupsk in cooperation with the Ministry of the Environment that would conduct research, implement ecological education and serve as a development laboratory for the innovative activity, yet the initiative did not launch – partly due to the changed political environment at the national level and a lack of political will at the time (Jaźwiński, 2019). In 2018, following Biedroń's term in office, Słupsk has also become one of the three European pilot regions[4] employing a Consumer Stock Ownership Plan within the Horizon 2020 project SCORE[5] launched by the European Commission to facilitate consumer joint ownership of RE (Goebel, 2019). The program was targeted at groups affected by or at risk of energy poverty, as it enabled for the proactive and profitable acquisition of production assets in power stations powered by RES by consumers who did not have savings or the ability to access investment credits (Błażejowska, 2019).

The above developments created a certain "buzz" around green energy solutions and constituted a favorable context for the energy cluster initiative. However, although the activities of the Słupsk Bioenergy cluster have been included in Robert Biedroń's "green city" framework, which somewhat created an outside impression that the idea of the cluster was initiated by his team, the process of establishing the cluster had longer roots and was driven by local actors who built on the existing significant social capital.

Cluster formation process

The bioenergy cluster was initiated by the company Słupsk Waterworks (*Wodociągi Słupsk*), the publicly owned agency that operates the Słupsk wastewater treatment plant and has a license for energy production with rights to RES and combines heat and power (CHP) certificates. The company became a managing coordinator of the cluster, which was formally established in October 2017 with 19 founding members that included the city of Słupsk, the heating company Engie SC Słupsk Ltd., the Pomeranian Regional Development Agency, as well as local entrepreneurs operating in and near the Słupsk Special Economic Zone. Cluster participants include producers of electricity and heat from RES and conventional sources as well as large energy consumers, such as the local aqua park Three Waves (*Trzy Fale*) and the fishing industry.

Crucially, the project draws on the Słupsk Waterworks' experience in the implementation of energy efficiency solutions, with its main undertaking being the establishment of the "Bio-refinery Słupsk" – a project based on the energy potential of sewage treatment plants. The director of the company was among the first ones in the country to launch cogeneration units based on waste from sewage treatment plants (Rasmussen et al., 2020). Having over 20 years of experience in pollution reduction, sludge composting and reuse, and biogas energy production, the company under his leadership grasped the momentum to utilize the thermal energy and electricity produced and to propose a project that could address local power supply while developing solar and wind sources that could be difficult to integrate into the old transmission systems (ibid.). At the core of the cluster initiative is the idea to connect local energy users with energy suppliers, who would all send their wastewater (as well as some biomass waste) to the Słupsk Waterworks to locally produce more electricity and heat from renewables while lowering costs and recycling nutrients recaptured from the sewage sludge. As such, the cluster is to be based on the use of cogeneration and local distribution of thermal energy and electricity.

Given the newness of the energy cluster initiatives in Poland, it is worth highlighting the importance of local leadership in launching the project. Interviewees all agreed that the personal initiative of the Słupsk waterworks' director was key both in introducing innovations within the company and in setting up the bio-cluster. Whereas some ideas for sustainable energy projects emerged in the city in the past (e.g., the proposal of the Baltic Center for Clean Energy to be established in Słupsk), and Robert Biedroń's term provided some local "buzz" around the topic of green energy solutions, the vision of the Waterworks' director was key here. As one of the interviewees from a local wind company stated: "If it weren't for the chairmen of the Waterworks and Engie, nothing would have happened, these are people who can and want to talk, the rest can only see their own backyard for now."[6] While personal determination and communication skills were crucial, so was the public trust in the Waterworks company. As a representative of the company noted:

> generally there was a high level of trust in us, we are safe, we are also a form of monopoly as a water supplier, but our goal is not profit [...] With us, we saw that a part of this community felt safe, they did not get involved in it, but willingly signed this agreement, because they believed that we were able to produce some products that would be beneficial for them from a business point of view.[7]

Moreover, trust in the company was also high at the national level. The Ministry of Energy that evaluated different cluster proposals at the time saw its local potential and appreciated the successfully implemented smaller steps of relevance to the project. For instance, one of the cluster members, the Słupsk Aquapark, has been making financial losses since its establishment and has created much burden for the city's budget. Due to the initiative of the Waterworks director, several energy efficiency solutions introduced in the aquapark improved its operation and had a positive effect on the municipal budget.[8] Furthermore, the planned heat pipeline between the Aquapark and Waterworks company within the cluster framework would further optimize energy usage within the area.

This combination of strong local leadership and a high public trust might be one of the key success factors behind launching bottom-up energy projects in Poland. It is also not confined to the energy cluster initiatives, as local actors and businesses are often risk-averse and unwilling to assume a more active role. In the case of Słupsk's bioenergy cluster, the initial leadership met with the enthusiasm of several key stakeholders at the local level. The latter included especially the Pomeranian Regional Development Agency, which could identify additional local entities interested in the project, and the local heating company Engie, which sought to switch from the coal sources to more sustainable alternatives. The key stakeholders were motivated to jointly optimize their energy consumption.

When it comes to the technical parameters, the investments in the cluster so far have aimed to increase the local electricity and heat generation potential in renewable energy sources, as well as in conventional and cogeneration units. As of 2017, the cluster's production potential was over 15 MW of electricity installed in renewable energy, with 1.2 MW coming from the biogas sources, 14 MW from the wind sources and 195 kW from photovoltaics (Lipiecka, 2017). Simultaneously, the cluster's thermal power production potential was at 1.5 MW in biogas sources and 190 MW in conventional sources (ibid.). The cluster aims at further investments in cogeneration, wind and photovoltaic sources that include local wind and solar farms, processing plants that would supply waste from the production process and production plants that would receive cheaper heat and energy (Błażejowska and Gostomczyk, 2018). Ultimately, the cluster's strategic goal is to use the potential of sludge and waste to launch a local initiative in line with the low-carbon, resource-efficient circular economy. To do so, the project aims to establish intelligent energy management and balancing system using energy storage, build a local smart grid and improve energy efficiency measures. While the cluster is still in the early development stages and the mentioned technological solutions are underway, it has several characteristics that make it a potential model for others to follow. The next section looks into these factors in more detail.

Model elements of the cluster

Słupsk's Bioenergy cluster was one of the pilot clusters in Poland and early on became recognized as a potential model for other small cities seeking to make the transition to a circular economy based on the optimization of local costs, development of renewables and waste recycling. In large part, the cluster's innovative potential draws on the technological solutions that have been implemented at the cluster's leader Słupsk waterworks treatment plant. The latter has an ambitious development vision, as it seeks to achieve zero sewage (through pollutant removal, water recovery), zero emissions (through GHG reduction), zero waste (through resource recovery, organic recycling) and zero waste energy (through energy efficiency, renewable energy cluster) (Rasmussen et al., 2020). As such, the company has previously introduced technical solutions that contribute to the local circular economy model. The most obvious one is the sludge-generated biogas that can be returned into the cluster system as heat and electricity. Moreover, the sludge composting produces a rich in phosphorous certified crop fertilizer that is in high demand by the agricultural businesses nearby. The technological innovations introduced by the company also include dry fermentation, green waste management, special liming processing for the sediment with signs of toxicity or connecting surrounding rural areas within one sewage system.[9] All the above determine that Słupsk's wastewater plant is among the top three cheapest out of 47 companies of this size to run in the country (Rasmussen et al., 2020).

However, all the technological innovations could not be successfully implemented and utilized without strong local leadership that facilitated foreign knowledge transfer and eased the launching of the initiative by drawing on its prior project management experience. First, the leading members of the cluster have taken some inspiration from the technical solutions observed at the German energy cooperatives, as well as during study visits to Denmark, Norway and Sweden.[10] As one interviewee stated, getting some knowledge and solutions from countries with practical achievements were important, as: "after coming back from such trips, we build knowledge and competencies. [...] Our goal was to create a structure that could function in this energy market, which is difficult and unpredictable."[11] Currently, the cluster also collaborates with foreign partners within some wider frameworks (e.g., Bonus Return with Sweden). Second, the experience of the founding cluster members translates into better business and risk management strategies. The establishment of the latter is necessary yet challenging, as being new initiatives, clusters are meant to pave the way for new business models. Doing so requires significant experience in the legal, economic and political aspects of the local project management and entails higher than usual risks due to the novelty of the undertaking. It is in this sense that local entities can facilitate the process. Here, the Słupsk Waterworks was able to draw on its project investment and risk management experience gained, for example, during the implementation of smaller initiatives and innovations at the treatment plant. Moreover, as local actors noted, both the Słupsk Waterworks and the local company Engie have sufficient budgets and adequate organizational structures to take certain investment risks, such as the project of the heat pipeline currently underway or the planned power lines.[12]

Whereas local competencies are key for implementing technological innovations and managing the initiative, another key advantage of the cluster comes down to its scalability due to the unusually close geographical proximity of the cluster members. Słupsk Bioenergy cluster concentrates on very small area producers and recipients of electricity and heat while having both conventional and renewable generation sources in its portfolio. As one interviewee from a local wind company noted:

> In a small space, we have close sources of energy and the recipients, close industrial zone, which is a perfect match when it comes to energy demand, thermal energy, and a water park – such a close connection is rare. There is probably no cluster that would concentrate so many sources on such a scale in Poland.[13]

As others point out, the fact that the members of the Słupsk special economic zone, aquapark – a recipient of heat and electricity, companies such as Engie that own cogeneration, waterworks, windmills and smaller companies are all within a radius of 2–3 km makes the ultimate creation of a self-sufficient energy system highly realistic.[14] Consequently, the cluster aims to develop an independent distribution system. Whereas the heating network is already under construction, there are also plans for a local electricity grid to be built. Despite its scalability, the cluster strategy was not too broadly defined, as managing too many stakeholders from the start would be problematic. Rather the initial 20 signatories included entities both geographically close to each other and highly interested in the project.[15] As such, in line with other cluster programs around the country, the Słupsk Bioenergy cluster aimed at the level of diversity in terms of participants, energy sources and technologies that would still allow for the most effective local management.

The geographical proximity also translates into other benefits that define the cluster's model characteristics. Most importantly, it gives strong economic incentives to cluster members and magnifies the potential for the cluster expansion to interested parties. Local stakeholders are bonded by business and strategic goals as they ultimately seek to reduce their costs. A series of smaller initiatives that make up the whole project (biogas plant, technology incubator with a photovoltaic power plant, windmills) also create an added value for each partner that becomes involved in the cluster. For instance, given the need for changes as a part of the energy transformation, the cluster gives its members a chance to enter the electricity market (e.g., some cluster member companies received additional funding for that purpose) or to provide them with a viable alternative to big electricity companies (e.g., for the small wind farm owners). In this environment, establishing a platform for exchanging information and searching for joint initiatives is also easier and gradually leads to the local synergistic effect.[16]

Crucially, the project has also an important societal dimension. Given a mixture of legal, economic and societal barriers to establishing a participatory energy system in Poland, the successful cluster initiatives are in a unique position to facilitate bottom-up projects in citizens' energy with a variety of local stakeholders.

The Słupsk Bioenergy Cluster managed to coordinate a diverse group of energy producers and consumers via strong leadership and articulated goals from early on and in a longer perspective envisages that individual prosumers would join the project. As such, the initiative creates possibilities to engage private capital and to limit the capital outflow from the region while contributing to the local self-sufficiency. This is particularly important in the case of Słupsk. While there is a great potential for the development of renewable energy in the Pomorskie district where the city lies (e.g., appropriate land and weather conditions), the region remains somewhat excluded from the more industrialized and economically dynamic centers of the country. For this reason, there is also a significant brain drain from the city to the larger metropolitan areas. Creating a local project that requires a high level of specialization and social competencies could retain some of the young talents in the city. In this way, the cluster initiative would utilize the local potential to address both the economic and societal challenges. In the short term, however, the societal benefits are likely to derive mostly from the reduced costs of electricity and heat, as well as the increased awareness of the local community regarding energy production and consumption.

The latter is also facilitated by the educational and informational activities in the city, which contribute to the local "buzz" around the project and sustainable energy topics more broadly. On the general level, the already mentioned "green points" that are currently located in the public libraries focus on educational activities for the wider public that take the form of lectures, debates and classes for local schools.[17] However, although the public turnout is quite high there and especially young people show interest in the "green energy" topics, the activity of the green points and its impact is not so visible to the members of the cluster, as they focus on the slightly different audience.[18] As such, the cluster initiative itself is promoted in a number of direct and indirect ways. An example of the former includes local happenings that promoted different energy topics in the city with the participation of cluster members every one or two months.[19] Worth mentioning are also smaller promotional activities such as cluster members' company electric cars covered with informational material[20] or practical initiatives visible to the public, such as photovoltaic installations on buildings arranged by the cluster.

Crucially, the cluster also benefits from more technologically focused innovation and educational platforms that address the topics of renewable energy and sustainable energy transition in Słupsk. Most importantly, the local technological incubator runs a "laboratory of renewable energy sources" and, since 2017, conducts educational training for the companies (including start-ups), entrepreneurs and schools. The practice-focused program for technical schools from the region consists of thematic blocks on photovoltaics, heat pumps, wind microturbines, solar collectors and energy-efficient construction (e.g., professional energy-saving houses). It also involves a series of laboratory-type seminars on the design and assembly of photovoltaic systems run by professionals working around the world in the field of renewable energy installation.[21] The building of the technological incubator itself is equipped with the largest photovoltaic installation in the region, as well as different examples of prosumer installations. The above programs, coupled with initiatives for the wider public, such as open days, contribute to raising local awareness. They also gradually build local competencies, albeit so far to a limited extent, as local companies are only a fraction of business participants, with the majority coming from the rest of the country.[22]

Despite all these activities, the leading cluster members point out that based on their experience, the best way to promote the initiative and mobilize local society is to show concrete projects that will provide practical solutions to the local community, e.g., for improving energy and financial efficiency, that local actors could replicate.[23] If the cluster offer is to be widened to a large number of stakeholders, then similarly what is needed are concrete project proposals, negotiated with the representatives of the local stakeholders who enjoy high public trust and have high competencies (e.g., housing associations or local public administration). Otherwise, the local population could doubt whether ambitious undertakings such as energy clusters are to be successful in the long term. As one interviewee stated while discussing the way forward:

> In Słupsk, everyone has heard about the cluster, and everyone believes that it has enormous potential. That said, at the same time, everyone believes that it will fail [without a clear roadmap] … so we need specifics [of how to get there, i.e., concrete project proposals connected to the cluster].[24]

Challenges to the cluster initiatives

Despite its model characteristics, Słupsk Bioenergy Cluster, similarly to other energy cluster projects in Poland, faces some key challenges. The challenges include significant legal, technical and operational barriers, as well as passive and risk-averse societal or business attitudes.

The most immediate obstacles to the development of energy clusters exist at the operational level and owe to the lack of established business models for clusters and cooperatives as well as the lack of cooperation models for distribution systems operators (DSOs).[25] Whereas strategic leadership and experience of the main cluster members can help to overcome these challenges to some extent, as discussed earlier, insufficient professional tools for the cluster coordination on the market remain problematic. As such, the pilot initiatives need to navigate between different interests and expectations of private companies, local government and later also individual private actors in finding the best management, financial and technical solutions.

The establishment of the well-functioning energy balancing and storage system for the cluster members, as well as the development of the long-term financing mechanism, in particular, will be decisive for the future success of the Słupsk Bioenergy cluster. The works on the former are in the initial stages, as the cluster looks for a company with relevant "know-how" to balance the electricity from different energy sources.[26] Adjusting the entire system is not easy, as cluster members have different energy balancing techniques and different cost considerations that need to be justified at the state (e.g., control of municipal budgets) or company level.[27] Hence, dedicating enough resources for analysis and making a functional program for a cluster's balancing system will be crucial here. It would also increase the cluster's ability to obtain additional external funds in the future, although the cluster budget is likely to remain comprised mostly of its own funds.[28] As a representative of the Pomeranian Regional Development Agency in Słupsk noted:

> The problem of clusters in Poland is that they functioned as long as there were EU funds, no one thought about the need to develop certain mechanisms of cooperation between cluster participants. […] What we do – we know that we do not have EU money in the sense that we came into existence at a time when there was no such possibility of support, and it is a bottom-up initiative that seeks to create a mechanism that will make it earn for itself at some point.[29]

Sufficient funds are crucial not only for conducting the cluster's eco-friendly policies and running new projects but also for opening the initiative to citizens' energy and other local companies. At the moment, the cluster members mostly incur mutual costs while applying for additional funding from the regional and EU funds.[30] External funding is also key as far as the innovative potential of the individual cluster's members is concerned. As an interviewee from Engie that received a subsidy for gas cogeneration from the National Fund for Environmental Protection (*Narodowy Fundusz Ochrony Środowiska*) noted: "Heating in Poland is generally underfunded, if the country is to move away from coal there must be a signal for these companies that they will get help [for innovation]."[31] Despite certain optimism that this type of funding will be available in the future, the cluster focuses on the strategies for generating its own income. This task is made harder by the track record of the unfavorable legislative environment in Poland.

Legal barriers constitute one of the most pressing challenges to energy cluster initiatives in the country. They largely derive from a combination of technocratic energy governance at the state level that protects big energy businesses under its control and a lack of a clearly defined long-term energy strategy that would be followed by the subsequent governments. First, the strength of the coal lobby and the current dynamic of the energy market that remains dominated by several big companies creates divisions between different market players and hinders the development of the renewable energy sector. Although cluster initiatives are a certain exception here, local actors point that there is still insufficient support from the governmental side in terms of dedicated programs (e.g., tax incentives for developing RES projects locally) coupled with a lack of consistency in following the current regulations (e.g., a need to build new distribution networks by the cluster, while there are existing ones locally). The perceived problem also exists at the level of the local government, as cities' local development plans are often not specific enough, as far as cluster initiatives are concerned.[32] If the type of the above support is not available in the future, there is a risk that cluster initiatives will be only realized in a limited form.

Second, there is a general instability of state regulations. The frequently changing regulations have previously forced many companies working with RES to withdraw from the projects, leaving the investors embittered. Currently, there are similar concerns that "the rules of the game" can change during the ongoing ventures. As a representative from the Pomeranian Regional Development Agency pointed out: "it is a matter of trust … the state by creating a confusing energy market and making decisions that are sometimes incomprehensible to its participants caused the level of trust to drop significantly."[33] Moreover, the regulations themselves are often unclear, and the risks involved in their interpretation (e.g., whether the network under construction a direct network) magnify the general risks for the investors. In the case of Słupsk Bioenergy Cluster, e.g., this lack of clarity effectively left some entities more loosely affiliated with the cluster (e.g., local wind companies that are partners, not participants of the cluster in a formal sense).[34] Therefore, there is high pressure from the market participants for the cluster initiatives to be firmly based on legislation to avoid changing legal frameworks mid-way through project developments. Especially, the business trends currently are changing. As the staff from the training department of the local technological incubator in Słupsk noted, whereas previous legislative changes had stopped for a couple of years new RES business initiatives in the region, since 2019, this trend has been slowly reversing due to new rules, subsidies as well as changing market needs (e.g., renewable energy installations on single-family houses).[35]

Lastly, there are significant barriers when it comes to general societal and business attitudes. Whereas lack of enthusiasm for the new bottom-up undertakings in sustainable energy solutions can be partially explained by the unclear regulatory framework and, to some extent, overcome by strong local leadership, it is also deeply entrenched in a wider socio-economic context in Poland. As the leader of the cluster noted: "at the moment, we are not able to cross two barriers, the legal barrier and the mental barrier that we can undertake such projects in Poland in general."[36] The risk aversion among local businesses hinders innovation and translates into mostly short-term economic focus that comes down to the question of "how much less will I pay for electricity when I am part of the cluster?"[37] As the cluster member notes:

> The first question we encounter is who will make money from it, the conversation starts with money and not with potential, [and] even if we cross the first barrier, then there is a question of commitment. I do not even talk about financial involvement, but business is focused on its activity and [often] has no research and development potential.[38]

The lack of business competencies in this area often goes hand in hand with a lack of an appropriate structure to change the company's energy policy at the local level so that it would have a stronger political and economic dimension.

As a result, local entrepreneurs often avoid taking risks and look for immediate profits, while waiting for a ready offer from the cluster. This low stakeholder engagement and expectant attitudes reflect the wider socio-economic context in Poland, and as an employee from the city council office working on the implementation of energy efficiency projects noted "it's not about money, it's about our mentality."[39] Yet, an attitude change is much needed, especially among cluster initiatives that comprise of a different set of actors with different expectations, who nevertheless need to work jointly on common projects that will ensure the initiative's self-sufficiency in the long term.

For the time being, local companies, as well as key cluster participants, are awaiting further development steps of the project. Whereas a photovoltaic farm might enter the design phase soon, the current plans revolve around building an energy distribution system – starting from a heat pipe and an energy cable between Waterworks company and the Aqua Park, as well as an independent electricity grid for renewable energy produced and shared within the cluster. Once the system is established, it will allow for better integration of cluster participants and higher self-reliance in managing the initiative.

Conclusion

To conclude, this chapter sought to shed light on the model traits as well as the existing challenges of the new energy cluster initiatives in Poland, by zooming in on the pilot Słupsk Bioenergy Cluster in the Baltic coast region. By discussing the cluster's background, formation process and key characteristics the analysis identified several model elements of the initiative and some pressing challenges ahead.

A combination of factors has determined the cluster's so far success. The leadership of the Słupsk waterworks company played a key role in forging an agreement, as it enjoyed high public trust locally and brought to the table a solid track of project management experience, technological innovation and know-how. The geographical proximity of clusters' diverse members additionally contributed to the project's scalability and heightened its potential for circular economy solutions, while creating joint business goals for the participants. In a wider perspective, the favorable political context and the ongoing educational and promotional activities in the city in the field of sustainable energy solutions also create a certain "buzz" around the topic and increase inter-sectoral collaboration. Although the initiative is still in the early stages, the above conditions will increase the synergistic effect of the project in the long run. It is worth highlighting though that if some model elements of the cluster owe to the pre-existing conditions (e.g., geographical proximity), the local leadership is particularly important in the Polish socio-economic context. The example of the Słupsk Bioenergy Cluster shows that a strong cluster leader can create enough enthusiasm to mobilize local social capital and to mitigate some risks related to the business, legal and societal barriers by drawing on its high public trust, resources and experience. This example is highly applicable to other regions of Poland, as the bottom-up cluster initiatives face similar challenges across the country, where the general risk-averse business attitudes and societal disengagement could be partially mitigated by strong local leadership. However, although local actors can initiate and facilitate the development of the local projects and use innovation to overcome some of the obstacles, scaling-up projects such as energy clusters inevitably remain dependent on the legislative framework in place. In Poland, the strong traditional fossil fuel industry inhibits regulatory solutions that would provide the distributed, RES-based initiatives with better access to the energy market. In the case of the Słupsk Energy Cluster, this resulted in a need to build an alternative energy distribution network for the cluster members. Moreover, other significant barriers to the advancement of the decentralized energy initiatives also remain, including insufficient governmental support and incentive schemes for energy production from RES at the local level, a lack of established market tools for new business models, lack of a stable legislative environment or the slow implementation of the EU regulations. Therefore, as far as energy cluster initiatives are concerned, it would be especially recommended that the legislative framework ensures better access to the energy market for the new local RES producers in the future and that better tax incentive schemes (e.g., for the production of energy from RES) are developed to foster the development of the bottom-up initiatives. On a wider scale, it is also crucial that there is a clear long-term energy policy course at the national level and that subsequent new regulations align with it to provide a stable business environment for the market players.

Despite insufficient governmental support, energy clusters remain in a unique position to advance the bottom-up transition to sustainable energy systems. The early experiences of the pilot Słupsk Bioenergy Cluster also highlight that strategic leadership, which can maximize local innovative potential and mobilize local actors, is crucial to overcoming some of the key barriers to the cluster initiatives in Poland.

Notes

1 Local administrative unit.
2 Author's interviews at the City Council and at the "green point," the main public library in Słupsk, 13 July 2020, Słupsk.
3 Author's interview at the City Council, 29 July 2020, Słupsk.
4 Together with Susa Valley from Italy focused on heating systems using biomass and Litomerice in the Czech Republic using photovoltaics.
5 "SCORE" = Supporting Consumer Ownership in Renewable Energy (CSA 2018–2020) Grant Agreement 784960.
6 Author's interview at the Baltic Wind.
7 Author's interview nr 2 at Słupsk Waterworks (*Wodociągi Słupsk*), 18 July 2020, Słupsk.
8 Author's interview at the Pomeranian Regional Development Agency – PARR (*Pomorska Agencja Rozwoju Regionalnego*), 27 July 2020, Słupsk.
9 Author's interview nr 1 at Słupsk Waterworks, 16 July 2020, Słupsk.
10 Author's interview nr 2 at Słupsk Waterworks and interview at the Pomeranian Regional Development Agency.

11 Author's interview at the Pomeranian Regional Development Agency.
12 Author's interview at the Baltic Wind and interview nr 2 at Słupsk Waterworks.
13 Author's interview at the Baltic Wind.
14 Author's interview at the Pomeranian Regional Development Agency.
15 Author's interview nr 2 at Słupsk Waterworks.
16 Ibid.
17 Author's interview at the "green point."
18 Author's interview nr 2 at Słupsk Waterworks.
19 Author's interview at the "green point."
20 Author's interview at Engie (heating company), 20 July 2020, Słupsk.
21 Author's interview nr 1 at the Słupsk Technology Incubator, 30 July 2020, Słupsk.
22 Author's interview nr 2 at the Słupsk Technology Incubator, 30 July 2020, Słupsk.
23 Author's interview nr 2 at Słupsk Waterworks and interview at the Pomeranian Regional Development Agency.
24 Author's interview at the local company, 16 July 2020, Słupsk.
25 Author's interview nr 2 at Słupsk Waterworks.
26 Author's interview at Engie, ibid.
27 Author's interview at the Baltic Wind.
28 Author's interview nr 2 at Słupsk Waterworks.
29 Author's interview at the Pomeranian Regional Development Agency.
30 Author's interview nr 2 at Słupsk Waterworks; ibid.
31 Author's interview at Engie.
32 Author's interview at the Pomeranian Regional Development Agency.
33 Ibid.
34 Author's interview at the Baltic Wind.
35 Author's interview nr 2 at the Słupsk Technology Incubator.
36 Author's interview nr 2 at Słupsk Waterworks.
37 Author's interview at the Pomeranian Regional Development Agency.
38 Author's interview nr 2 at Słupsk Waterworks.
39 Author's interview at the City Council.

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Part IV

Insights from other sectors and regions

10 Actor roles and practices in energy transitions

Perspectives from Finnish housing cooperatives

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Introduction

Housing sector represents a huge potential – as well as a major challenge – in efforts to achieve a carbon neutral society. In Finland, the housing-related practices are responsible for 20% of total energy use and for one-third share of the carbon footprint of an average resident, the major share coming from heating. Much of the existing building stock will go through renovations in the coming decades and the decarbonising energy system requires more demand response capacity, dispersed production and energy storages. It is thus essential to understand how to accelerate the shift towards renewable energy, as well as energy efficiency and sufficiency, in homes.

Despite apartment buildings accommodating one-third of Finland's population, they have become the focus of energy policy only recently (Kivimaa et al., 2020). Several recent, cross-sectoral policy developments position housing cooperatives at the forefront of energy policy. The Ministry of Economics and Employment of Finland commissioned a *Smart grid taskforce* in 2016 to coordinate activities in the implementation of the EU energy community legislation (Pahkala et al., 2018). The work led to legislative reforms that ease rules for the energy micro production and required energy companies to enable the sharing of produced electricity in the energy communities, such as housing cooperatives, without extra fees. Further, the State Energy Authority enrolled a *network of regional energy experts* to provide more hands-on advice on the period between 2019 and 2023, and *Energy Aid Program* for housing was launched in 2020 by the Ministry of Environment. Both actions aim to push energy actions on the grassroots level. Finally, the new *Building Renovation programme* 2020–2050 mandated by the EU aims at coordinating building energy activities and provides support across the country. On the local level, networks of cities and municipalities, such as the national network of *Carbon neutral municipalities* (CANEMURE), are engaged in experimentation and piloting sustainable energy use in buildings (Heiskanen et al., 2017).

Housing cooperatives[1] are at the centre of implementing climate policies for the building sector, as they are a dominant form of governing residential building stock. However, the policy designs and developments often miss the

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residents, who form the central decision-making body that should be engaged in the sustainable energy activities and whose everyday consumption practices steer the energy demand in buildings. We suggest that better policy implementation requires a practice-based understanding of these dynamics. Previous research exists on the ways the material conditions, ownership structures and decision-making dynamics of housing affect the long-term development and implementation of the energy policies for buildings (e.g., Kivimaa and Kern, 2016). Research also exists on the roles of professionals as intermediaries in transitions (e.g., Kyrö et al., 2012; Lazarevic et al., 2019; Peltomaa et al., 2020), the interplay between novel technologies or building physics and user practices (Gram-Hanssen, 2011; Strengers, 2012; Wolff et al., 2017) and professional practices in the building sector (Gram-Hanssen et al., 2017; Macrorie et al., 2015; Shaw and Ozaki, 2016), while less has been said about the practices in housing cooperatives and how actors reproduce and reconfigure these practices.

This chapter presents the findings of a study, in which we interviewed key actors – property managers, board members and residents – in eight Finnish housing cooperatives engaged in sustainable energy projects. The objective of our study was to utilise practice-theoretical approaches to uncover (1) what are the practices either supporting or preventing engagement with sustainable energy in housing cooperatives and (2) how do people conceive these practices and their agency for changing practices towards sustainability. The findings provide insights for the reconfiguration of housing practices by linking systems of politics, education, planning, management and housing more closely together.

In the following sections, we outline the theoretical and methodological premises of the study. Then, we present the results and provide concluding thoughts in the final section.

Conceptual framework

Practice theories are much used in sustainable consumption research, yet they are applicable to many domains of activity (Schatzki, 2015; Welch and Yates, 2018). In the housing sector, Guy and Shove (2000) have emphasised the importance of understanding cultural and social engagements when energy-efficiency decisions are made in building research, design and construction. Also, Karvonen (2013) has employed practice theory in analysing the complexity of community-based domestic retrofit programmes. In their study on heat pumps, Gram-Hanssen et al. (2017) highlight the need for improved communication between professionals and residents in embedding new technologies in everyday practices. Incumbent regime practices in different areas, for example, the energy company business models, operations of construction and renovation companies, and education for building maintenance and management specialists, as well as asymmetric information between the different actors, non-functional regulation and incentive structure and lack of technical expertise, have been identified as barriers for shifting energy practices (e.g., Macrorie et al., 2015; Palm, 2013; Palm and Reindl, 2018; Shaw and Ozaki, 2016).

According to Strengers (2012), practice theories overcome "common dualisms" manifesting themselves in the energy sector, such as supply and demand, consumption and production, and behaviour and technology. In practice theories, the focus shifts from autonomous agents, structures or technologies, onto practices reproduced through daily performances. Until recently, theories of practice have said relatively little about people in their emphasis to serve as a "middle-range theory" (Schatzki, 2017, p. 26). According to Shove and Pantzar (2005), individuals hold a very specific role in practice theories as "carriers" or "performers," who are both "captured" by practices and reproduce them through their actions. In addition to individuals holding the potential to alter the practices, participants in particular practices occupy particular roles and positions – different ways of carrying on a set of practices and being someone of a given sort in them (Schatzki, 2017). These roles comprise partially overlapping and partially divergent understandings of these practices and skills to perform them.

As Strengers (2012) notes, the practice approach also acknowledges the agency of other than human actors: for example, new technologies, such as air conditioning or heat pumps can bring changes into practices and hold them together, while the limitations of the existing building stock or the energy infrastructure can make the practices rather constant. While studying the role of professionals in implementing sustainable building code in the UK, Shaw and Ozaki (2016) noted how technologies participate in reconstituting existing activities and relations, acting "to unite means and ends" (sometimes with undesired outcomes). They use the example of solar photovoltaic technology, in which the housing cooperatives were able to maintain their jurisdiction as housing landlords and existing relationships with tenants and energy suppliers. The combined biomass heat-and-power (CHP) technology, in turn, required the housing cooperative to register as a utility provider and build new practices, such as sourcing energy, supplying fuel and billing residents for energy consumption. In the contrasting cases, the technologies were strategically mobilised to keep in place or reconfigure practices.

Overall, the housing cooperatives can be seen as key players in the energy system transition on three levels. *On the level of energy systems*, the building stock has a large demand response and dispersed production capacity that can be utilised in the networked system by utilising diverse enabling technologies. *On the project level*, the housing cooperatives can mobilise investments in novel energy services and smart energy technologies that reduce the demand for fossil fuels and lower the carbon footprint. *On the level of everyday interactions*, the housing cooperatives are facilitators of different constellations of energy-related practices that might transform the energy consumption patterns. All three levels are relevant, when considering political activation of the housing cooperatives, although our analysis focuses mainly on the last two.

Materials and methods

In our study, we focus on the critical practices for sustainable energy transition in the housing sector and various roles the actors can take in these practices, by interviewing the key actors in eight Finnish housing cooperatives. The key actors in the housing cooperatives are the residents (of which those who own their property are also shareholders) and the board members elected by the annual meeting of the shareholders. In addition, a professional property manager oversees the day-to-day operations of the apartment building as well as supports the board in the planning and communication activities. Property managers have been identified as important middle actors between policy, technology, residents and their practices in previous research (Peltomaa et al., 2020). In two of the studied housing cooperatives, the property management company was also co-owned by the housing cooperatives, while in others it was selected based on market tendering.

Five of the housing cooperatives are in Helsinki, two in Vantaa and one in Joensuu. The construction year of the buildings ranges from the late-1950s to the early-1990s, and the housing cooperatives vary regarding type and number of buildings. The housing cooperatives had carried out sustainable energy projects, such as installing smart meters and predictive heating systems or larger refurbishment project preparations. We considered the engagement in the projects as an indicator for interest towards sustainable energy solutions and thus a selection criterion to be included in the study.

Our aim was to interview property managers and chairs of the boards from all housing cooperatives, as well as board members and residents from five that represented different sites and sizes. We conducted altogether 50 interviews between December 2019 and May 2020 (see Table 10.1). The interviews took place in the interviewees' homes, in the housing cooperatives' shared spaces or in nearby cafeterias. In addition, since the closures due to the Covid-19 pandemic, almost half of the interviews were done by phone or by video conferencing tools. The interviews lasted from 15 to 95 minutes, the average being around 45 minutes. The semi-structured interviews covered the themes of 1) the personal engagement with energy and main sources of information; 2) the most recent major renovations and activities; 3) the planned energy renovations; 4) the collaboration between different actors in these renovations; 5) the available information, financial or other support; and 6) the communications and collaboration within housing cooperatives. The interview guide was adjusted to the different types of actors but covered all the themes for each group.

The transcribed interviews were qualitatively coded and analysed based on our theoretical framework. There are many ways of conceptualising practices (see e.g., Gram-Hanssen, 2011). In our study, following Schatzki (2015), we see practices as entities organised by participants' understandings of how to do things, the

Table 10.1 Number of interviews

Property manager[1]	*Chair of the board*	*Board member*	*Resident*	*Total*
4	9[2]	14	23	50

[1] Some of the property managers were unwilling to participate in the interview at the time.
[2] In one of the housing cooperatives, both former and recently chosen chairs were interviewed.

principles and rules they are guided by and normatively prescribed objectives and ends. Moreover, technologies and material arrangements have been considered important especially in practice-based studies on energy and thus also in this study (see Gram-Hanssen et al., 2017; Strengers, 2012).

Results

The different roles of actors in practices of housing cooperatives

There are three main categories of actors in the regular housing cooperatives: residents, boards and property managers.[2] In times of renovation projects, the network extends covering other actors, such as consults, planning offices, technical experts, engineers, builders and building companies, inspectors and public authorities. However, in this section, we focus on the roles of boards, property managers and residents.

Some of the **board chairs** described themselves as "project managers" having to take care of a number of things related to the daily practices in housing cooperatives, and they considered their active role as critical for day-to-day upkeep, as well as for any improvements, in the housing cooperative. This role also gives them natural leadership in taking the initiative of energy projects. The workload has increased over the years with new requirements on planning and reporting, so the position resembles part-time work and currently many of the chairs get compensated for their time invested. The board members also expected the chair to clearly take the lead and to actively communicate with the property manager. The residents valued the active presence of chairs via regular updates in bulletins and emails.

Board members saw themselves having various roles. Some were actively educating themselves about energy issues, while others considered themselves as mere receivers of the information. This was somewhat in contrast with the expectations that were given to the board by the chairs and property managers, who expected the board members to actively look for information, be interested in learning and put effort into the management activities in the housing cooperative. The residents often considered board members as middlemen who listen to the concerns related to living comfort and technical functioning of the building, though such daily issues are beyond their focus. The studied cooperatives differed greatly regarding the interest of residents joining the board. If the board is passive, it requires constant "pushing" from the property manager – which they necessarily did not have resources for, as they spread their worktime across dozens of apartment buildings.

Property managers were in many cases not expected to take a (pro)active role in energy issues. They were seen as important actors in "keeping the wheels rolling" in general and making sure that everything is functioning well, financially and technically, but the initiatives were expected to come from the boards. One of the chairs even described how they "do the everyday management by themselves" as the property manager only takes care of reports, certificates and other paperwork. However, if there were any issues, such as unexpectedly high consumption of energy or water, the property managers were expected to raise those and suggest solutions.

Nevertheless, the property managers are the ones with holistic information on the buildings (also in relation to other similar buildings), networks of planning specialists and, in most cases, formal education to evaluate the feasibility of different initiatives. The property managers and management companies thus hold a great potential as they have expertise and experiences from many projects and a large number of housing cooperatives, and they can share the expertise and extended networks among all the cooperatives they work with. Some chairs felt that this potential was largely unexploited and were missing a more proactive hold from their property managers, as otherwise the responsibility lay with the chair and whether they were interested in energy issues or not. In some housing cooperatives, the property managers indeed brought up some suggestions for consideration for the boards about energy management applications, solar panels, ground-source heat pumps or other renewable energies, and the board members valued that. One chair also noted that it does not have to be the property manager, but the companies could host the energy expert that could bring energy issues up in the housing cooperatives when possible.

The property managers interviewed were very cautious about their role, especially in promoting energy renovations (or renovations in general). From their perspective, it was critical that the boards take the active role and responsibility for any decisions made, as they are the ones elected to represent the residents. While some managers were willing to "guide" the board members in decision-making and to suggest potential contractors and other actors as they realised that this was something that was needed in the boards, some were more careful due to these juridical issues, liabilities and resources, even if they had the needed expertise (see also Kyrö et al., 2012).

Only a minority of interviewed **residents** considered community or sustainability as the most important aspects in managing the housing cooperatives, while most of the residents valued comfort of living and economic efficiency. The board members saw the residents have an important role in deciding whether sustainability is an important issue in the housing cooperative or not, as the board is expected to represent the residents and their feedback could trigger more active orientation from the property manager. The residents can also stall the projects they are not engaged in. Generally, the residents did not consider having much say on the energy topics, and their main means of action were providing incremental initiatives and participating in annual meetings. Few wished that the board and the property manager organised more events or other opportunities for them to discuss and become heard on topical issues or coming plans – which could have a positive impact also on the outcome of a project or materialised energy savings (see Heiskanen et al., 2013). However, some of the chairs recognised tensions in engaging residents as much as possible and considered allocating the decision-making solely for the board representing the residents as "less complicated."

The "critical" practices for sustainable energy in housing cooperatives

Based on the interviews of actors in housing cooperatives, practices critical for either supporting or preventing engagement with sustainable energy were all not directly related to energy but to the day-to-day activities such as strategic envisioning and planning, dividing work and communicating within the housing cooperative. In the following, we present main findings and examples on the practices of decision-making, planning, counselling and communication.

Practices of decision-making

The practices of everyday decision-making in housing cooperatives are in principle based on the roles described above. Board holds the main decision-making power, while chair and property manager are mainly responsible for forming the agenda. Residents, however, are not directly engaged in the decision-making activities in regular conditions.

The interest in joining the board differs greatly from one housing cooperative to another. In our interviews, the openness for new things and readiness to experiment were viewed as important characteristics in the board. Some interviewees discussed the community energy projects being envisioned in the boards, which was considered a motivational factor and learning opportunity. However, the board obligations that included long meetings and digesting large amounts of information, were also in constant conflict with their everyday life consisting of other practices, such as working and taking care of the family. In some housing cooperatives and for some board members, it seemed that their traditional role was to participate in the meetings and do what was required – and, in many cases, that was already quite a lot given the planned or on-going renovations and other responsibilities. Therefore, the energy issues were often considered demanding extra time and effort that many board members were not able to provide.

> There is, kind of, no room for those non-acute things, or we have been more like "now there is a hole in the wall, or now we fix that pipe" or "now someone said that the clubroom is in a bad condition, we need to do something about it." So, it [energy issues] has not been discussed actively in the board. It could be interesting but I feel that someone should provide a ready solution or a concept for it to proceed. If it is like "should we do something about it," it does not go forward.
>
> (HA2, member of the board)

Further, the existing practices and mandates in the boards were considered an obstacle for taking initiative. Although many interviewees were interested and inspired about energy issues, they were also hesitant about changing practices within the boards, towards being utility providers and having to learn new practices of management and maintenance (see also Shaw and Ozaki, 2016). Similarly, the property managers were reluctant to engage in new practices, as the existing work practices emphasise the day-to-day management of buildings. Here, the role of the municipal energy companies could be to provide the know-how and technologies for implementing the project and managing the new systems.

> we have many buildings and they are of similar age, and the ground is similar as well [...] we envisioned if we could get one big unit [of ground source heat] and maybe even go off-grid [...] it would be possible based on calculations. It is very intriguing idea, but I'd feel a lot better if the local energy company would be involved, as they have the technologies and know-how even if we had our own unit [...] it is quite a management, then.
>
> (HA1, member of the board)

In some cases, there was a contradiction between expectations of boards towards the property manager and vice versa, creating tensions and dysfunctionalities in the decision-making. One of the property managers also raised the issue of timing, as projects promoting energy efficiency can fail, if they fit poorly with the ongoing processes in the housing cooperative, which require long-term planning, while board members might favour more ad-hoc initiatives. Contrary to this, the board members also have power to stall the projects as the decision-making practice favours strong consensus.

> Liability is one, if the property manager is very active in promoting a certain solution, it inevitably makes the manager also responsible to some degree and if it blows, well you can imagine who will be blamed. It is very difficult. And it's not only about energy but also many other things in the housing cooperative, the one who brings something on a table is the one to carry the responsibility.
>
> (HA4, property manager)

Finally, the distinction between the residents and the shareholders is crucial for how a housing cooperative works (see also Matschoss et al., 2013). The latter might be investors that do not live in the building but still hold the power of making decisions in the annual meetings or even as board members (three of the interviewed chairs were investors). While the investors were generally considered having an obstructing role when making decisions about the renovations not directly increasing the value of the apartment, the investors might possess better resources to engage in the energy renovation projects and even have previous experience and networks.

Practices of planning

There are two main devices that housing cooperatives use for the planning of future activities. Legislation obligates the housing cooperatives to prepare an updated five-year maintenance and renovation plan and the board to present the plan to the residents in the annual meeting (Ministry of Justice, 2009), but some proactive housing cooperatives have opted for even longer-term plans or housing strategies, where the residents are given a more active role. However, it is typical that the sustainable energy topics do not fit on agenda in either.

In the case study of housing cooperatives, the focus of the mandatory renovation plans is strictly techno-economical, which reflects the normative objectives of professional planning practices in the building sector. According to the interviewees, the main aspects of plans were either related to improving the value of buildings by anticipating renovations or keeping the price of living low (or maximising rent profits) by pushing back investment decisions. The sustainability issues were not on the agenda but were instead considered to be something additional, while the obligatory renovations occupied the attention. As one of the board members noted, even if the energy improvements could reduce the costs of living, it might not be enough to persuade residents to invest in them because of vested short-term interests. Therefore, including sustainability aspects in the planning would provide the board members leverage in considering and suggesting longer-term aspects of, for example, retrofitting as an element of the larger renovations. This also enables criteria other than cost, when recruiting contractors for specific projects.

> It is the price. Those energy efficient things are often more expensive. I don't know why, maybe it is the new technology. But then you often think about what the added value is, and it has to be profitable in euros. You don't promote something just based on ideology even if it was important for you. And maybe just, I'm not sure if it was officially brought down but that ground-source heat project, I myself was not excited about that at least, because it was something like 400,000 euros' investment and the payback time was like 40 years [...] these are old buildings after all, who knows if they even exist after 40 years as the trend now is to tear down the old and build new instead.
>
> (HA5, member of the board)

Consequently, the long-term strategies offer a more deliberative and inclusive space but face a different type of dynamics. Three of the case study housing cooperatives had prepared strategies (either energy strategy in particular or more general strategy that also includes sustainability topics) that were expected to allow more visionary discussions on the long-term priorities and long-term improvements. However, the interviewed board members, while noting the potential of repositioning energy on the shared agenda of housing cooperatives, were unsure about how the sustainability goal would transform to practice as these are still rather new strategic tools that need operationalisation on a case-by-case basis. The residents were usually involved in the strategy work through questionnaires and workshops that allow voicing concerns and providing feedback, but the energy and sustainability topics are usually not at the top of their priority list but preceded by the mundane issues of convenience, healthiness and cost of living. The housing cooperatives thus lack the capabilities of linking sustainability aspects, such as more active management of heating, with comfort and convenience (see also Gram-Hanssen et al., 2017).

> in the resident survey, the most important thing was the convenience of living, outdoor areas and the economy of course, I cannot remember if the energy part was asked or what were the responses like, but the energy comes through the economy.
>
> (HA1, chair of the board)

Moreover, the board members viewed the strategies as another administrative document with less practical influence than the long-term renovation plans. The residents did not engage with the strategies as anticipated and the envisioning practices gained no reflection in the interviews. Therefore, rather than activating envisioning or deliberation of sustainable energy topics, the two complementary devices stabilise the existing planning practices in which sustainability plays a minor role.

Practices of counselling

The obstacles in integrating the sustainable energy issues in the decision-making and planning practices of housing cooperatives are connected to management of available information. The amount of information in the building sector is indeed vast and scattered across different platforms.

Financing the energy projects proved to be a particularly problematic area. There are various municipal, national and EU projects providing temporary aid for energy activities, but these are disconnected from the sphere of housing cooperatives. Some of the board chairs and members were confused about the different alternatives and hoped that they could have an overall image of the feasible solutions and support mechanisms, especially when it comes to sustainability. Furthermore, instead of approaching the apartment building as a whole, service providers and authorities often focus on specific aspects and the responsibility for reaching an optimal result is left to the housing cooperatives.

> The property manager brought up these … electric vehicle charging station aids […] there are so many kinds of them and new ones emerge all the time. Especially related to cars, there are many mechanisms and, I did not get the whole picture of which ones would be best and most functional for us.
>
> (HA6, member of the board)

Several of the interviewed chairs and board members had been actively educating themselves about energy issues and considered it valuable. Most mentioned peer-groups on social media and professional journals as important sources of information, highlighting the importance of both peer and expert support in learning about new technologies and ways to utilise them in practice (see also Karvonen, 2013). Moreover, some had also recently participated in energy expert courses, which provided them with basic tools to find out about energy issues and the opportunity to meet technical specialists. They recognised that energy ignorance may lead to for example maintaining old technological constellations, reproducing less-sustainable heating practices and missing potential economic savings. This was illustrated by the case of a housing cooperative shifting to combustion-free ground-source heat pump solution.

> Those courses are useful also because you meet people there and have an opportunity to discuss with them, hear about their experiences and things to consider […] it supports this, provides food for thought for someone like me, not educated in this field. I'd say that through these courses and listening to the experts, it has really improved the understanding of laymen like myself, and strengthened the will to take these issues forward. […] I heard about a housing cooperative, one of the board members had suggested a ground-source heat pump and the others resisted. So, people have attitudes that reflect the ignorance and lack of information.
>
> (HA3, chair of the board)

The property managers were seen as a potentially important source of information and several board members expected active counselling from the managers. Consequently, some property managers acknowledged this by organising events on energy issues and invited experts to board meetings. Some of the property managers were indeed very educated on energy issues and had a professional background on, for example, energy consultancy. However, this was clearly a minority among the studied housing cooperatives and not all the property managers found resources "to educate" the members of the board. In fact, this is also reflected in the reluctance of managers towards this study focusing on energy issues.

Not surprisingly, several board members and majority of the interviewed residents considered it sufficient to only follow energy-related issues in the news and social media feeds. One of the board members even thought that if they owned a detached home in which they had more power over energy issues, they would think about the topic more actively. Some residents also considered the daily energy practices an important topic to pay more attention to and pointed out that tailored energy tips could be a welcome way for incremental improvements. However, there were also more active residents, who used different specialist sources to verify and critically evaluate the information on the energy projects as well as passive residents who considered energy issues being totally beyond their realm of influence. The engagement with information also reflected the resident's interest in participating with the long-term development of the housing cooperative but none of the studied housing cooperatives was particularly successful in connecting personal energy interests with practices of decision-making and planning.

Many board members hoped for a centralised and independent counselling platform for seeking and finding information (both information and financial), learning about on-going projects and contacting experts. The field of energy renovations in the building sector is so complex, that having such a platform would make it a lot easier for board members and property managers to learn about and compare different alternatives and build networks for specific kinds of projects.

Practices of communication

Critical issues regarding advancing the sustainable energy topics are tied to the practices of communication. There are several areas where insufficient or wrongly positioned communication practices may become an obstacle for sustainability improvements. The topics are often entangled with the medium of communication and issues of inclusion, which should not be overlooked in the discussions on sustainable energy practices.

Already before the Covid-19 disruption, many of the boards had moved their meetings to virtual platforms of email and social media, which have replaced a lot of face-to-face interaction. This shift has accommodated a more pragmatic and strictly topical focus on the hands-on management issues with less room for general discussions on sharing knowledge and experiences about sustainability issues. In several cases, it has also excluded elderly board members who lack the skills to use these tools.

However, especially the communication between boards and residents was seen as a complex task in all of the housing cooperatives. The boards relied to a high degree on “low-tech” means, such as printed notes on the bulletin board, with the chair of the board often being responsible for printing and distributing the notes. Printed materials were considered the equal way of communication, despite it being one-way, minimal and not allowing any conversation among the residents. Many of the interviewed residents also valued the effort, because the bulletins offered clear summaries on decisions and a transparent paper trail to legitimate the actions. Some of the housing cooperatives also published a regular newsletter that included for instance practical tips about recycling but less about energy saving directly as those were considered uninteresting (or at least invisible) for many residents. Further, the board members felt uneasy to ask people to use less water or turn down heating. This highlights the stability of social norms and conventions of, for example, comfort and cleanliness, in mundane energy use (Laakso et al., 2019).

All the housing cooperatives had at least discussed about applying IT platforms for communications and management, but there were no good experiences, as they remain separate from the practices and spaces of everyday communication. Email and social media were seen as more interactive channels in all the housing cooperatives but it was recognised that they could be exclusionary and even become quite off-putting without moderation. One board member notes that not all residents even expect interactive communication. There could thus be a need for deliberation on the goals of communication and whether it is about engaging residents or merely disseminating information, as well as better reasoning for engagement efforts, as described by one of the interviewed board members:

> When I was not in the board I knew nothing. Actually, there was some kind of a survey but it did not come up what it was about and if it was part of some larger project, or why I should respond and take part as a resident. It was just a piece of paper coming by mail and it remained open what it was, what it was related to or anything. From the viewpoint of the resident, you could have hoped for a bit better background or reasoning and like "hi, as a housing cooperative we are going in this direction and this kind of project is being planned, and it is important that as many residents as possible take part." But now it seemed like [...] not so many residents got involved, which is of course a bad thing and we did not get a very wide perspective from the residents.
>
> (HA1, member of the board)

Many interviewees recognise that creating a more collective atmosphere in the building would make communications easier and more inclusive, as people would know each other and talk to each other more openly, which would both raise interest on the matters of the housing cooperative as well as help the information spread. Many residents of the smaller housing cooperatives indeed valued the more informal way of making decisions and solving issues. As noted by one board member, it is easier to say what you think in the laundry room of the building than in the annual meeting. However, this also creates potential new interest conflicts, as loud minorities might end up deciding over the whole community. Some residents, however, found anonymity important when voicing their ideas and opinions. For example, the annual meeting was considered a pressurised situation for queries or statements.

> It is easier to ask questions without going to any meeting, those are so oppressive situations. As we do have the internet nowadays and it is a modern way to communicate. So, you could just ask questions and provide suggestions online.
>
> (HA2, resident)

One important line of communication on energy issues is between boards and housing managers, but there are also complicating factors. As the managers' bill for every meeting they join, some of the board members thought that it was best to invite managers only to necessary meetings, which are run as efficiently as possible. This excludes the manager from less formal discussions on, for example, sustainability and thus emphasises their technocratic role. This could also put some pressure on the chair as the link between the board and the property manager in making sure that all actors are on the same page.

Finally, the collaboration was considered important also from the perspective of developing the residential area on more planning related topics, such as dispersed energy and storage or mobility. However, there are no official forums for discussion among housing cooperatives, which meant that unless some chairs of the boards in the area were active, the communication was challenging. The buildings are also in different stages of their life cycles and thus energy renovations are not topical to all the neighbouring buildings at a certain time. Some of the chairs indeed raised up the need for coordination from, for example, the municipalities in order to improve the collaboration.

Conclusions: towards sustainable energy practices and improved decision-making

In this chapter, we have approached the positioning of sustainable energy in housing cooperatives from the perspective of practices and actors' roles. Our findings show that the critical practices from the energy policy perspective are not necessarily related to energy as such but to mundane practices, such as those of decision-making, finding and utilising information, planning and communication. In this section, we provide summarising perspectives on how to re-engage housing cooperatives to the energy policies.

The roles and expectations towards different actors can be seen as blurry, which (un)intentionally complicate the sustainable energy improvements in buildings. It is not always clear who should hold the initiative and how the responsibilities are defined in energy investments. For example, the existing working practices and the allocation of liabilities in decision-making may discourage the property managers from taking a more proactive role in promoting sustainable energy, while the board members' initiative in decision-making might rely on this proactivity. Re-defining the role of property managers, who already hold the pragmatic knowledge on the buildings, could support the planning and implementation of sustainable energy solutions. In essence, new incentive structures prioritising sustainable energy improvements and linking them more directly to the management practices in the buildings need to be introduced for contracting to support the inclusion of sustainability in the practices of housing cooperatives' decision-making.

Education is another key area worth policy interest. The voluntary nature of the board implies that while skills related to planning and implementation of sustainable energy solutions are needed, no counselling is required nor readily available. Moreover, the property managers who are central middle-actors often lack needed skills in energy actions (e.g., Peltomaa et al., 2020). Public policy can take a facilitating position by providing tailored information platforms and accessible online and face-to-face courses available for anyone interested in energy issues in the housing cooperative. Making energy information more tangible works as an incentive also for educating the boards of housing cooperatives.

The democratic structure of the housing cooperatives might passivate the residents from committing to sustainability. First, a large share of investors in relation to tenant-owners often reduces motivation in carrying out investments and shortens the timespan of decision-making. The flawed incentive structure could be balanced by stronger public intervention by, for example, obligating energy performance consideration and modelling at the early stages of project planning or as components in the long-term maintenance plans on buildings. Second, the participation of residents in energy decision-making could be enhanced by the wider use of housing cooperative strategies as a novel planning device. However, to become effective they need to replace the established practice of planning as merely doing the inevitable and avoiding any extra effort. The actual concerns of residents are also currently undermined, as the strategies lack connection to the daily practices. The strategy work, at the level of the housing cooperatives but also at the level of the state, would indeed benefit from engaging more closely with how present but also future practices in homes steer energy demand and its spatial and temporal dynamics (Strengers et al., 2019). As the capacity of buildings as energy producers and demand response party is strengthened in a changing energy system, the connection of the residents' everyday practices with the systemic level becomes more direct. In addition, based on our findings, engagement of residents by finding varying and more informal means of communication would be crucial in providing acceptability of the projects (see also Kojo et al., in this book). This also requires an understanding of the objectives of communication and whether it is only to spread information or also to support engagement.

The practice approach also emphasises how buildings themselves, as well as existing infrastructure, create material constraints for the energy projects. The buildings are architecturally designed to operate as integrated wholes rather than consisting of modular components that could be developed and renovated separately. These create material baseline conditions, where the energy-related issues in housing cooperatives are distanced from individual residents' sphere of influence and placed on the level of the collective. Further, there are always a limited number of technical combinations available for a specific place and at the specific point of the renovation cycle – and fitting these to social practices is not always straightforward (Shaw and Ozaki, 2016). Recognising the social role of these technologies is an important communicative challenge for housing cooperatives, which can also be approached from the perspective of residential areas or city blocks. In practice, cities and municipalities can operate as facilitators for collaborative planning, co-procurement and peer-to-peer learning on the scale of residential areas. In fact, the on-going renewal of the land-use and building act in Finland is enabling municipalities to take a more proactive role in steering the development in the district and city-block level as well as creating collaborations between building owners and energy companies. This also highlights how not all the changes should be made on a legislative level or at the level of the state but together with municipalities, residential areas, housing cooperatives and other actors.

In conclusion, this chapter has revealed how the sustainable energy decisions are entangled in a complex of practices and materialities within housing cooperatives. Although the governance and maintenance of housing associations, cooperatives or companies might vary across countries, the challenges faced are shared in many contexts also in the Baltic Sea region (Matschoss et al., 2013). A practice-theoretical approach complements the systemic view on energy transitions by focusing on unarticulated gaps in actor roles and sharing of responsibilities oneveryday basis. Further, the practices such as those of decision-making, planning, counselling and communication require reconfiguration in the level of housing cooperatives, which can be supported by stronger incentives and carefully designed policy interventions, especially by providing more coordinated information management and hands-on support. The practice-theoretical reading positions the housing cooperatives as spaces of policy implementation connecting the ambitious large-scale visions to pragmatic work of reconfiguring the present ways of doing.

Acknowledgements

This work was supported by the Academy of Finland, under grant number 315898.

Notes

1 Housing cooperative (*taloyhtiö* in Finnish) is by jurisdictional definition a corporation managing the apartments, offices and business premises of a building, where a single share or a group of shares give their owner proprietary rights to specific property and voting rights in the annual meeting. To qualify as a housing cooperative, the total floorspace of apartments must be more than 50% of the building's overall surface area. Housing cooperatives are a form of collective ownership and decision-making in living environments and vary between country contexts regarding specific rules (Ministry of Justice, 2009).

2 The Board (or the Board of Directors, as defined in the Limited Liability Housing Companies Act) shall see to the administration of the housing company, the appropriate organisation of maintenance of the real estate and of the buildings and other operations. The Board of Directors shall be responsible for the appropriate arrangement of the control of the housing company accounts and finances. The Manager shall see to the maintenance of the real estate and of the buildings and to the executive management of the housing company in accordance with the instructions and orders given by the Board of Directors. The Manager shall see to it that the accounts of the housing company comply with the law and that its financial affairs have been arranged in a reliable manner (Ministry of Justice, 2009).

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11 A mixed methods engaged study of divergent imaginaries in Bergen's mobility transition

Siddharth Sareen, Devyn Remme, Amber Nordholm and Katinka Wågsæther

Commoning and decarbonising mobility in Bergen

Like Rome with its seven hills, Bergen is set amidst seven mountains on Norway's west coast. Physical geography can be determinative of many things (Marshall, 2016) and transport is no exception – unlike a flat bicycle mecca like Copenhagen, Bergen's old city centre is inaccessible from many suburbs by bicycle but within quick reach using motor transport through mountain tunnels. Little wonder that an urban planner at our seminar remarked and visualised that the mountains are Bergen's most powerful planners (see Figure 11.1). The mountains not only condition mobility flows; they also drive preferences for where inhabitants reside, with high demand for real estate on mountain slopes angled to get more sunlight in Europe's rainiest city on a northerly latitude.

Yet it is not mountains alone that determine mobility patterns, as is apparent in one of Bergen's claims to fame: in the late 2010s it became arguably the global electric car capital. Diffusion of electric automobility, helped along by a generous all-inclusive national package of incentives, made Norway a world leader in electric vehicle (EV) rollout, with 2020 marking a year with considerably more EVs sold than cars with internal combustion engines (Norsk Elbilforening, 2021; Norwegian Road Federation, 2021). In 2018, Bergen took over the mantle as the city with the highest penetration of EVs per capita from Oslo at the annual week-long political gathering of Norway in the southern city of Arendal.[1] While this title changes hands annually among Norwegian cities, EV diffusion in Bergen remains high relative to both national and global averages. This shift has been enabled in large part through financial subsidies (for EVs) and taxes (for fossil fuel cars).

The same logic of incentives can be extended to the more complex issue of multi-modal transport. Bergen municipality has signed an Urban Growth Agreement, circumscribed by the federal Zero Growth Objective, which calls for "zero growth" ("null vekst" in Norwegian) in urban car traffic while prioritising public and non-motorised transport. Accordingly, urban planners are working to reduce car parking spaces in the city centre, increase use of car sharing schemes, expand the light rail ("Bybanen"), increase bus services including electric buses and enhance bicycling infrastructure. In 2021, an old tram route

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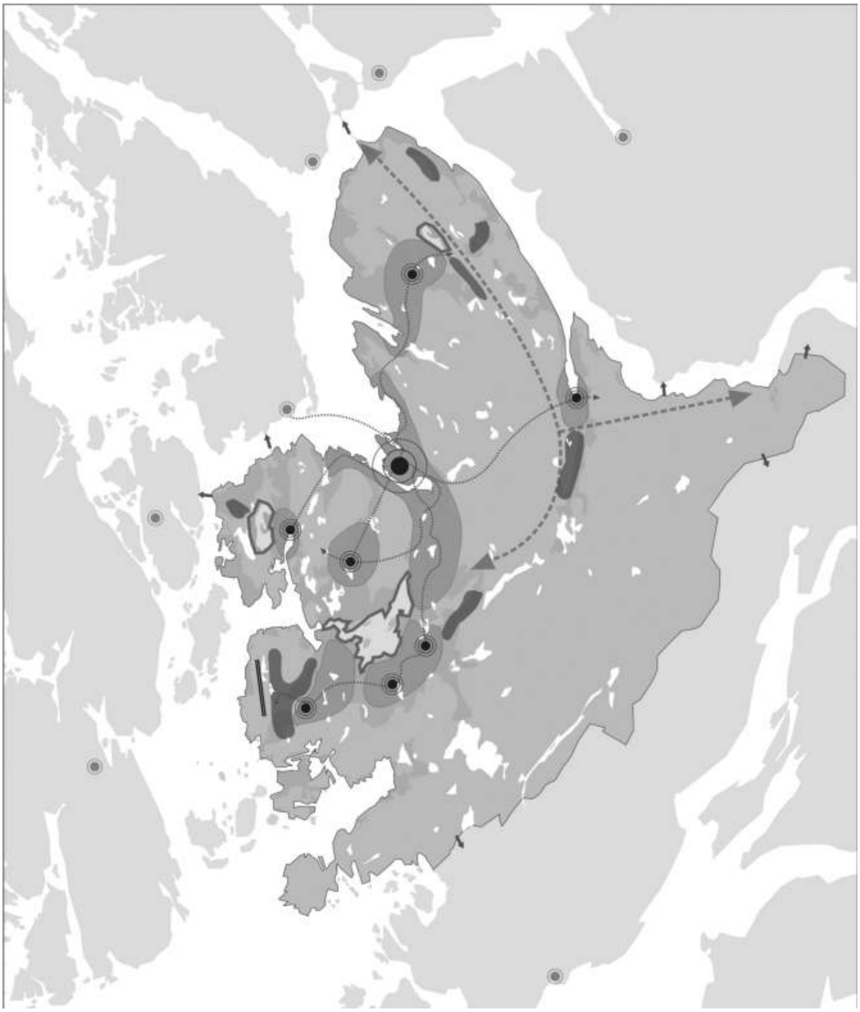

Figure 11.1 A planner's map shows that the mountains are Bergen's most powerful urban planners. Source: Bergen municipality, municipal spatial plan 2018.

was re-established after decades; an important symbolic nod to a shifting socio-technical imaginary of urban mobility. It runs adjacent to Bergen's first car-free zone of Møhlenpris, and the municipality is actively pursuing multiple car-free zones in the suburbs.

The guiding principle here is to reduce greenhouse gas emissions (principally carbon) sourced from urban transport, which is one of the major emitting sectors in a Norwegian context where most urban energy use relies on electricity which is predominantly generated through hydropower. The most straightforward way to decarbonise urban transport is to electrify it. This reduces energy demand compared to fossil fuel sources, as electric transport today is already more energy efficient (Asdrubali et al., 2018). In order to avoid a dramatic increase in demand on the electric grid, it is important to incentivise greater use of public transport solutions rather than individually powered electric cars and to activate complementary low-energy mobility solutions like electric bicycles and e-scooters. Such shifts have the advantage of freeing up valuable urban space from cars. Car-centric planning, theorised by mobility scholars as a scarcity-producing regime (Hoeschele, 2010), can be summarised as the production of unlimited wants in a world of limited resources. In response to these scarcity concerns, scholars present the commons as an alternative to privatisation. "Commoning" transport entails collective decision-making and the allocation of resources such as urban space and transportation facilities to public usage (Nikolaeva et al., 2019). The street, seen as a commons, frames automobility as an enclosure of public space for private use. Accordingly, redistributing space from cars to less resource-intensive modes represents a "communing" project (ibid). But the socio-technical imaginary of mobility in a Norwegian context is heavily biased towards automobility (Eriksen, 2020), with high car ownership rates, which makes this fundamental shift challenging to govern and incentivise (Kester et al., 2020). Indeed, Bergen's local elections in 2019 witnessed a strong performance by a political party premised on opposition to congestion fees in the city centre, finishing third with a 16.7% vote share compared to the Green Party in fourth place with a vote share of 9.9% (Bergen Municipality, 2019).

This chapter draws on a mixed methods study to advance an understanding of how socio-technical imaginaries are shaping and being shaped in what is in some ways a world-leading example of urban mobility transitions. This is particularly significant for the Nordic and Baltic context, where policy insights gleaned are transferable across cities and of high relevance in the near future. We draw on small-scale surveys with both public transport users and car drivers, expert interviews with diverse sectoral stakeholders, focus groups with transport users and discussions during a public seminar on just mobility transitions and a closed workshop with Bergen's mobility planners. We show that the main argument emerging from this study is for urban and mobility planners to explicitly address mobility transition politics and justice in public messaging and to change the embodied routines of transition planning and implementation to cohere around enabling socially inclusive mobility futures during rapid sectoral decarbonisation. Thus, we call to heighten explicit ambition to reshape the socio-technical imaginary of mobility through altered bureaucratic routines of urban governance.

We proceed as follows: a short theoretical section features a review of literature on socio-technical transitions and imaginaries, and on energy justice. A section on our methodology comes next, followed by empirical analysis that sequentially utilises our mixed methods data. A discussion places our findings more abstractly within an energy justice framework. We conclude with key policy insights for commoning mobility in Bergen and other transitioning Nordic and Baltic cities.

Transition politics, socio-technical imaginaries and energy justice

During the 2010s, the urgency of low-carbon transitions such as decarbonisation of the urban mobility sector has become a major issue on policy agendas (IPCC, 2018). Following the Paris Agreement of 2015, this is reflected, for instance, in the Sustainable Development Goal (SDG) 11 on sustainable cities and communities (Nikulina et al., 2019), in the ambitions and membership requirements of global city networks such as C40 Cities and the Covenant of Mayors (Croci et al., 2017) and in cities' own carbon budgets and commitments (Phdungsilp and Martinac, 2013; Vagnoni and Moradi, 2018) such as Bergen's Urban Growth Agreement (Haarstad, 2019).

These targets and concomitant real-world activities have prompted rapid growth in scholarship on socio-technical transitions, evident in the rise to prominence of e.g., the Sustainability Transitions Research Network and its flagship journal *Environmental Innovation and Societal Transitions* (established 2011) and the influential journal *Energy Research & Social Science* (established 2014). Seminal (e.g., Markard, Raven and Truffer, 2012) and more recent agenda setting contributions (e.g., Köhler et al., 2019; Sovacool et al., 2020) and synthesis reflections (e.g., Van Veelen et al., 2019) showcase the breadth and depth of this established field of scholarship. Within this vast field, there is a rich focus on urban transitions (e.g., Loorbach et al., 2016; Frantzeskaki et al., 2017), including a direct concern with a range of socio-technical pathways for urban mobility transitions and the roles of diverse stakeholders (Marletto, 2014; Axsen and Sovacool, 2019). These studies have shown that challenges linked with mobility transitions are inherently political, dynamic and contingent upon the political economy of urban mobility sectors. In other words, it is important to understand how government administrations, politics and the economy interact and influence each other, which impacts how mobility manifests in a city. Scholars emphasise that actors play embedded roles and mobilise embodied understandings that proliferate in a variety of ways, through their lived experience, received wisdom, inertial conventions and other cities' examples.

Within this rich tapestry of networked governance of mobility transitions, we locate our focus in relation to two distinct trends in scholarship: evolving socio-technical imaginaries of urban mobility and the impact of transitions on energy justice. Mutter (2019) employs the concept of socio-technical imaginaries to the mobility sector using the Swedish case of Linköping to examine contrasting visions of electric and biogas-based public transport. We share this concern with imaginaries of future low-carbon mobility and envisioned socio-technical pathways, but distinct from this study, we adopt a focus on justice and approach this in an explicitly socio-spatial manner.

Energy justice draws from environmental justice by acknowledging the uneven and inequitable distribution of environmental effects, such as pollution and climate change (Bullard and Johnson, 2002; Agyeman, Bullard and Evans, 2002). Taking this idea further, energy justice scholarship supports a targeted systems focus, which is better oriented for policy uptake and real-world impact (Jenkins, 2018). Closely related to energy justice is mobility justice research, wherein scholars consider transport, environmental and energy justice to be intertwined and co-constituted (Verlinghieri and Schwanen, 2020; Mullen and Marsden, 2016; Sheller, 2018; Urry, 2006). Their analytical approaches span attention to underlying socio-cultural, political and economic structures that shape policy and practice (Kębłowski and Bassens, 2017; Mattioli et al., 2020) to focus on everyday practices and embodied knowledge (Doughty and Murray, 2016; Jensen, 2010; Waitt and Harada, 2012). Similar to energy justice researchers, mobility justice scholars adopt a practical approach that extends beyond describing and analysing social inclusion. They endeavour to materialise transitions that create more just cultures of mobility.

In this study, we unpack the justice implications of urban mobility transitions through attention to what changing imaginaries imply in terms of use of urban space. Following Nikolaeva et al. (2019), we regard a justice lens as a push for commoning mobility, foregrounding shared resources and participatory processes in response to scarcity. This has deep resonance with Baltic urban contexts, whose mobility transitions have complex legacies and face current challenges (Grava, 2007). To this focus on mobility transitions, we add what is by now a relatively mainstream understanding of energy justice that links sustainability to social and spatial equity. Although this richly developed field has more to offer (e.g., Jenkins et al., 2016; Sovacool and Dworkin, 2015; Bouzarovski and Simcock, 2017), we share the concern of Wood and Roelich (2020) to advance situated understanding of what is at stake, namely competing socio-technical imaginaries of mobility futures.

To this end, a basic adaptation of what Fraser (2009) defines as the distributive, procedural and recognition-based aspects of justice are sufficient to explicate our concern with energy justice. We frame the allocation of benefits and disadvantages in society and across space under distributional justice (McCauley, 2018; Sovacool et al., 2019). Procedural justice concerns fairness in how transitions are implemented, thus serving to evaluate participation (Yenneti and Day, 2015). Justice as recognition acknowledges marginalised or vulnerable people who may experience worsened conditions as a result of the low-carbon transition (Sovacool et al., 2019). Accordingly, we structure the empirical analysis of our mixed methods data through the energy justice dimensions of distributive, procedural and recognition-based justice in Bergen's mobility transition, as a means to unpack the changing nature of this socio-technical imaginary of urban mobility.

While the envisaged sectoral shifts are legitimated in terms of these dimensions to Bergen's commuting publics, our explicit consideration devotes attention to which mobility users' interests are represented, in what manner, at what forum and which ones are potentially absent. We subsequently discuss the implications that these justice aspects have on the particular way in which urban planners, practitioners and politicians may productively regard the challenge of such a transition: as the explicit reshaping of the socio-technical imaginary of mobility to a more just way of using and moving through urban space. This analysis advances an emerging push in the socio-technical transitions literature for a more closely wedded understanding of energy vulnerability and transport as referring to highly overlapping users (Robinson and Mattioli, 2020; Martiskainen et al., 2020).

Methodology

This chapter is based on data collected and analysed during the "Just Mobility Transitions" and "Responsive Organising for Low Emission Societies" projects, where our team studied how rapid changes to decarbonise mobility impact social justice in Bergen. In combination with a literature and document review, we organised a public seminar, co-facilitated a closed workshop with municipal actors, designed and ran two linked mini-surveys and conducted 19 expert interviews.

The surveys were developed with two target groups in mind. First, public transport users (labelled the "public transport survey") and second, those who mainly commute by private vehicle (referred to as "driver survey"). There were overlapping and customised questions in each, and here we have conducted a combined analysis focusing on the overlapping questions. Together these yielded a total of 162 responses. The public transport survey featured 18 questions and the driver survey featured 21 questions. These covered commuting habits, perceptions of fairness or (dis)agreement with public transport financing and costs and concerns for climate change. We considered geographic, social and technical dimensions such as location, income, public understanding and digital literacy. The surveys were anonymous and took three to six minutes to complete.

The *public transport survey* was conducted by a researcher stationed at public transport hubs in Bergen. The researcher approached commuters who then had the choice of completing a paper version or scanning a QR code with their phone to complete the questionnaire online via their mobile smartphones. A total of nine 90-minute sessions across three locations yielded 113 responses. The initial approach of *the driver survey* was similar, with a researcher stationed at parking houses in the city centre. Four sessions across two locations yielded 21 responses. This approach was discontinued when researchers experienced persistent unapproachability of drivers and awkwardness, exacerbated by concerns related to the pandemic circumstances which had heightened by this point in time in Bergen. Instead, we requested Facebook pages and groups related to urban mobility to post a survey link to their members, and it was subsequently shared by the City Centre company (Bergen Sentrum) and City Development (Byutvikling i Bergen) group on their respective Facebook pages. This yielded another 28 responses.

The public seminar featured contributions from Bergen's urban planners, private sector mobility actors (a digital mobility solutions start-up Alpha Venturi and Bergen's largest car sharing company Bildeleringen) and local academics. While the pandemic circumstances restricted participation and the form of engagement (i.e., the format was limited to plenary talks and discussions with partially digital participation), there was strong attendance with over 50 participants ranging from planners and policymakers to practitioners and academics with an interest in urban mobility transitions.

The municipal workshop was a collaboration between the Centre for Climate and Energy Transformation at the University of Bergen and Bergen's municipal office for cycling and mobility. The need for such a workshop emerged through discussions between the two units around the roll-out of Car-Free Zones (CFZs), for which the latter unit is responsible. Convened in October 2020, the workshop aimed to generate and discuss inputs from a variety of municipal actors and mobility researchers on the next steps for CFZ development. This featured a brainstorm on the why, what and how of this municipal initiative, with a mandate to expand these zones from inner city areas to outer suburbs. Eleven municipal officials and five researchers took part in the full-day workshop.

The expert interviews were semi-structured and mainly conducted virtually in line with pandemic measures. The 19 interviewees included local and county politicians (three), municipal officials from Bergen and neighbouring municipalities (eight), a representative of the Norwegian State Housing Bank, private sector property developers and architects (four) and a civil society representative, a researcher and a journalist each with expertise on urban mobility. Interviews focused on issues linked with Bergen's broader mobility trajectory, mobility justice and explicit details of the mobility system and changes underway. The interviews aimed to bring to the fore perceptions, contestations, challenges and system components. We undertook basic data analysis using a combined deductive and inductive approach, referred to as an abductive approach, and by triangulating among four project team members to ensure a robust analytical process. This took the form of weekly meetings and detailed written analyses as we drafted this chapter.

The next section presents our empirical analysis. It draws sequentially on mixed methods data.

Empirical analysis of mixed methods data on Bergen's mobility transition

To structure our empirical analysis, we first report the results of the public transport and driver surveys as a baseline on issues relevant to a just mobility transition in Bergen. Next, we deepen insights on key issues by drawing on discussions during the public seminar and the municipal workshop. Finally, we discuss specific aspects that emerged from expert interviews with salience for social justice and socio-technical imaginaries of Bergen's mobility transition.

Survey results

Our 162 survey respondents were on the younger end of the spectrum, between 18 and 40 years old, with a quite even gender split. 75/162 owned cars, of which 31 had petrol cars, 25 had electric cars, ten had hybrid cars and nine owned diesel cars (see Figures 11.2 and 11.3).

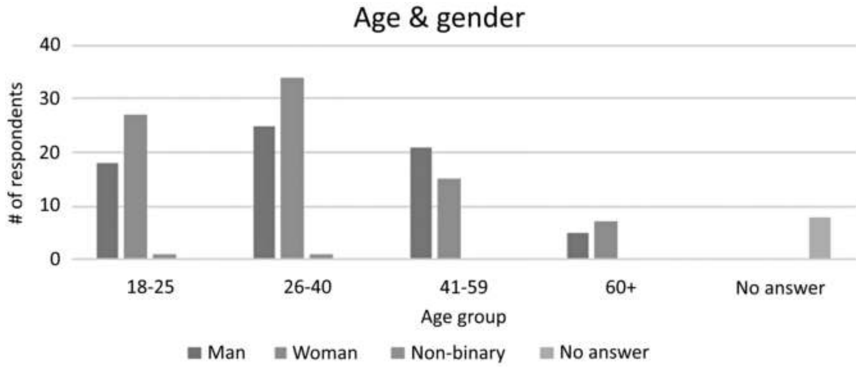

Figure 11.2 Respondent distribution by age and gender.

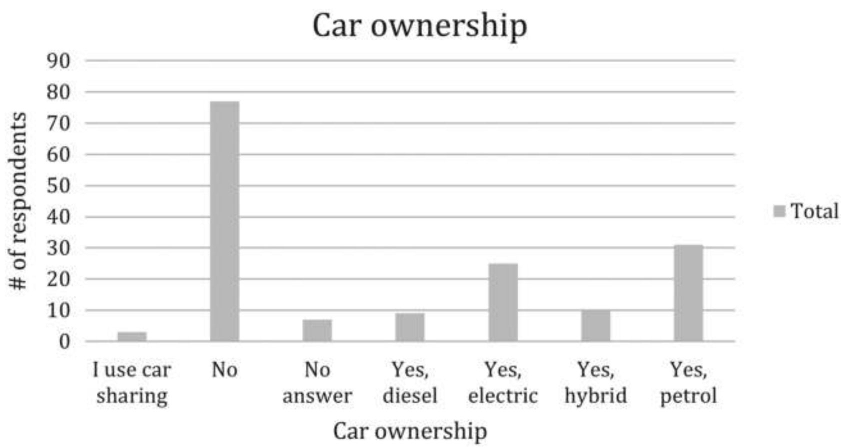

Figure 11.3 Respondent distribution by car type ownership.

Our small-scale survey offers good scope for reflections within its limited scope. Respondents overwhelmingly agreed with funding public transport by imposing tolls charges on car users (141/162) and through tax revenue (151/162) as fair (see Table 11.1). Most were favourably inclined to the prospect of free public transport (131/162) and stated that climate concerns impact their modal choice (145/162). These findings suggest that citizens' transport imaginaries are well-aligned with Bergen's urban planning vision of decarbonisation and prioritisation of public and non-motorised transport over individual cars.

To discern if this imaginary varies by car ownership, we filtered responses by car ownership. Table 11.2 shows that percentages are quite similar across the 75 car owners and 87 non-car owners. Both categories are highly positive. Yet non-car owners show a slightly higher proportion of positive responses, notably on the use of toll charges to finance public transport, where 91% are positive compared

Table 11.1 Overview of responses related to climate concern, public transport finance, pricing and tolls

Question	*Negative response*	*Positive response*	*Grand total*	*Positive rate (%)*
To what extent do climate concerns influence your choice of transportation?	17	145	162	90%
To what extent is it fair for public transport to be financed by taxpayers?	11	151	162	93%
Toll charges previously financed roads and bridges. More recently, more of these have financed public transport. To what extent is this fair?	21	141	162	87%
Some cities have made public transportation free. Is this a good use of taxpayers' money? Do you agree or disagree?	31	131	162	81%

Table 11.2 Percentage of positive responses per car ownership

Question	*Owns a car (% of n = 75)*	*Does not own a car (% of n = 87)*
To what extent do climate concerns influence your choice of transportation?	88%	91%
To what extent is it fair for public transport to be financed by taxpayers?	96%	91%
Toll charges previously financed roads and bridges. More recently, more of these have financed public transport. To what extent is this fair?	83%	91%
Some cities have made public transportation free. Is this a good use of taxpayers' money? Do you agree or disagree?	79%	83%

to 83% of car owners. Hence, while people broadly agree on these aspects of the Bergen transport imaginary, non-car owners are slightly more aligned with the city's vision.

We next consider the extent to which climate concerns shape modal choice. Table 11.3 shows all available options and differentiates respondents by car ownership. Again, we find minimal differences across categories, with a slightly higher rate of climate concern among non-car owners. Car owners have higher proportions in the two least concerned categories ("not at all" and "to a small extent"), whereas non-car owners have a slightly higher proportion in the categories that show greater concern, with one exception: car owners have a slightly higher proportion of people who state climate concern as driving modal choice "to a very large extent" (13% compared to 10%).

Table 11.3 To what extent do climate concerns influence your choice of transportation?

	Owns a car (% of n = 75)	*Does not own a car (% of n = 87)*
Not at all	12%	9%
To a small extent	21%	18%
To some extent	41%	44%
To a large extent	12%	18%
To a very large extent	13%	10%

Table 11.4 Main transport mode by extent to which climate concerns drive choice of mode

	Not at all	*To a small extent*	*To some extent*	*To a large extent*	*To a very large extent*
Car main mode (% of n = 39)	18%	28%	44%	5%	5%
Other main mode (% of n = 123)	8%	17%	42%	19%	14%

We therefore took a closer look at respondents' reported primary mode of transport, running a cross-comparison between the concern for climate in modal choice and the main mode of transport. Although 75 respondents reported owning a car, only 39 reported the car as their primary mode of transport. 123/162 reported other modes – public transport (bus or light rail), bicycling or walking. We then compared those with cars as main mode versus those with other main modes for their responses on the extent to which climate concerns determine transport modal choice. This showed a distinct difference: many respondents who used cars as their main mode stated that climate concerns influenced their modal choice "not at all" (18%) or "to a small extent" (28%), while only 5% reported "to a large extent" and "to a very large extent" each. By contrast, among respondents with non-car main modes, climate concerns influenced this "to a very large extent" (14%) or "to a large extent" (19%) for many, while only 8% stated that climate concerns did "not at all" influence modal choice. Hence, users who mainly use buses, light rail, bicycling or walking tend to factor climate concern into modal choice far more than those who mainly use cars (see Table 11.4).

Among the 123 respondents who reported a non-car primary transport mode, 37 reported car ownership. We compared these 37 respondents' spread of climate concern as driving modal choice with the entire 162 respondent sample. Car owners who do not use these as their primary transport mode exhibit above-average climate concern as an influence on modal choice. Most prominently, 24% of such respondents report "to a very large extent" compared to the 12%

average across all 162 respondents. This indicates that car owners who use their car sparingly are relatively more prone to have climate concerns influence their modal choice than average.

We also broke down climate concern as a factor by car type ownership and found respondents who state a lack of climate concern as a factor across all car types, including electric and hybrid cars. Some electric car owners also responded "to a small extent" (see Figure 11.4). This indicates that climate concerns are not necessarily a major factor behind owning an electric car.

Next, we consider the spread across primary transport modes by car type ownership (see Table 11.5). Among respondents, 56% of EV owners and 60% of hybrid owners use the car as their primary mode. Among petrol car owners, this rate drops to 42%, and among diesel car owners to 33%. While the small sample size (75 car owners) limits the scope of our claims, findings indicate a greater tendency among fossil fuel car owners to use another primary transport mode, compared to EV and hybrid car owners. While the reason for this is unknown,

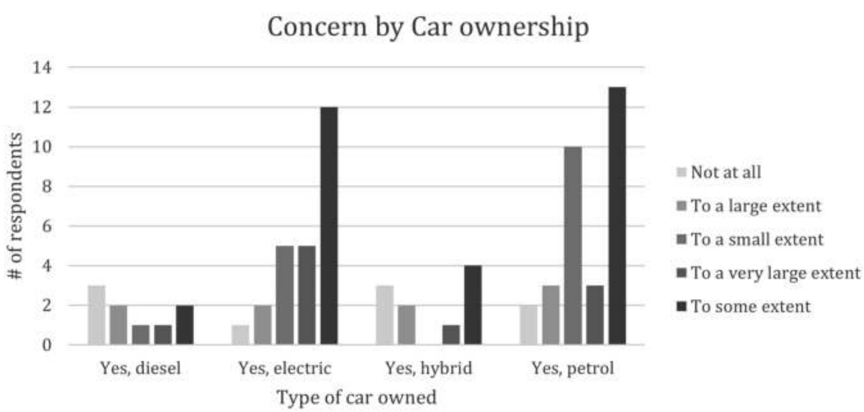

Figure 11.4 Climate concern as a factor in modal choice responses plotted by car type ownership.

Table 11.5 Primary transport mode by car type ownership

	Yes, diesel (% of n = 9)	*Yes, electric (% of n = 25)*	*Yes, hybrid (% of n = 10)*	*Yes, petrol (% of n = 31)*
Bike	11%	12%		6%
Car	33%	56%	60%	42%
Combination			10%	
e-bike	11%			
e-scooter		8%		
No answer	22%	4%	10%	
Public transport	22%	12%	20%	45%
Walking		8%		6%

Table 11.6 Car owners with financial ease or financial difficulty versus car type ownership

	Ease	*Difficulty*
Diesel (% of n = 9)	56%	44%
Petrol (% of n = 31)	61%	35%
Hybrid (% of n = 10)	70%	30%
Electric (% of n = 25)	92%	8%

one can hypothesise that, given the relatively high climate concern amongst car owners, those with petrol cars tend to limit car usage. We note, however, that other aspects such as higher fuel and toll costs could be confounding factors here.

Finally, we considered car type ownership against personal finances, based on responses to how easy it is to "make ends meet" with one's household income. EV owners exhibited ease in finances, and only 8% reported some form of difficulty with finances (see Table 11.6). By comparison, 30% of hybrid car owners reported some form of difficulty, and this rose to 35% of petrol car owners and 44% of diesel car owners.

Overall, our survey indicates substantial public support for Bergen's mobility transition, with an appetite for an affordable public transport system financed by taxpayers and car users. This holds across both car owners and non-car owners but with marginally greater support among the latter. The same applies to the extent to which climate concerns influence modal choice, where respondents voice substantial support but non-car owners exhibit a slightly higher proportion.

While respondents did report substantial climate concern, which suggests fundamental alignment with the imaginary of a low-carbon mobility transition, our findings nonetheless show that modal choices are closely linked to financial position. Notably, in some cases EV ownership does not appear to be related to respondents' climate concern.

Thus, our survey captures a link that supports the possibility of a "green buy-out": those with greater financial means tend to buy EVs and are more likely to use cars as their primary transport mode than other (non-EV) car owners. This begs the question of how many public transport users, if they could afford EVs – which are becoming more affordable and are still incentivised – might switch to at least partial reliance on automobility in the future. This constitutes a serious concern, considering that a central part of the Bergen mobility transition imaginary is a shift away from private vehicle use to public transport, cycling and walking.

Public seminar and municipal workshop

Public seminar on just mobility transitions

To facilitate reflective public discussion on these socio-technical imaginaries, we organised a public seminar on the theme of just mobility transitions. Urban planners from the municipality presented Bergen's vision of moving away from car-centric mobility towards a city centre with more public space opened up through reduction of car parking spaces, accompanied by the development of CFZs and a more diverse range of public transport services. They emphasised the policy learning they had gained through urban networks and mobility transition efforts of other cities. For instance, experience of multi-modal transport hubs in Belgium had been transposed to "mobilpunkt" in Bergen to facilitate easier connections between Bybanen, buses and the city bicycle sharing scheme. The planners emphasised their efforts to hold urban cafes and other interactive engagement modes to inform action with public needs. They highlighted the example of Møhlenpris, a city centre neighbourhood developed as a prototype CFZ, which we will return to below.

Private sector speakers introduced a focus on the potential of digitisation to assist with mobility transitions. The car sharing company Bildeleringen, the largest such operator in Bergen, pointed out that its cars served the needs of at least eight households on average, thus reducing potential car ownership eight times among its users and consequently freeing up urban space, all enabled through smart card access that allowed users to digitally book and access cars placed at many central points. A speaker from a blockchain start-up Alpha Venturi explained the potential of distributed ledger technologies to enable a mobile wallet, for instance at the mobility hubs, so that users could use the same ticketing system across operators of Bybanen and city buses (already integrated), city bicycles and car sharing schemes.

Discussion with the audience and amongst speakers brought up concerns such as the availability of and ease of access to services (both public transport and car sharing) beyond the city centre. An issue that was especially prominent in public debates on mobility at the time – the introduction of "e-scooters" – was discussed in relation to the spatial regulation of transport. An urban planner explained that the city would pilot "geo-fencing" for these e-scooters, opening up possibilities to introduce incentives and penalties for providers to meet, for instance, certain levels of provision in suburbs while limiting pavement clutter in the city centre by allocating e-scooter parking zones. These developments flagged the importance of inclusion of diverse perspectives and needs, both in the process of developing interventions and in the implementation of specific designs (e.g., of mobility hubs and smartphone applications for mobility maps and ticketing systems), as well as the key concern of mobility transitions benefitting users across the city's socio-spatial profile.

Municipal workshop on CFZs – whose imaginaries?

It became apparent from the public seminar that CFZs were emerging as a central part of the urban mobility imaginary of Bergen led by the municipality. The showcase project is in Møhlenpris, a neighbourhood that represents the epiphany of a trendy urban sustainable hipster area with popular cafes and a new beach – an imaginary distant from the realities of Bergen's outer suburb. The planners were fully aware that this city centre pilot could not be airlifted over the mountains and into the outer suburbs. They were faced with imagining how the distinct planning legacies, milieus and mobility imaginaries of these suburbs could intermesh with the ambitious timeframe of implementing CFZ projects in every suburb, with a pilot due to commence in autumn 2021 and a report identifying areas and plans for each suburb on this basis due by the end of 2022 (Oppedal, 2020).

What CFZs are and how they may be meaningfully adapted to outer suburbs comprised a central focus of the CFZ workshop in October 2020, which we convened with the municipality. The team entrusted with the suburban CFZ project articulated the challenge of choosing a suburb for pilot implementation, without clear local demand for CFZs in any such suburb and in the absence of clarity on what a CFZ would in fact entail. After all, public space was at a premium in the city centre, but what was the imaginary for it in outer suburbs, where placemaking faced completely different challenges? With the top-down mandate to materialise these CFZs not subject to public participation or political intervention, the team was positioned to make an expertise-based decision and to "move quickly" bound by predetermined timeframes. The project team regarded this mandate, however, as accompanied by the potential to create outrage, both in terms of "why here?" and "why *not* here?" A reflexive process of imagining these spaces with us as researchers and a broad range of municipal workers across relevant units therefore became an essential next step.

To support the first step of pilot selection, our CFZ workshop included preliminary envisioning of outer suburban CFZs. Municipal representatives emphasised participatory processes with local residents as key, noting that these should lead to an outcome, and that actors involved should be taken seriously. Yet, as they also noted, real participation also implied that the municipality needed to partially let go of control over the process. Here, we note a second challenge: facilitating a deep participatory process within a relatively pre-defined, tightly timebound project. The municipality has already placed CFZs within a specific imaginary: a low-carbon future where the privileges of the private vehicle are substantially curtailed. This conflicts with the project team's ability to facilitate a process that enables local residents – who may or may not subscribe to the municipality's overarching imaginary – to engage, stay engaged and feel ownership of the outcome. This specific collaboration with the municipality identified a key concern: would the project team have the opportunity and willingness to let go of some control, giving people choice to a greater extent, or would it apply an approach aimed principally at enrolling people into its low-carbon mobility vision?

We see here that municipal planners are split between their recognition of the need to observe due process with inhabitants and the need to show measurable results that speak to an imaginary of a low-carbon mobility transition. Finding the balance entails the art of juggling voices, priorities and compromises. As a participant put it, picking an "easy" suburb (with some existing street life and scope to create a convivial area) might not convince people that much had been accomplished through a CFZ, whereas picking a "hard" suburb (with a car-centric legacy) that could make a major impression ran the risk of failure, which could also be a blow for what the CFZ vision represents.

Expert interviews

During October-November 2020, we conducted expert interviews on Bergen's low-carbon mobility transition, primarily with City Council members and municipal planners. This allowed us to explore divergent imaginaries evident in political discourse, led by the green and left-leaning City Council coalition on the one side, and by a recently constituted yet large opposition party called "No to more toll roads" (FNB) on the other side. In contrast to the Green Party's dominant voter base in the city centre, where FNB had a vote share below 4%, the latter proved far more popular in the suburbs. This political polarisation reflects the divergent socio-technical imaginaries entangled with the varied socio-spatial realities of mobility and access across Bergen. The municipal planners working to enact the City Council's imaginary find themselves faced with a vocal minority of FNB supporters, amongst whom an oppositional imaginary elides persistent and cheap car use with socioeconomic equity.

An FNB representative we interviewed argued from a distributional justice standpoint that automobility infrastructure (e.g., roads and tunnels) represents a common good that should be financed entirely by the taxpayer. An interviewed Green Party representative approached the issue from a recognition justice perspective by pointing out that not everyone can afford a car, which indicates that the FNB perspective fails to recognise how funding automobility infrastructure only benefits a select group, making it inherently unfair.

The ruling coalition's reduction of parking spaces in the city aims to level the playing field of convenience and travel time between driving and other modes. Conversion of parking spaces into people-centric land use, e.g., play areas for families, illustrates the car-free socio-technical imaginary championed by the coalition. The FNB representative flagged a distributional effect in this regard, arguing that benefits are concentrated to city centre inhabitants while suburban dwellers bear the burden. The City Council's decision to create CFZs in every suburb can be read partly as a response to such critique. But the FNB representative opined that "people perceive this policy as completely meaningless, provocative and without factual justification. It's this kind of thing that makes people call the Green Party car haters." He elaborated that planners act as though the Bybanen already services these areas (providing a convenient alternative to cars), whereas the light rail line expansion will in fact take many years. This marks a clear bifurcation in mobility imaginaries – car-centric versus commoning oriented – undergirded by divergent socioeconomic visions, justice-related rationales and temporal misalignments.

The Green Party representative posited the reduction of demand for mobility as an important motivating factor for suburban CFZs, noting that the goal is to "fill the street with joy […] make it nice so people won't feel the need to go anywhere." However, if such an approach to demand reduction is accompanied by a failure to simultaneously provide access to low-carbon mobility, there is a risk of socially unjust outcomes such as spatial segregation and unequal access to pursue opportunities closely linked with one's ability to be mobile. Less vocal and organised minorities than pro-car FNB supporters, particularly poor suburban households that cannot afford a car nor housing close to convenient public transport services, are not adequately recognised in the political debate. This despite the fact that support schemes for desirable alternatives to cars, such as subsidies for electric bicycles (and cheaper commuter transport passes in other cities), have proven very popular.

Municipal planners were acutely conscious of these tendencies and the limits that this dominant framing of and contestation over imaginaries placed on their approach to mobility transitions. Planners involved with the Møhlenpris CFZ explained, "we got a lot for free," referring to many organised and engaged groups that were eager to participate in that particular process, ranging from a neighbourhood Action Group and Street Forum to a Somali Women's Group and a Retiree Group. By contrast, they saw the identification of organised neighbourhood groups – or the social construction of these places through a participatory planning exercise – as a major challenge to establish suburban CFZs, without locally established, engaged proponents of the cause.

Discussion: policy insights for a just mobility transition in Bergen

As our preceding analysis makes evident, Bergen is moving forward with its low-carbon transition, through interventions that are changing the face and functioning of its local transport system. Its inhabitants, their political representatives and urban planners, are constructing, agreeing upon and contesting sociotechnical imaginaries of mobility in which automobility is noisily but steadily being relegated to the back seat, as other modes of transport such as the light rail expand, and yet others including electric buses and a revived tram line emerge. Simultaneously, a powerful EV imaginary is taking hold, extending automobility through perceived compatibility with climate concerns, even as the contrasting project of "commoning mobility" (Nikolaeva et al., 2019) takes a weakened form of articulation as the construction of public spaces for romanticised local togetherness and attachment.

We note that both FNB and the Green Party seem to approach the debate around cars from a justice perspective but ground it in different types of justice. FNB points to distributional justice – arguing to divert the burden of paying for public transport expansion away from financing through toll charges especially into city centres – but neglects the massive investment in car-centric infrastructure funded through the public purse that mainly benefits car users. The Green Party calls for recognition of the "poor" in a Norwegian context – those who cannot afford cars to start with.

While these competing views and agendas indicate a highly polarised public, our survey responses reveal a much more nuanced and large middle: many people largely support the green imaginary, a strong public transport system and restrictions on private vehicles, but have diverse views on specific interventions (e.g., reduction of parking spaces). As further indicated by our small survey, opinion is not clearly divided between car owners and non-owners. However, the choice of vehicle (fossil fuel versus electric car) and choice of mode (e.g., public transport use when one has a car) reflects some links, albeit tenuous, both to concern for climate change and to financial capacity.

Contradicting views and actions also exist. Two survey respondents indicated a concern with climate in their modal choice, yet reported driving a fossil fuel car and not using public transport. While their reasoning is unknown, we can hypothesise that this is a distributional justice issue related to limited public transport options and the lack of financial means to change vehicles or to move to a location with more convenient access to alternative transport modes. Yet, it is entirely possible that they see their mobility needs as relatively limited and feel entitled to their level of consumption and climate budget despite fossil fuel car use. Rather than black and white relationships to a low-carbon transition, we discern lots of grey zones and nuances. These lived experiences and the contexts that shape perspectives and choices constitute the ground for myriad agreements and contestations with the City Council's socio-technical imaginary of future mobility.

In the midst of this are the planners, who implement this imaginary, with public participation as a tool for recursive alignment with public imaginaries. Yet, the romantic idea of CFZs may be too far removed from a lived reality where people need improved access to low-carbon mobility or are too accustomed to the convenience (and incentivised affordability) of automobility. Mobile subjects may be outraged by the idea that more public space could be linked to reduced demand for mobility (and consequently no improvement in public service provision), making them policy "takers" while those with EVs continue to indulge in automobility with "green buyouts," availing financial incentives from the state (e.g., subsidies, tax exemptions and reduced road tolls) and even free car charging at some workplaces. The stakes in participatory processes are thus high. We foresee the potential risk of a "green backlash" by the poor whom the car-centric stance of FNB does *not* represent, as the quality of transport services these marginalised users have access to during Bergen's low-carbon mobility transition, if not adequately high, may lead to disillusionment.

Bergen's mobility planners must make a tough choice: if the low-carbon mobility transition is limited to logistical and modal shifts, then suburban CFZs make little sense. Upping the level of ambition to adopt a more aggressive position on place-making that obviates the need for cars and improves public transport service provision to counter critique is the best way forward in this sense. But then, suburban CFZs can be understood as a means of engendering hopeful socio-technical imaginaries and placing new desirable visions of low-carbon futures in Bergen's outer suburbs, as a "solarpunk" intervention to create real utopias

(Johnson, 2020; Wright, 2010).[2] Understood thus, suburban CFZs become a matter of demonstrating an attractive alternative future in which cars are side-lined.

The Bergen case shows that, when there are engaged citizen groups calling for low-carbon mobility interventions (as in the CFZ in Møhlenpris), urban planners and policymakers stand to gain by supporting such initiatives and facilitating the materialisation of local, low-carbon imaginaries. These initiatives not only create local benefits, they also strengthen the participatory governance of mobility – commoning both the process and (reclaimed) urban space. Supporting local agency can moreover benefit larger urban transition processes, as it helps demonstrate the potential of such interventions and may well inspire other actors to re-imagine and re-constitute the relationship between mobility, low-carbon transitions, urban space and place-making.

When, and where, such grassroots initiatives and engagement with municipal actors are lacking, a publicly oriented agenda requires policymakers and planners to pay *even more* attention to divergent imaginaries and uneven distributions of benefits and burdens. This begins with recognising the particular needs and potentials latent in an urban, or suburban, community. This recognition must be followed by participatory planning activities related to place-making that create invited spaces (Gaventa, 2006) to engender and nurture new, publicly oriented imaginaries. This is a form of constructing publics and does not imply control of the public agenda that emerges. Legitimate participation requires delegating power from technocratic decision-makers to publics with their own situated knowledges and imaginaries, while also equipping them with experiences and inputs from policy learning to collaborate on a project of collective improvement. The result is thus steered but not predetermined by visions of experts and policymakers, even when they initiate an intervention.

Conclusion: cross-fertilising insights to Nordic and Baltic cities

Our mixed methods study of Bergen, a global frontrunner on low-carbon mobility transitions, presents insights on the dynamics and decisions that accompany such shifts. From a policy perspective, cross-fertilisation of such insights is desirable, especially so in Nordic and Baltic urban contexts where similar transitions are already in play or are likely in the near future. Mobility justice scholarship reminds us that these contexts have place-specific legacies to which general justice principles must be applied in situated ways. The main insight with transferable value from our study to Baltic Sea Region contexts is our locally engaged methodology as researchers studying, interacting with and informing public policy on urban mobility transitions. This approach constitutes a mode of generating and inserting insights into public decision-making to advance a twin concern with mobility justice and urban commoning. We offer three generalised reflections that follow from our discussion.

First, despite politically polarised debate, inhabitants' lived experience of mobility is conditioned by complex socio-spatial entanglements, path dependence and individual perspectives, and constitutes a large middle ground. It appears that a way forward for urban mobility planners and practitioners is to place trust more firmly in eventual public backing. It seems reasonable to assume that, if they pursue their vision in a manner that creates public value through improved service provision, it will appeal to and be steadily recognised by a large, even if not yet very organised or vocal, user base. As Kębłowski et al. (2019, p. 967) reflect in their study of Tallinn's fare-free public transport scheme, such urban transport interventions are in fact "political and spatial projects, whose processual, cross-sectorial and scalar dimensions help to reveal the embeddedness of transport in inherently urban questions of metropolitan governance, electoral strategies, territorial competition and socio-spatial inequalities."

Second, the rapid growth in EV adoption (a highly incentivised one in a Norwegian context) muddies the waters of low-carbon mobility transitions with elitist options of "green buyout" where relatively well-off households can persist with automobility practices while moving away from fossil fuel cars. This risks losing half the battle of just mobility transitions, as these are a matter of both low-carbon modal shifts as well as reclaiming urban public space. Shifts to EVs must therefore be accompanied by continued phase-out of car parking spaces, more car sharing schemes and a focus on ensuring that the most convenient and affordable option is the public transport system. Light rail expansion along strategic corridors, electrification and expansion of bus fleets, revival of old tramways, bicycle and potentially e-scooter schemes, and improved non-motorised mobility infrastructure are key components here. Such cross-sectoral and socio-spatial considerations are no less important in Baltic Sea Region cities, given their complex histories and resultant forms and political dynamics (Kasekamp, 2017).

Third and last, ambitious visions require inspirational examples. Car-free zoning, if approached as a means to materialise a people-centric form of place-making that "commons" mobility (Nikolaeva et al., 2019) and displaces cars with attractive and inclusive use of public space, can engender public engagement with hopeful socio-technical imaginaries of just mobility futures. Planners must guard against an urban mobility transition being co-opted by elite interests and counter tendencies towards austerity that characterise Baltic Sea Region countries' historical experience (Woolfson and Sommers, 2016) by consistently espousing a broader logic of commoning urban space. If – and only if – implemented in tandem with adequate public transport service provision, such interventions have the potential to succeed not only in central "hipster" neighbourhoods but to lead the transformation of suburban mobility and bring the streets to life by bringing life to the streets.

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Notes

1 Website accessed on 26 March 2021 at https://elbil.no/bergen-er-norges-elbilhoved-stad-2018/.
2 Solarpunk refers to the making of hopeful futures, as an aesthetic that stems from an ecologically oriented genre of speculative fiction, and as a socio-politically engaged, reflexively utopian project.

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12 Co-creating policies on societal transformations as a factor of resilience of modern society

Nadejda Komendantova, Sonata Neumueller and Elvis Modikela Nkoana

Introduction

International climate policy settled targets to mitigate impacts of climate change through decarbonization of various sectors of national economies, such as energy generation, mobility or housing (IPCC, 2019). Energy sector contributes a significant share of greenhouse gas emissions, therefore various goals were settled to decarbonize energy and electricity generation, even up to 100% by the year 2050. Renewable energy sources (RES) are one of the possible options to decarbonize electricity generation (Patt, 2015). RES is also considered by energy security policies as an option to satisfy energy demand with locally available energy resources and to mitigate the risks connected with volatility of energy supply from other countries (European Commission, 2014).

Deployment of RES at scale will lead to societal transformation and to the transformation of energy systems, including all its parts such as energy generation, transmission and distribution. It will lead to a transition from centralized energy solutions based on large-scale fossil fuel energy generation power plants to more decentralized solutions based on diversified RES such as solar, wind, geothermal and others. Electricity transmission and distribution grids, including high direct voltage grids and smart grids, will be playing a greater role to balance RES that are in various places or to cover intermittency in energy supply and demand.

This process of societal change based on the transformation of energy systems is termed "energy transition" within mainstream energy policy making processes (Sovacool, 2016). This "energy transition" is deemed a wicked process as it involves many stakeholders with their various and sometimes conflicting interests, perspectives and aims (Komendantova, 2018). Therefore, understanding the positions of various stakeholders and development of common-ground policy-oriented options is crucial (Komendantova et al., 2018).

As such, the public are an important stakeholder and an end-user of services in the energy transition hence it is crucial to understand patterns of public acceptance of energy transition process. It is within this context that we should understand that the transition towards a more sustainable energy system will require not only the implementation of technological solutions but also a change in behavior of people with respect to the growing use of RES. Laypeople need to be at the

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center of the energy system; they need to be informed, engaged and activated. Laypeople also have the right to participate in decision-making processes that affect their lives (Nkoana et al., 2017). To this end, the objective of this chapter is to deepen our understanding of behavior and motivation structures within the complexity of different user groups in the energy transition process by reporting on empirical case studies conducted in two regions in Austria. Hopefully, the lessons learnt in this region might inform policy and practice in the countries of the Baltic Sea Region (BSR).

Background

Energy transition is giving a greater focus to the local level of governance. In many European countries, there are targets of energy transition that are settled at the regional and national level but are being implemented at the local level (REN 21, 2019). For example, in Austria, the targets of climate policy and energy security are identified by the Federal Government. This includes targets on decarbonization of energy generation, transportation, housing sector and industry. These targets are implemented in frames of the Climate and Energy Model regions (CEM) or at the level of various cities (Komendantova and Neumueller, 2020). The Climate and Energy Model regions are regions in Austria which took commitment towards a high share of RES, up to 100%, in their energy mix. Austria is pursuing its climate goal and concurrently energy security and regional development, by supporting CEM regions, which are committed to becoming independent of fossil fuels by 2050 (Climate and Energy Fund, 2014).

In the past two decades, discussion about energy transition was going in frames of the so-called Not-in-My-Backyard (NIMBY) thinking and was criticized later in social sciences (see, for example, Burningham, 2000; Wolsink, 2006). NIMBY was even a special term that was developed to describe issues with public acceptance in communities where energy infrastructure was planned. The meaning of this term is that there are globally recognized goals such as the need for climate change mitigation. These goals should be implemented in communities because infrastructure should be constructed somewhere. Inhabitants of these communities are supporting such goals in general but are reluctant to have infrastructure in their communities (Kaldellis et al., 2013). Now the discussion about energy transition is considering NIMBY thinking more and more as a pejorative description of legitimate interests of communities regarding infrastructure that will affect their lives (Wolsink, 2012). Nowadays, local communities are also frequently questioning the necessity of deployment of large-scale infrastructure to address global problems such as climate change (Wüstenhagen et al., 2007) considering other available alternatives such as decentralized energy generation (Wolsink, 2000).

Today the communities' attitude towards energy infrastructure is changing in comparison to the situation of the last century when the backbone of the existing energy infrastructure was constructed (Komendantova et al., 2018). Before, energy infrastructure was considered as some kind of "economy locomotive" that was a driver for technological and economic development. Nowadays, there is a growing perception of impacts from such infrastructure on human health and environment. Such perceptions were formed by the growing awareness after several technological accidents such as Chernobyl and Fukushima.

Also, several international declarations, scientific results and awareness campaigns by environmental and social groups have changed the understanding of local communities from being passive recipients in the implementation of decisions made at the national governance level delivered by the so-called "experts" to a more participatory governance wherein communities have a right to express their views regarding infrastructure projects that affect their lives and livelihoods. The Universal Declaration of Human Rights calls for participation of people in decision-making processes that affect their lives (Zillman et al., 2002). Participation of local communities in decision-making processes can also increase the quality of outcome as the knowledge available to experts and decision-makers at the national level might be limited and the inclusion of local knowledge can be essential (Nkoana et al., 2017; Rowe and Frewer, 2000).

Participation of local communities in decision-making processes goes beyond simple social acceptance of energy infrastructure. Usually the term "acceptance" applies to lay people or affected communities when there is opposition to the planned infrastructure. Acceptance in favor of the projects was studied much less frequently (Cohen et al., 2014; Wolsink, 2012). Also, the term "acceptance" relates to tolerating something that is impossible to change (Batel et al., 2013). It is also a part of top-down decision-making process when acceptance from inhabitants is needed to construct projects, decisions about which are taken at the national level, without public protests at the local level (Rau et al., 2012).

Participation of local communities and integration of views of laypeople can increase legitimacy and trust in decision-making processes which usually would have been in the hands of "educated experts" (Nkoana et al., 2017; Renn, 2008). In a traditional decision-making process, information and knowledge flows from scientific experts, practitioners and policymakers at the national level to stakeholders at the local governance level. Frequently, such decisions are communicated to the public in a form of decide-announce-defend (DAD) model. However, such an expert-driven process often does not consider the complex relationship between experts and the public and can even lead to the loss of trust in public institutions by laypeople. The shortcoming of this process calls for greater public participation in decision-making processes that affect communities and the way of life of such people (Renn, 2015). Participatory governance goes beyond this model as it is based on the procedural, normativity and substantive principles of participation. Participatory governance is also defined through these principles. *Normativity* is based on a democratic principle, which states that citizens should be involved in decision-making processes. Engaging citizens in decision-making processes can lead to empowerment, equity and equality. *Substantive* principle argues that the involvement of citizens improves the quality of decision-making process and outcomes. Broader participation facilitates access to diverse, extensive and context-specific knowledge and takes a more careful and explicit account of divergent values and interests. In turn, this approach fosters collaborative or social learning. *Instrumental* imperatives foster the acceptability and justification of decisions. It states that citizens are more likely to accept an outcome if they took part in the decision-making process (Salter et al., 2010). In addition, the output justice that involves principles of transparency of information and its availability as well as engagement of stakeholders at various levels, including the local one, and discussion about fair distribution of risks, costs and benefits of the project. Therefore, participatory governance can not only increase the quality of decision-making outcomes but also contribute to implementation of good governance practices and democratic processes.

Methodology

Our research is focused on two case studies, namely, Freistadt and Amstetten, where we conducted our research in the period between 2015 and 2020. Freistadt is in the northern part of Upper Austria and has 27 municipalities. Agricultural land constitutes the biggest part of the region (53%) while forests account for 42% of it. The economy of the region is dominated by small-scale companies, which are mainly one-person operations. The major challenge to the region is the high rate of commuters (29%) needing to travel to Linz for employment. Freistadt established the ambitious goal of reaching the highest possible rate of energy self-sufficiency based on renewable energy sources. The region is home to one of the biggest solar power stations in Austria, which is financed by local people. There are also several local initiatives promoting renewable energy sources. These initiatives are managing the implementation of the targets of the CEM concept. To date, they have already implemented 30 district heating facilities, five biogas plants and some small-scale hydropower plants.

The Amstetten South CEM region has 19 municipalities and is an industrial region in the Ybbstal Valley in the Alpine foothills. The region has around 58,000 inhabitants and rural areas especially in the south. The region is well connected to all commercial centers with a highway.

RES is considered useful in both regions (Amstetten and Freistadt) because there are ample potential resources there such as solar panels and hydropower (Komendantova and Neumueller, 2020). Among renewable energy sources, the region is especially promoting small hydropower stations due to the abundance of water resources in the region. The programs of energy transition include implementation of energy efficiency measures, especially in the real estate, construction and housing sectors. The importance of electro-mobility is also growing. Public information measures include raising awareness through personal communication, community meetings and media reports.

This research deals with human factors of energy transition, such as the drivers to support or oppose the energy transition. It used a mixed method approach that included both quantitative and qualitative data collection techniques through key informant interviews, observation of stakeholders' events and a standardized survey questionnaire distributed among inhabitants of the case study regions. In total, 4,500 paper questionnaires were sent out to the population in the CEM region of Freistadt and the response rate was 7%. In total, 30,000 questionnaires were sent out to the population in the CEM region in Amstetten and the response rate was low at 1.2%.

In Freistadt, the heads of offices of 25 municipalities were contacted by phone to request their participation in the survey. Seventeen municipalities agreed to participate in the research and eight municipalities refused. The reason for their refusal was the lack of time and personnel resources. In the CEM region of Amstetten Süd, the survey questionnaire was sent out as an attachment of the regional newspaper "locum Mostviertel" in all 19 municipalities. Consequently, we contacted the municipalities and informed them about the project and the questionnaire and asked them to collect the filled in questionnaires. Furthermore, we convinced most of the municipalities to place the link to the questionnaire on their homepage and promote the project actively within their municipalities. As in the CEM region Freistadt, we stayed in contact to keep an overview as well as to assist with problems concerning the course of the project. In total, 240 Web interviews in the CEM region of Amstetten and 322 Web interviews in the region of Freistadt were collected. Several 354 mailed-out questionnaires were returned from Amstetten and 316 from Freistadt respectively. Based on these figures, we calculated the number of questionnaires required to fill the sample quota for each region. As a result, in the first week of January 2016, we planned a field trip to the two CEM regions. A team of five interviewers and a research manager travelled to Freistadt and then to Amstetten to complete the task of augmenting the questionnaires quota. The field phase was scheduled for five days and during this time, the team collected completed questionnaires in the municipal offices that were not returned to the researchers' office so far. A comprehensive sampling was developed prior to the data collection. According to this sampling, interviewers approached the missing social groups in the sampling. In addition, to augment the self-completed questionnaires distributed in the survey via mail and web, the team of researchers interviewed respondents using the survey questionnaire to fill-in the required quota. During this field trip, the research team visited five municipalities and collected another 369 questionnaires completed through face-to-face interviews. So, the total number of respondents in the survey is 1601 (see Table 12.1). The representation of respondents was equal according to the

Table 12.1 Number of completed questionnaires in Amstetten and Freistadt.

	Amstetten	*Freistadt*	*Total*
Mail out	354	316	670
Web	240	322	562
Face-to-face	207	162	369
Total	**801**	**800**	**1601**

number of male and female respondents. Various age groups were also represented equally. The sampling included respondents with various levels of education, from the basic to the university one. In results where we saw that education played a significant role, we weighted the results according to the percentage of people from this education group in the overall sampling.

Interviews and questionnaires were analyzed with the help of artificial intelligence methods such as various methods of content analysis, including NVivo and Atlas.ti. The data were analyzed with various methods of statistical analysis including correlations and linear regressions analysis. Correlation analysis relates to the regression analysis which is a statistical approach to model associations between dependent variables and provide explanatory of independent variables. Finally, we conducted a validation workshop with CEM managers of the identified regions as well as from other CEM regions to discuss our results and their implementation in the energy policy process.

Results

Awareness about renewable energy sources

Our results show the level of public awareness about climate change mitigation among Austrian inhabitants as well as their willingness to support RES. The inhabitants of both regions are aware of climate change. For instance, over 90% of respondents in Amstetten and Freistadt believe that climate change is happening and it is caused by man-made activities. Even though the many respondents believe that climate change is real, their understanding of the causes of climate change varies according to their occupation. Considering the occupation variable, farmers seemed less convinced that climate change is mostly caused by human activities than it is by natural variability in the climate. Farmers' perceptions of the causes of climate change were closely followed by those of the unemployed respondents' who unequivocally indicated that climate change is a result of natural variability instead of anthropogenic activities.

Many inhabitants in Freistadt and Amstetten, where we conducted large-scale surveys, think that development of renewable energy sources is the best climate change mitigation option (see Figure 12.1 and Figure 12.2). Being aware about climate change, the majority of inhabitants' support climate change mitigation, such as deployment of renewable energy sources or implementation of energy efficiency measures. However, the biggest part of inhabitants is completely against nuclear energy. For instance, 61% of respondents in the CEM regions support the deployment of RES as an applicable climate change mitigation strategy, 54% are in favor of increasing efficiency in the production and storage of energy, 51% supports the reduction of energy needs, 46% prefers limiting emissions from existing power stations. Overwhelmingly, more than 70% of the respondents rejected nuclear as a potential energy source in both regions of Amstetten and Freistadt.

The comparison of both regions showed that there is almost no difference in preferences regarding climate change mitigation options among inhabitants of

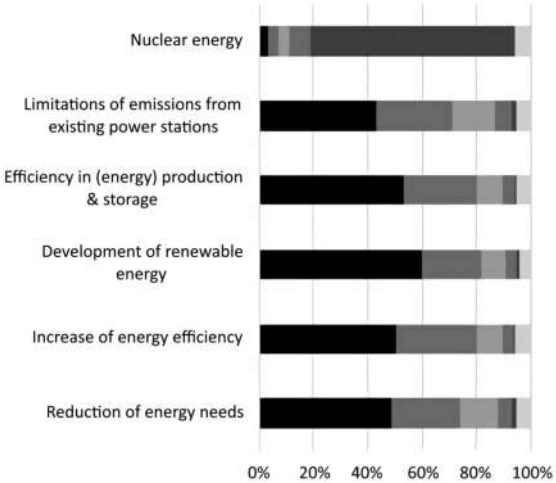

Figure 12.1 Preferred climate change mitigation options in Freistadt.

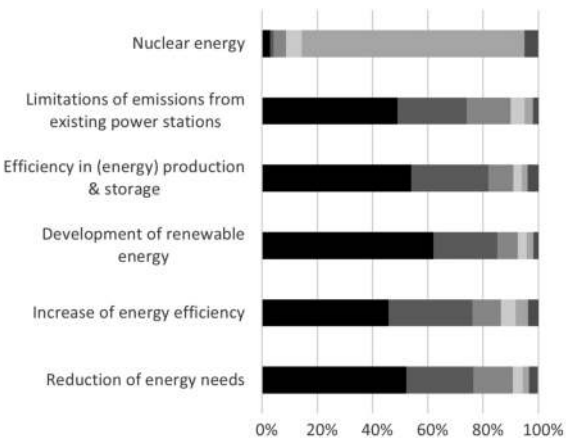

Figure 12.2 Preferred climate change mitigation options in Amstetten.

these regions. Inhabitants of both regions totally reject nuclear power and have RES as preferred options.

Over 60% of respondents were aware of measures aimed at deploying renewable energy technologies and mechanisms in their local communities but 40% were unaware of this initiative. The 40% represents a sizeable number of residents (n=727), which are unaware of renewable energy transitions in their immediate communities, revealing the inadequate information (communication) in the CEM regions initiative. Despite this, respondents unanimously endorsed renewable energy projects as bearing positive benefits in their regions. Knowledge of the CEM regions by lay people can facilitate the public's acceptance of renewable energy transition.

Despite being well informed about climate change, its mitigation and available options, inhabitants are less informed about implementation of these options, namely, in frames of the CEM process. We found that 36% of the respondents do not know about the CEM regions initiative and 46% have heard about it but do not have sufficient information about its implementation. Only 17% of the respondents confirmed their thorough knowledge of the CEM regions initiative. We discovered that pensioners and middle-aged professionals possessed more information about the CEM regions initiation. What is mostly concerning is that only 3% of the youth had a thorough knowledge about the CEM regions, with over 40% having heard about the initiative, and more than 50% had never heard of the energy transition endeavor.

Nearly half of the respondents are unaware that their community is participating in the CEM initiative. We further segregated the primary data by occupation and found that most workers, employees, students, self-employed and unemployed residents did not know that their communities are participating in the CEM process. On the contrary, pensioners and farmers were well informed about their local communities participating in the CEM process.

While speaking about policy processes like energy transition, there is a great variety in the level of awareness among inhabitants. Many people over 61 years old in both regions (61%) know about CEM regions as a vehicle to implement the energy transition policy in Austria. However, the level of awareness decreases with the age of respondents. Young people below 20 years old are the least informed group of inhabitants. In comparison, around 50% of all respondents aged over 61 years showed awareness and knowledge about participation of their community in the CEM process. Only around 18% of the youth had this awareness and knowledge. In general, the level of awareness among inhabitants of Freistadt was higher than their counterparts in Amstetten. As such, inhabitants from Freistadt in the age between 41 and 60 were the best-informed group of population (see Figure 12.3).

Access to information from various media sources might play a role in awareness, as such, respondents receive information on regional energy transitions from a mixture of traditional and new media that include the internet, television, radio and newspapers. We subsequently investigated the correlation between the type of information source and education level of the respondents. The results show that varying educational attainment also influences the preference of an information source. For example, respondents with university degrees received some of the information on regional energy transitions from scientific publications. Also, these university educated respondents used a variety of information sources rather than soliciting a few. On the contrary, respondents with primary and secondary education relied on a limited source of information about regional energy transitions, with their information mainly coming from family and/or friends, private companies which implement RES projects and local NGOs.

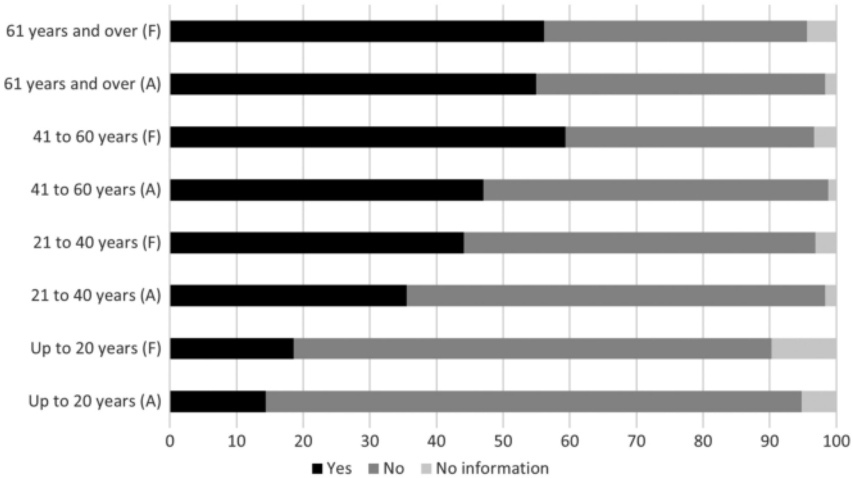

Figure 12.3 Level of awareness among inhabitants of Freistadt (F) and Amstetten (A) about participation of their community in the CEM regions initiative. "No information" option means that the respondent could not provide the answer.

Many inhabitants of both regions receive their information about energy transition from various media such as TV, radio, newspapers and internet. The influence of other sources such as NGOs, private companies, scientific publications, friends and family is much lower. Local authorities are the second most influential source of information after media (see Figure 12.4).

Support for the deployment of renewable energy sources

Many inhabitants in both regions support the deployment of RES. However, this support varies significantly depends on the technology such as wind energy, geothermal, solar power or biogas. In general, solar power enjoys the highest level of support, followed by geothermal and hydropower. Biogas is the least preferable option. Support for wind energy and biomass is also significantly lower in comparison to other renewable energy sources (see Figure 12.5).

The usage of renewable energy sources depends strongly on the size of a household with general tendency – the larger the household is, the greater is the willingness to use RES. There are different explanations for this finding. This willingness might relate to the fact that larger households have children. Such households care more for the environment because they are concerned about the future of their children. They might also consider installation of PV because they think that this might help to reduce electricity costs or to make them more independent from energy suppliers. Or it might also relate to the fact that larger households live mainly in privately owned houses and not rental apartments. The fact that someone lives in a private house increases the willingness to use renewable energy sources because such investment belongs to the person. In rental apartments, there is no incentive to make private investments from the site of the

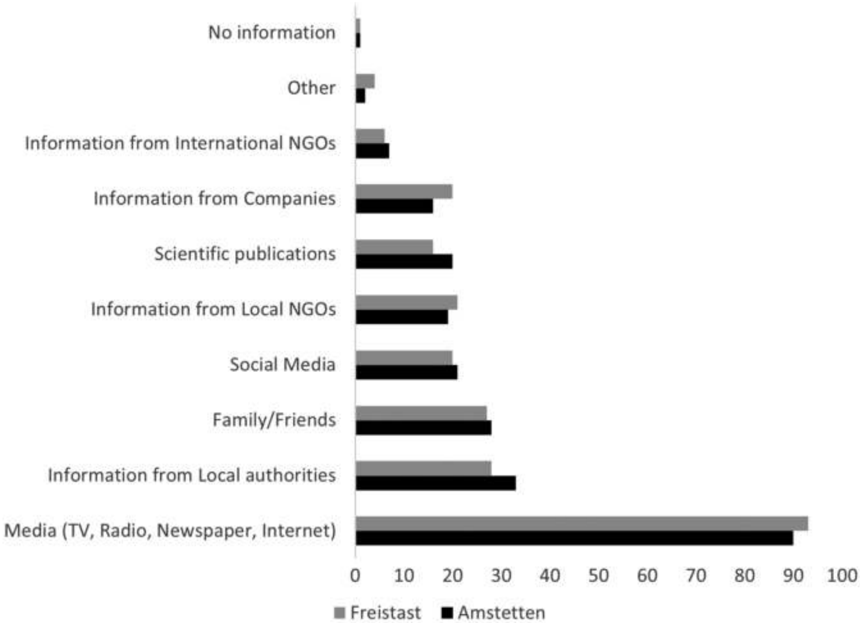

Figure 12.4 Sources of information about energy transition in Freistadt and Amstetten. "No information" option means that the respondent could not provide the answer.

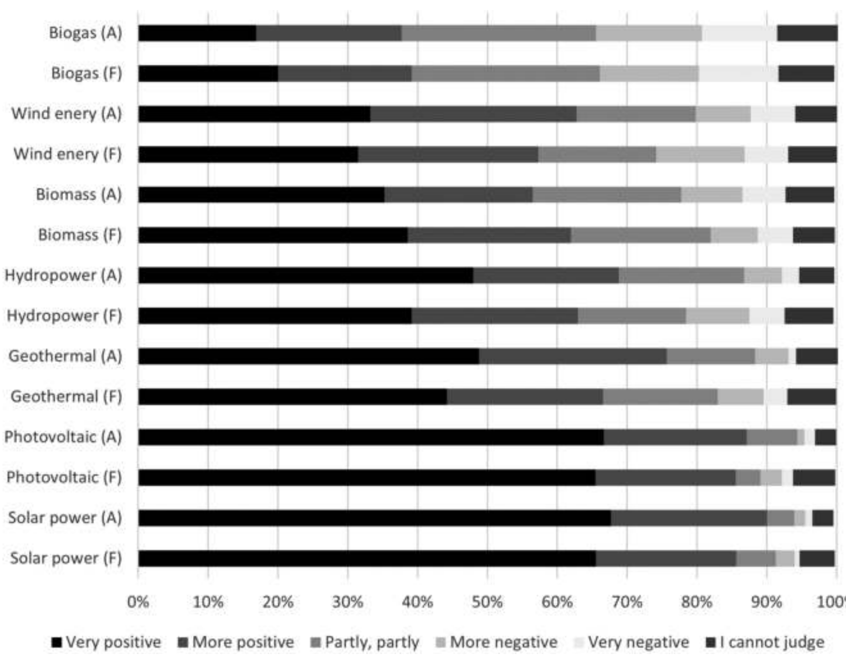

Figure 12.5 Attitudes towards renewable energy sources in Freistadt (F) and Amstetten (A) (partly means here "undecided").

tenant. However, investigation of this phenomena with other factors was beyond the scope of our research.

Our results show a significant share of households made of one person is not using renewable energy sources. At the same time, the share of households who are not using renewable energy sources among five-person households is much lower and a bigger part of these households are using up to 50% of renewable energy sources to cover their energy needs. A significant share of households is covering more than 75% of their energy needs from renewable energy sources. Interestingly, the number of such households in Freistadt is almost twice as high as in Amstetten.

The Willingness-To-Pay (WTP) for renewable energy sources also depends on the kind of economic activity exercised by the respondent. Our results show that WTP is the lowest among unemployed people with most of them wishing no additional payment for renewable energy sources. But the results for this group are also polarized. A significant share of unemployed people would be willing to pay between 21% and 30% more for renewable energy sources.

On average, people are happy to pay up to 10% more for energy that comes from renewable energy sources. The group of students in Freistadt would be willing to pay between 11% and 20% more for renewable energy sources. The second strongest group of people that is willing to pay up to 30% more for renewable

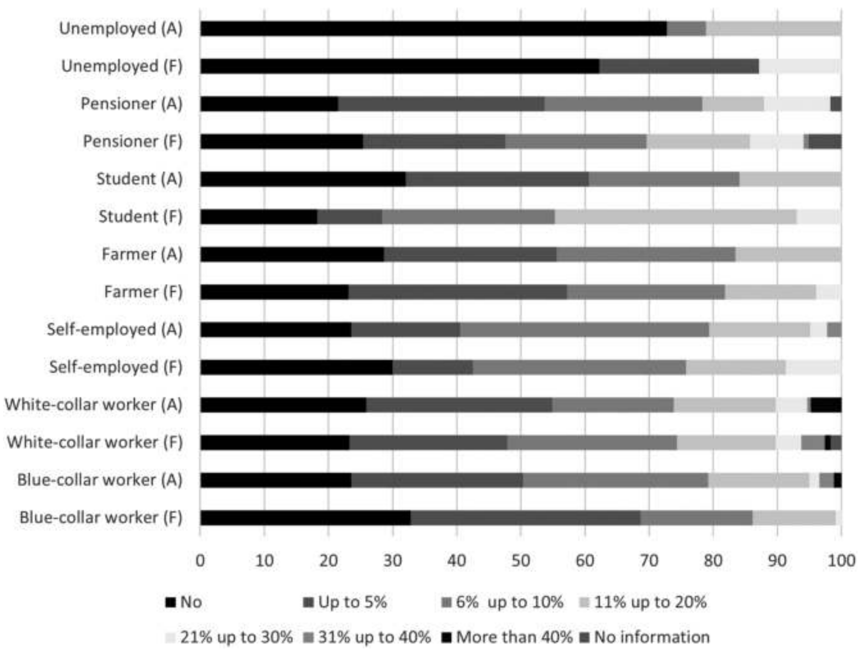

Figure 12.6 Willingness to pay for renewable energy sources among inhabitants in Freistadt (F) and Amstetten (A). The answer "no information" means that the respondent did not know what to answer.

energy sources are pensioners in both regions. Also, among self-employed people in Freistadt, the share of people willing to pay up to 30% for renewable energy sources is significant (Figure 12.6).

Discussion and recommendations

Discussion of results

Our results show that an overwhelming majority, over 90%, of the respondents in the CEM regions of Freistadt and Amstetten believe that climate change is a real phenomenon. This result is supported by a comparative survey study of climate change perceptions of residents in the European Union (EU) and in the United States conducted by Lorenzoni and Pidgeon (2006). However, and despite this heightened level of awareness, residents in both regions have different understanding of the causes of climate change due to their varied demographic variables such as occupation. For example, most respondents indicated that climate change is caused by man-made activities. However, farmers were less convinced that climate change is caused by man-made activities more that it is induced by natural variability. This is baffling as studies report that farmers have high levels of awareness and perceptions of climate change due to their intimate relationship to the ecological environment through the land they cultivate (Fosu-Mensah et al., 2012; Deressa et al., 2011; Manandhar et al., 2011; Gbetibouo, 2009; Mertz et al., 2009; Maddison, 2007). Farmers' views were closely shared by the unemployed residents who strongly believed that climate change is caused by natural variability instead of anthropogenic factors.

Despite this, residents' high levels of awareness about the causes of climate change seems to factor into their support for the deployment of renewable energy technologies in their region.

With nearly two-thirds of the respondents aware that their regions are transitioning away from fossil fuels towards renewable energies with only one-third responding otherwise. Interestingly, respondents in the Freistadt region seem to know more about regional energy transitions than their counterparts in Amstetten. Of concern is that one-third (36%) of the respondents did not know that their region is transitioning away from fossil fuels towards renewable energy sources in both regions. This large percentage of uninformed residents in this study is concerning considering the public resistance to the deployment of renewable energy technologies experienced in Europe (Musall and Kuik, 2011; Jones and Eiser, 2010; Zografakis et al., 2010; Zoellner et al., 2008).

In this energy transition, respondents preferred the deployment of renewable energy technologies such as solar, wind and photovoltaic as popular choices, increasing energy efficiency through renovations of private and public buildings, and reducing energy needs using electric cars, and car sharing schemes.

The popularity of certain renewable energy technologies for electricity generation presents an entry point through which planners and decision-makers in the CEM regions initiatives can solicit the buy-in of residents into the energy transition effort. For example, over two-thirds of the respondents overwhelmingly supported the installation of solar energy technologies such as photovoltaics. With nearly one-third of the respondents supporting the deployment of hydropower, geothermal and biomass energy sources in their region. However, less than one-third of the respondents supported the utilization of wind energy and biogas in the CEM regions. The insignificant support for wind energy might be explained by NIMBYism attitude induced by residents' concerns over noise and visual pollution (Devine-Wright, 2014). Respondents' support of biogas is very low despite it being a renewable energy source. This might be due to smell perception, socio-economic factors and communication challenges reported in other regions. It is noteworthy that communication challenges remain a key theme that consistently re-emerges in this study. This challenge is reported in other parts of the world (see, for example, Ahlborg and Hammar, 2014; Richards, Noble and Belcher, 2012; Musall and Kuik, 2011; Mondal, Kamp and Pachova, 2010; Mirza et al., 2009; Sovacool, 2009).

On average, respondents in Freistadt seem better informed than their counterparts in Amstetten and this trend features prominently in our results. Pensioners and respondents between the ages of 41 to 60 years are more informed about energy products and energy transitions when compared with other age groups. Young people constitute most uninformed respondents. Once more, this trend draws attention to the inadequate involvement of young people in the CEM regions effort. In addition, over 60% of respondents were aware of measures aimed at deploying renewable energy technologies and mechanisms in their local communities and around 40% were unaware of such steps. This 40% represents a sizeable number of respondents (n=727) that are unaware of renewable energy transitions in their immediate communities revealing the inadequate information-sharing.

Implications for the BSR

Our results on Austria allow us to develop the following recommendations for further deployment of renewable energy sources in the BSR where most of its countries are the EU member states as well. We identify here three groups of factors which should be considered while addressing attitudes of people towards RES in the countries of the BSR.

First, the level of awareness can be affected by the information-sharing and communication channels tailored to the varying age groups of the residents of energy transition regions. As a result, it is recommended to have targeted information campaigns for different groups of population as well as usage of targeted and trusted information channels.

Second, respondents seem to be much better informed about climate change and the need for its mitigation, in general. However, they are much less informed about details of the projects in their localities or about energy policy processes on energy transition in which their communities are participating. Therefore, it is recommended to diversify information campaigns from the focus on the need of climate change mitigation to more detailed information about projects and processes in the vicinity of people.

Third, the level of support for different kinds of renewable energy sources might be very different. In Austria, people are mostly supporting solar energy while biogas has the lowest level of support. Therefore, it is recommended to evaluate how inhabitants of local communities support various kinds of renewable energy sources rather than treating renewable energy sources as one category with the same level of support.

Last, the level of support varies significantly dependently on the kind of occupation, size of household and the age of the respondents. Therefore, it is recommended to identify the drivers of support among various groups of population and to develop and implement policy support measures that target these specific groups of population.

Concluding remarks

This study investigated the awareness of renewable energy sources and support for their deployment in a Western European country. Using empirical methods, we administered a survey questionnaire to more than 1,000 residents in the Freistadt and Amstetten regions of Austria. The primary data was analyzed using descriptive statistics and correlation analysis. We found that most residents in both regions are aware of the climate change phenomenon and the different types of renewable energy sources and technologies deployed for its mitigation. In addition, the residents overwhelmingly support the deployment of these renewable energy technologies in their regions.

The residents preferred solar energy more when compared to wind power. This should not come as a surprise as most European countries experienced a bush-back by residents through the so-called NIMBY stereotype against large wind farms. Interestingly though, was that residents preferred hydropower and geothermal sources more than wind power. Biogas, a renewable energy source, was the least preferred by the residents of the CEM regions. Nuclear power was completely rejected by the residents in both regions owing to the human health hazards and safety risks associated with it and in the context of widely reported Chernobyl and Fukushima disasters. Information on these nuclear accidents were widely publicized in all forms of media highlighting the importance of information-sharing and communication in a way.

Information-sharing is important in the energy transition, as a sizeable portion of the respondents were unaware of the initiative aimed at deploying renewable energy technologies in their region and the benefits thereof. The data analysis revealed that their ignorance was due to the limited communication they received from the authorities responsible for the energy transition. This is not surprising as scientific literature suggests that communication is an important factor in the transition from fossil fuels to renewable sources. More information campaigns using different media for varying social groups is urgently required to aid public acceptance that bolsters successful transition towards renewable energy sources. Targeted, clear and transparent information campaigns are also a first step on the way of engaging people into energy transition.

The BSR countries have good potentials for deployment of renewable energy sources but further work on addressing human factors of an energy transition is needed. Following recommendations from other regions, further research should evaluate the available level of acceptance and attitudes towards various potential RES in the BSR. This should include attitudes and preferences for various technologies but also for the process of energy transition itself. Also, further research is needed to evaluate how information about energy transition is being communicated to various social groups and what are the trusted sources of information. The communication messages should be tailor made to the needs of each social group and to the trusted communication channels. Further understanding is also needed on potentials for engagement into an energy transition, which possibilities exist already and into which parts of the decision-making processes people would like to be engaged.

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Conclusion

13 The power of the grassroots

The Baltic Sea Region, an energy transition laboratory

Farid Karimi and Michael Rodi

Epilogue

The purpose of this book is to identify measures influencing stakeholder engagement, grassroots activities and the emergence of social acceptability in the context of the energy transition, based on case studies mainly drawn from the Baltic Sea Region (BSR). Demand-side, bottom-up, decentralised activities have largely been a 'blind spot' in national energy policy, even in progressive countries with ambitious goals for an energy transition, as discussed in Chapters 5, 6, 7, 9, 10 and 11. As shown in the chapters of this book, bottom-up activities are critical to the decarbonisation of the economy, as well as to the provision of energy security, energy democracy and social justice, and thus to the overall success of the energy transition. This edited volume also demonstrates that the BSR is a 'laboratory' for ideas, approaches and challenges associated with the bottom-up engagement of civil society in climate and energy issues. The BSR is uniquely positioned to serve as a laboratory due to the diverse socio-political, cultural and legal features, histories, energy profiles and strategies that characterise the region (see Chapter 1).

The interdisciplinary conceptual approaches applied in this book outline different perspectives on bottom-up and grassroots activities in an energy transition and on the emergence of social acceptability. The conclusions drawn from this research contribute, in particular, to the governance of an energy transition vis-à-vis social sciences, social movements and social justice. They can also inform broader debates about the social dimension of sustainability transformations taking place in response to global environmental crises, such as climate change. In general, the link between the various approaches and perspectives vis-à-vis citizen roles and activities, social acceptance and acceptability in the individual chapters is the governance of an energy transition, with an emphasis on energy democracy and social justice. This volume employs a comparative law and policy approach to identify potential legal barriers to the active participation of consumers and prosumers in an energy transition, as well as to provide a solid basis for future studies that can elaborate on legal design options through a comparative best-practice analysis.

In this concluding chapter of the book, we first summarise the arguments on social acceptability and the importance of citizen participation in an energy

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transition. Next, we discuss the possible forms of participation and the factors that foster this participation. The requirements for institutional and legal design to activate people are then briefly discussed. Finally, we summarise the most important policy recommendations and offer concluding remarks.

Bottom-up activities: why do micro-level activities matter for the macro-level energy transition?

This book contributes to the literature on the importance of active public involvement in an energy transition, beyond the typical discussion of social acceptance. The following is a summary of the importance and impact of bottom-up activities and citizen engagement.

From social acceptance to social acceptability

In contrast to the conventional centralised energy systems (e.g., coal, gas and nuclear), most renewable energy (RE) facilities are largely decentralised and thus located in the vicinity of residential areas (excluding offshore facilities). Increasingly, this has led segments of the population to voice opposition to new RE developments due to concerns about noise and sight disturbance, nature degradation, adverse impacts on wildlife and possible losses in property value. Thus, social acceptance has become a significant threat to the success of energy transformation. Still, as Kojo et al. (Chapter 6) point out, social acceptance is not sufficient to deal with; the full realisation of an energy transition requires active support and participation. This will require a paradigm shift from the issue of social acceptance – as a general attitude towards renewable technologies – to that of (social) acceptability, which applies not only to technology as such, but also to the concrete design, planning, implementation and communication surrounding an energy transition. There is an urgent need to identify relevant factors that influence the dimensions of social acceptability (cf. social acceptance) of RE. Each of these factors has socio-political, community and market dimensions and pertains to production, network and consumption sectors. It is evident that, in the identification of appropriate measures to achieve social acceptability and activate demand-side responses, 'the devil is in the details,' as public attitudes vary significantly based on factors including age, gender, education and professional background (as demonstrated in Chapters 4, 6 and 12).

Obviously, the development of concrete incentive-based instruments to address local opposition and promote social acceptability is vital. Nevertheless, as Egelund Olsen argues in Chapter 3, most of the existing measures in the 'strategy toolbox' – even in countries with front-runner status, such as Denmark – focus on social acceptance; counterintuitively, opposition among local populations is rising. Egelund Olsen is critical of the 'nuisance equals compensation' methodology. She argues that a strategy designed to increase social acceptability (c.f. social acceptance) should take into account the overall legal frameworks for planning, site designation, strategic environmental assessments and environmental impact assessments, rather than focusing solely on specific legal incentives related to community acceptance.

As Pons-Seres de Brauwer and Cohen suggest in Chapter 4, the development and mobilisation of community-as-investor schemes is another important strategy-cum-approach that enhances the potential for social acceptability and encourages local activities. The authors contend that enabling the local community to serve in the 'new role' of 'investor' would help mitigate community-related concerns about issues including fairness, distributional justice, transparency, trust in stakeholders and place attachment, given that citizens themselves would manage the relationship between the market, community and socio-political dimensions of RES development.

Facilitating an energy transition and energy security

Social acceptance is only one of the issues that can be addressed by engaging people in an energy transition. A decentralised energy system based on fluctuating RE sources is dependent on decentralised demand-side actions to balance energy. In other words, increasing the share of variable RE requires flexibility in the energy system in order to ensure security of supply and energy security. This can only be achieved by involving all actors that are connected to the system and by taking all possible measures on both the supply and the demand side. For this reason, it is important to take measures to encourage 'prosumers' – thus abolishing the traditional dichotomy between consumer and producer (as discussed in Chapters 2, 6, 7 and 9) – or to enable and activate residents of buildings in urban areas to push for clean energy and energy efficiency in the housing sector (as argued by Laakso and Lukkarinen in Chapter 10).

Although greater individual autonomy and decentralisation can facilitate an energy transition, these same elements can also destabilise the entire energy system (above all the electricity system), with significant economic and political repercussions. It is therefore necessary to carefully define suitable instruments with measurable impacts.

Reanimating civil society and enhancing democracy

Engaging people for an energy transition also has meaning and impact outside the context of climate change policies. Activation can promote social justice, empower civil society and enhance democracy. As Standal and Feenstra (Chapter 7) demonstrate, public engagement in an energy transition tends to vary based on gender, socio-economic and cultural factors, which raises questions of social justice. Such disparities can even lead to energy poverty in some countries or to marginalising certain segments of society.

Interestingly, Pietrzykowski, Rembarz and Cenian (Chapter 8) show that civil society can be an impactful agent of change if local entrepreneurs, urban activists, representatives of the local community and the scientific community voluntarily cooperate to transform and revitalise less-developed parts of countries emerging from economic and political transitions, like Poland. The involvement of various civil society stakeholders enables feedback transfer of knowledge and experience, among other things. Furthermore, bottom-up activities strengthen the catalytic effect of the change process. Such activities become not only a channel for technological change but also a factor supporting the development of social capital.

Finally, activating people and enabling civil society is part of the broader concept of 'social innovation' (see Chapter 4). This means that the activation process reconfigures social practices, institutions and networks to empower citizens to support novel solutions that can address societal challenges. Empowering civil society increases legitimacy and trust in decision-making processes and thus contributes to equity and equality, as discussed above, in the sense of energy and mobility justice (Chapters 7, 11 and 12). This allows people to take control of new technologies, adapting them to their needs (Chapter 8). However, as Sareen et al. argue in Chapter 11, socio-political imaginaries about social innovations and transformation are dynamic and can thus be shaped and changed. This makes it extremely important to develop meticulous strategies for providing information and disseminating knowledge on social innovation and transformation, as argued by Komendantova, Neumueller and Nkoana (Chapter 12).

What are possible forms of public participation? How can this participation be encouraged?

Before examining how people can be activated to participate in energy and mobility transition, it is necessary to consider possible forms of participation. According to Antoni and Rodi (Chapter 2), the first level of active participation consists in demand-side flexibility, i.e., participation in demand response. Thus, people can passively – or in some cases, actively – help balance fluctuating RE in the energy system. The central technical instrument in this regard is smart meters, and they are already widely implemented in some countries, e.g., in Finland (Chapter 6).

The second level of active participation is prosumers (Chapters 2, 6, 7 and 9): consumers who also produce energy mainly in the form of electricity. In addition to producing energy, prosumers can play an active role in providing flexibility, e.g., through storage.

Most chapters in this volume focus mainly on the third level of active participation: different kinds of community engagement. According to Pons-Seres de Brauwer and Cohen (Chapter 4), the concept of 'communities' is not exclusive to geographical locality; it also applies to other recognisable communities of interest, for instance those based on a shared interest. Magnusson (Chapter 5), however, shows that the historical (centralised) development of the energy system, for instance in Sweden, has led to path dependency and obduracy, and that community energy and collective initiatives have been met with a lack of active support and, in some cases, even neglect. Notwithstanding that countries like Sweden and Norway have implemented seemingly successful policies to increase RE production, these states have not directed support towards individuals and communities; this has resulted in a centralised energy system (Chapters 5 and 7). Nonetheless, Magnusson argues that decentralised electricity production appears to be inevitable (e.g., in Sweden), given that there is a growing shortfall in power supply capacity. A similar observation is made in Chapter 6 with regard to Finland's electricity system. As Surwillo (Chapter 9) argues, community participation in the energy transition is even more crucial in the Eastern European states of the BSR, such as Poland; in these countries, other RE sectors, like wind energy, have stagnated, and there is a need to reconcile emission reduction obligations under EU policy with the heavy reliance on fossil-fuel-based energy resources for economic growth (see Chapter 1).

The concept of 'community' is not exclusive to the energy sector. Laakso and Lukkarinen explore potential in the housing sector, focusing on housing cooperatives. The authors argue that residents do not have adequate incentives or sufficient information on how and why they should participate in the development of sustainable energy for their housing cooperatives. The chapter thus concludes with a call for new incentive structures that prioritise sustainable energy improvements and link them more directly to management practices in buildings.

An energy transition requires both attitudinal and behavioural support from the general public (Chapter 6). A central prerequisite for engaging people is the dissemination of necessary information and knowledge for potential prosumers and communities and for municipalities and other stakeholders (Chapters 6, 7, 8, 9, 10 and 12). Targeted information and educational campaigns should be tailored to specific situations; this may require adaptations to technologies applied, socio-political factors, ages and backgrounds of target groups, and community location (e.g., Chapter 12). Pietrzykowski, Rembarz and Cenian (Chapter 8) show how 'living labs' in Poland serve as an interesting platform for a knowledge dissemination campaign of this kind.

When it comes to compensation and financial incentives to activate people for an energy transition and facilitate social acceptability, there are various perspectives on how to address these issues, and financial benefits are not necessarily constructive. Egelund Olsen (Chapter 3) reports that support schemes for facilitating social acceptability should be approached with caution given that financial incentives can be seen as buying consent or even as 'bribery,' which could stir up further opposition or reluctance within local communities. Similarly, Sareen et al. (Chapter 11) warn against policies that open up the possibility of a 'green buyout' (i.e., policies solely benefitting those with a better financial situation) within the mobility sector. It is essential for policies and strategies to be designed in accordance with principles of social justice, for example by promoting gender equality and equity for less privileged members of societies and minorities (see Chapters 7 and 11). Support schemes and funds provided by the EU seem to play a crucial role in enabling civil society to engage in grassroots activities that advance an energy transition (e.g., Chapter 8).

Finally, placing too much emphasis on prioritising top-down policies and strategies that favour centralised energy systems – as observed in Sweden (Chapter 5), Norway (Chapter 7) and Poland (Chapter 9) – can lead actors to underestimate the importance of public engagement in an energy transition. This can slow the pace of transformation due to the unique characteristics of democratic polities, such as regular changes in government and power transitions between parties with varying or even contradictory policies (see Chapter 1). A sole focus on centralisation even threatens the security of supply (see Chapters 5 and 6).

Institutional and legal design for mobilising people

This volume also elaborates on the institutional and legal design for mobilising people. As shown in Chapter 2, the European legislature clearly obliged the Member States to develop concepts for this process and enact them. Still, the European legal framework is vague on this topic and leaves the Member States substantial leeway to translate such concepts into concrete terms.

In keeping with the subsidiarity principle, it is vital to find specific solutions that respect regional and local differences. Furthermore, the institutional and legal design needs direct input from the social sciences to identify needs for, gaps in and impacts of regulations. However, it is clear that the design of new legal concepts cannot be merely academic. Existing legal structures must be taken into account and adapted accordingly. The challenge of path dependency must be taken seriously when designing new instruments (Chapter 5). This will require a deconstruction of the traditional dichotomies that are deeply rooted in the historical evolution of the legal order, such as the dualism between producers and consumers, between the state-as-regulator and civil society (Chapter 2), and between housing owners/residents and decision-makers (e.g., Chapter 10).

In light of these factors, it is impossible for the chapters in this volume to identify a one-size-fits-all solution. Instead, they propose various institutional and legal designs that can be further developed and – after any necessary adaptations – transferred to other legal systems. Although most of the chapters show that mobilising people for the energy transition requires financial incentives, Chapter 3 demonstrates that the design of the incentives also plays a vital role; poorly constructed incentives do not provide constructive solutions. As mentioned above, these incentives must be reliable to encourage long-term investment schemes (Chapter 4). Feed-in schemes have some advantages in this respect (Chapter 4), as do green certificates, which can be used as a suitable long-term regulation (Chapter 5). Financial support schemes are often overly complex and entail extremely high transactions costs or thresholds (e.g., Chapters 5 and 7). Modernised instruments directed at engaging people for the energy transition should take this into account and contribute to harmonising and simplifying existing schemes instead of further complicating them.

The recent EU regulation demands more support for energy communities (Chapter 2). Magnusson (Chapter 5) suggests that there should be a greater focus on cooperatives, perhaps in the form of umbrella organisations. In this respect, Pietrzykowski, Rembarz and Cenian (Chapter 8) refer to the Polish experience of 'living labs' as an innovative organisational form that can also foster an integrated planning process. In order to activate people, it is vital to overcome existing obstacles that hinder a common bottom-up production of energy. Energy communities like those created in Finland (e.g., housing cooperatives) can enable the sharing of produced energy (Chapter 10). In Norway, a 'plus-customer scheme' implemented in 2017 appears to be a suitable approach to reduce transaction costs (Chapter 7). This model encourages end-users to feed power into the grid (not exceeding 100 kW). These users are exempted from charges and feed-in tariffs and are allowed to sell their excess production without a licence. Households within the same building are allowed to join energy production projects (through virtual metering).

Policy recommendations and implications

Each chapter of this book provides recommendations for practical policies that cultivate citizen-driven initiatives, establish decentralised systems and facilitate social acceptability to expedite an energy transition. In this section, we summarise the most important of these holistic policy recommendations, which can be applied even beyond the borders of the BSR:

- The legal design of incentives for social acceptability should be carried out meticulously to ensure that the end result accommodates different regional circumstances. Context matters, and the same method or measure may not work everywhere (even in the same region with shared borders, i.e., the BSR) or for all projects.
- Lawmakers should consider instruments that are less complex, more predictable and more likely to project a positive outlook on the local implications of the green transition. Legal measures with complex procedures are perceived as less transparent; one example is the notably *subjective* assessment of the visual impact of a wind farm (see Chapter 3).
- Policies should promote the principles of social justice and mitigate gender, social, cultural and other disparities. Thresholds should be low to create a level playing field.
- Policies, strategies, measures and incentives should not benefit only elites and privileged groups (e.g., in the case of the electric vehicle (EV) rollout in Norway; see Chapter 11).
- When it comes to the legal framework vis-à-vis bottom-up, decentralised activities in the EU, it is clear that the rights of prosumers or energy communities granted under EU law remain relatively open to interpretation; the crucial step is their transposition into national laws. Therefore, Member States should carefully examine how the various design options presented in this volume can be adapted to their legal and cultural contexts to enable people to participate actively in the energy transition.
- Financial measures to incentivise local communities will play a crucial role, with some caveats: they must be designed in such a way that they will be reliable in the long term and create legal certainty. Moreover, they should be transparent and not overly complex in order to grant access to more people.

Finally, the design should prevent incentives from being perceived as an attempt to buy consent.

- More specifically, when it comes to the electricity sector, an effective market design is crucial to ensure that the system is cost-effective overall, not just for those who 'actively' participate, because local consumption also needs to respond to effective market price signals. The Member States must ensure that self-consumed electricity that is used behind the metre is not subject to any charges or fees, although the Member States may apply charges in certain limited cases, in particular for installations with a capacity above 30 kW (see Chapter 2).
- An important recommendation for policymakers at the national level is to keep the door open for alternative pathways and technological breakthroughs. Specific circumstances – for example with regard to country geography, resources, socio-political events and the economy – obviously shape possible pathways, but keeping the door open to new opportunities and supporting alternative groups to invest in renewable energy may lead to surprising developments and major breakthroughs (see Chapters 4, 5, 6 and 9).
- A comprehensive plan is crucial for social outreach and knowledge dissemination. There should be effective and transparent communication with the public concerning renewable energy technologies, possible pathways to participation in an energy transition, costs and benefits, existing legal and support schemes, and various measures for citizen-driven energy projects and demand-side flexibility. For such communication to be successful, cross-cultural differences, socio-political factors, demographic backgrounds and legal landscapes in each country must be taken into account (see Chapter 12).
- Local-level innovation vis-à-vis a local-level energy transition cannot be limited to the adaptation of solutions from other areas to local conditions, such as in the context of urban revitalisation and the decarbonisation of the housing sector (see Chapter 8). Moreover, not all the changes should be made at the legislative level or at the level of the state; there must be cooperation with municipalities, energy companies, residential areas, housing cooperatives and other actors (see Chapter 10). In some cases, bottom-up grassroots activities require innovative grassroots solutions. Policies and legal frameworks must have sufficient flexibility to accommodate these in conjunction with top-down policies and strategies (e.g., EU policies).

Concluding remarks and outlook

Overall, the chapters in this volume show that the BSR represents a kind of 'energy transition laboratory' that can provide valuable insight into the activation of people for the energy transition and the emergence of social acceptability. The region is uniquely suitable for this role because histories, political conditions, geographies, cultures and economic performance vary considerably between BSR countries. Therefore, other regions and countries, particularly those in the EU, would benefit from the experiences of this region to avoid 'reinventing the wheel' and expedite the transformation necessary to meet the goals of the European Green Deal.

In order to motivate consumers to become active in the energy transition (e.g., as prosumers), it is crucial to make the process as interesting (e.g., financially attractive), as transparent and as simple as possible. Citizens need adequate and precise information regarding the opportunities available to them to participate in an energy transition. A lack of crucial information often constitutes a significant obstacle to participation. Sufficient and transparent information, a simple process and clear rights of consumers to participate will lead to a more flexible energy system, optimise the grid and ensure energy security. This will not only address the challenges of acceptance, but also facilitate acceptability, which is essential to the success of an energy transition.

The prevalent reported grand challenge of social acceptance for development of clean energy systems and an energy transition would not be fully addressed unless a balance is struck between top-down, centralised energy policies and strategies on the one hand and bottom-up, grassroots approaches on the other. Therefore, we suggest that future studies shift the focus from social acceptance to social acceptability. Social acceptance is a top-down concept that merely refers to the absence of active stakeholder opposition to a technology. Social acceptability is a more democratic and socially inclusive concept that combines social acceptance and social support. Social acceptance should not be considered the equivalent of social support; when studying the social dimensions of an energy transition, care should be taken to distinguish between these two concepts. Evidence suggests that social acceptability emerges when citizens are activated to make practical contributions to an energy transition through demand-side flexibility, prosumption, community energy projects, decarbonisation of the mobility sector, sustainable land use, and energy efficiency and green energy systems for households. Hence, citizen participation will not only expedite an energy transition and mitigate climate change, but also facilitate more jobs and bolster the economy in the face of significant challenges, such as those associated with technological breakthroughs (e.g., artificial intelligence) or abrupt global crises, like climate change or the Covid-19 pandemic.

One of the limitations of this edited volume is that none of its chapters focuses exclusively on the Baltic States (i.e., Latvia, Lithuania and Estonia), although these three nations are considered alongside other BSR countries in Chapter 4. This issue warrants further investigation: the significance of grassroots activities for energy independence and for the security of small states in geopolitical regions facing particular challenges (in this case concerning the dispute between Russia and the Baltic States and the security threats posed by Russia) is an important topic for future research. In addition, further comparative studies between regions would also allow for an exchange of lessons learned between regions and countries and prevent the repetition of experiences that hinder a timely energy transition. Generally speaking, constructive cross-border knowledge exchange is valuable because, in the context of climate change and energy security, local actions have global impacts.

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