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Masterarbeit, Wintersemester 2022

Sozialwissenschaftliche Fakultät

Ludwig-Maximilians-Universität München

https://doi.org/10.5282/ubm/epub.93346

LUDWIG-
MAXIMILIANS-
UNIVERSITÄT
MÜNCHEN

GESCHWISTER-SCHOLL-INSTITUT
FÜR POLITIKWISSENSCHAFT

Münchener Beiträge
zur Politikwissenschaft

herausgegeben vom
Geschwister-Scholl-Institut
für Politikwissenschaft

2022

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Energy Communities in Comparative Perspective: An Explorative Study of the Institutional Factors Affecting the Development of Community Energy Initiatives across the European Union Based on the Cases of Germany, Spain and Poland

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Masterarbeit bei
Dr. Yves Steinebach
2022

Abstract

Although energy diversification has been on the EU's agenda for several decades, the right of citizens to engage in energy generation and trade was first explicitly acknowledged only in 2018. Prior to their legal recognition, community energy initiatives had been emerging for some time across the EU, primarily in its Northwestern member states. Given the rising political relevance and regional character of the phenomenon, this thesis explores institutional enablers and barriers influencing the uptake and abundance of renewable energy cooperatives. It does so by comparing the national contexts of Germany and Spain, while testing the derived evidence against the Polish case. To this end, the present study is guided by the question of what institutional factors affect the development of energy communities in the EU member states, as well as what role the market-related, political and socio-cultural environments play. For this purpose, as a framework for theoretical explanation, the policy arrangement approach according to Arts, Leroy and van Tatenhove is applied, in combination with the concept of the institutional space by Oteman et al. and ideal types of policy arrangements by Liefferink. The study concludes that governance-related factors are the ones that exert a critical influence. The most beneficial environment for the emergence of energy communities is the one where the state artificially creates a space for them to develop, while protecting them from manipulation by traditional market actors.

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List of Abbreviations

AELÉC	Asociación de Empresas de Energía Eléctrica [Association of Electricity Companies]
ANPIER	Asociación Nacional de Productores de Energía Fotovoltaica [National Association of Photovoltaic Energy Producers]
BMU	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit [Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of Germany]
BMWi	Bundesministerium für Wirtschaft und Energie [Federal Ministry for Economic Affairs and Energy of Germany]
CAP	Collective action problem
CEC	Citizen energy community
CEP	“Clean Energy for all Europeans” package
CHP	Combined heat and power
CNMC	Comisión Nacional de los Mercados y la Competencia [National Commission for Markets and Competition]
DGRV	Deutscher Genossenschafts- und Raiffeisenverband e.V. [German Cooperative and Raiffeisen Confederation]
DSO	Distribution system operator
EC	European Commission
EEG	Erneuerbare-Energien-Gesetz [Germany’s Renewable Energy Sources Act]
FiP	Feed-in premium
FiT	Feed-in tariff
GHG	Greenhouse gas
IDAE	Instituto para la Diversificación y Ahorro de la Energía [Institute for Energy Diversification and Saving]
IEA	International Energy Agency
IEMD	Internal Electricity Market Directive

MITECO	Ministerio para la Transición Ecológica y el Reto Demográfico [Ministry for Ecological Transition and the Demographic Challenge]
PAA	Policy arrangement approach
PV	Photovoltaics
Px1NME	Plataforma por un Nuevo Modelo Energético [Platform for a New Energy Model]
RE	Renewable energy
REC	Renewable energy community
RED	Renewable Energy Directive
REE	Red Eléctrica de España [Spanish Electricity Grid]
RES Act	Renewable Energy Sources Act of Poland
UNEF	Unión Española Fotovoltaica [Spanish Photovoltaic Union]
WWF	World Wide Fund for Nature

1. Introduction

Climate change and supply security dominate the current energy policy debate. It is, therefore, vital to consider and find reasonable ways to reconcile the energy industry and climate policy objectives. Swift action and a rapid expansion of renewable energies are urgently needed to meet the goals necessary to avert irreversible harm to the global ecosystem. In view of this fact, the importance of renewable energy (RE) and the awareness of the finite nature of fossil fuels have increased in recent years.

Since the Earth Summit in Rio de Janeiro in 1992, the United Nations Council for Environmental Development has made sustainable development and global climate protection a priority. Since then, there have been isolated attempts to reduce rising carbon dioxide emissions and the threat posed to the Earth's atmosphere, such as the famous Kyoto Protocol and, most recently, the Paris Agreement. Some states, however, still continue to pursue separate strategies, leading to difficulties in successfully achieving globally "concerted" climate and energy milestones. For instance, the withdrawal from the Paris Agreement of the United States (US) – as the second largest CO_2 emitter after China (Ritchie & Roser, 2020) – is expected to reduce the willingness of some countries to contribute and may thus delay global emission reductions (Sælen, Hovi, Sprinz & Underdal, 2020: 128f).

However, the European Union (EU) has been overall active in promoting climate and energy policies. In the first commitment period of the Kyoto Protocol, the EU could domestically cut its greenhouse gas (GHG) emissions by an average of 11.7% by 2012, having exceeded the set target of at least 8% compared to 1990 levels (EEA, 2016). By contrast, the global result with an emissions' *in*crease of 40% was rather sobering (Worldbank, 2012). In 2021, the EU agreed on a more ambitious goal to reduce emissions by 2030 by at least 55% of 1990 levels and to become fully climate-neutral by 2050, i.e., to achieve a state of net-zero carbon dioxide emissions (European Council, 2021). In this regard, one of the crucial aspects is the expansion of RE use: the current EU-wide target is that 40% of energy should stem from RE sources by 2030. Nonetheless, the European economies and industries still largely depend on fossil fuels.

Such a radical energy turnaround requires a large-scale restructuring in established economic and energy systems, provoking debates on future energy needs, the security of energy supply and environmental compatibility of energy use. Accordingly, the transition towards decentralized, regionally anchored energy production has been gaining momentum in recent years.

One of the key developments is the emergence of *energy communities.* In simple terms, citizens and other local actors jointly participate in the storage, use, distribution and trade of own-generated energy. Energy communities offer a possibility for introducing collective arrangements into the energy sector, thereby shaping the latter towards open and democratic participation and governance, while simultaneously delivering benefits to own members or the local community in a broader sense. The anticipated potential of such initiatives is spectacular: by 2050, half of all EU citizens could produce their own renewable electricity an, in such a way, cover almost half of the EU's energy demand (Kampman, Blommerde & Afman, 2016), while generating up to two times more power than nuclear plants currently do (Aryblia et al., 2018: 16).

Nonetheless, until recently, energy communities did not have a solid legal basis on either national or EU level, which is an essential prerequisite for unleashing the full potential of energy communities (Caramizaru & Uhlein, 2020). It was only in 2019 that the EU included the concept of energy communities into its "Clean Energy for all Europeans" regulatory package (CEP), while providing certain categories of community energy initiatives with a position in its legislation. Accordingly, the EU member states are presently obliged to create national frameworks that foster the emergence and development of such energy communities and allow the latter to compete with established, large-scale market players on an equal footing.

As the EU places its citizens at the heart of the RE process, traditional business models of large energy market players are increasingly being challenged. Hence, the member states may have a difficult time developing strategies on how to foster energy communities, while staving off resistance of traditional actors and preventing the destabilization of national market structures. National governments had until July 31, 2021, to transpose the new provisions of the EU law into their own legislation. At present, only a few states – Greece, Slovenia and Portugal – have succeeded with this task (Frieden, Türk & Neumann, 2020: 3).

Despite the absence of legal recognition, energy communities have been booming across European countries. Their uptake is yet marked by regional differences: while Northwest Europe shows a high number of community energy initiatives, Southeast Europe is clearly lagging behind (Caramizaru & Uhlein, 2020; Hewitt et al., 2019). However, studies concerning this geographical imbalance are lacking. Moreover, even with energy communities attracting increasingly more attention from policy-makers and the media, only a transparent number of studies address their potential in advancing climate and energy goals and identify obstacles to their development.

The existing studies on community energy are predominantly of a multidisciplinary nature, while highlighting its (socio-)technical (Weber & Shah, 2011; Walker, 2008, Ruggiero, Martiskainen & Onkila, 2018; Dóci & Vasileiadou, 2015), socio-psychological (Koirala et al., 2018; Bauwens, 2016) and, increasingly, economic (Bauwens, 2019; Yildiz, 2014) aspects. Community energy has, however, rarely been an object of analysis from a social and, more specifically, political science perspective. To date, it has been explored from the viewpoints of social innovation (Hewitt et al., 2019), political economy (Ćetković & Buzogány, 2016) and co-production in the context of the European welfare state (da Silva, Horlings & Figueiredo, 2018).

The reviewed literature on the context of energy communities mostly comprises single-case studies examining individual traits of community energy projects in pioneering countries such as Germany (Kalkbrenner & Roosen, 2016; Yildiz et al., 2015; Yildiz, 2014), the Netherlands (Reijnders, van der Laan & Dijkstra, 2020; Oteman, Kooij & Wiering, 2017), the United Kingdom (Mirzania et al., 2019; Seyfang, Park & Smith, 2013) and Denmark (Mey & Diesendorf, 2018; Hvelplund, Østergaard & Meyer, 2017).

The limited number of studies extending the single-state context mostly investigate separate initiatives and motivations of their members (see e.g., Sloot, Jans & Steg, 2019; Hicks & Ison, 2018) or examine institutional settings in the Northwestern European states (e.g., Schmid, Meister, Klagge & Seidl, 2020; Kooij et al., 2018; Bauwens, Gotchev & Holstenkamp, 2016; Oteman, Wiering & Helderman, 2014). In addition, some of the comparative studies approach the institutional environment solely from a regulatory perspective (e.g., Romero-Rubio & de Andrés Díaz, 2015).

Notably, the variance in uptake of energy communities in different states is reflected in the selectiveness of the available research, as most research bodies concentrate on the analysis of the Northwestern pioneers. By contrast, the phenomenon of energy communities in the Southern and Eastern European countries – the latter being earlier labeled as “laggards” in the global energy transition (Liefferink, Arts, Kamstra & Ooijevaar, 2009) – has only been covered in very few studies (e.g., Spasova & Braungardt, 2021; Capellán-Pérez, Celador & Teres-Zubiaga, 2018; Romero-Rubio & de Andrés Díaz, 2015).

As European countries enormously vary in the number of their energy communities, there is a pressing need for a comparative study on institutional settings (Blasch et al., 2021: 3). This thesis takes the underlying research puzzle of such EU-wide divergencies as its starting point, as it seeks to fill the research gaps addressed above. Accordingly, the following question guides the present inquiry:

➢ *What institutional factors affect the development of energy communities in the EU member states?*

This research question, in turn, generates further subquestions in the course of the paper, concerning the role of market-related, political and socio-cultural enablers and barriers. Accordingly, the following chapters shall also examine their relative importance and provide insights into measures that may facilitate the introduction of energy communities.

In order to answer the questions posed, the author follows a two-step research procedure. The first step is a comparative study of Germany and Spain based on the *method of difference* by John Stuart Mill’s (1883), as countries with most and least energy communities in the EU, respectively. Subsequently, Poland, which also has the second-lowest number of community energy initiatives, is used as a test case to validate the findings derived from the country comparison. Including countries that have not been particularly successful in the context of community energy so far, not only sheds light on an under-researched area in social sciences but also provides new insights into a constraining environment for the uptake of energy communities.

The thesis follows the so-called *policy arrangement approach* of Bas Arts, Pieter Leroy and Jan van Tatenhove, while adopting the key concept of *institutional space* (Oteman et al., 2014). The author argues that the different configurations of the relationship between state, market and civil society (community) in diverse countries offer different degrees of freedom or *space* for communities to organize their energy supply. Thus, the trends in the emergence of energy communities are expected to depend on the design of arrangements in a national context. For the first time, the institutional space concept is applied in combination with Liefferink's (2006) ideal typology of institutional arrangements, which directs its focus on the national level and is hence suitable to address differences between the EU member states.

In addition to the application of a new theoretical model and investigation of "laggards", the present study refines the conceptual approach of Oteman et al. (2014) by revisiting their choice of enabling institutional variables, while drawing upon the research on barriers for energy communities' development and adding further explanatory factors to the framework. Defined in this manner, this conceptual framework allows for a systematic comparison of different national settings in which energy communities are forced to operate.

The remainder of this thesis is structured as follows: Chapter 2 leads the reader on a short digression into climate change mitigation and the energy transition path of the EU, in order to delineate the important role that energy communities play along the way towards the set targets. Chapter 3 starts by providing a general definition of energy communities, a brief outline of existing business models, technologies used and driving factors for citizens to participate in such initiatives. Further, their newly acknowledged position in the EU law and potential benefits will be elaborated more thoroughly. Chapter 4 develops the theoretical perspective briefly outlined above, prior to moving on to the analytical framework in Chapter 5. Here, the existing literature on community energy is consulted regarding the variety of enabling and constraining factors to its development. Then, the author identifies the relevant factors to be examined empirically and matches them to the theoretical argument developed in the previous section. Moreover, the author explains her choice of countries to be analyzed in the next step as well as comments upon the data sources used. Chapter 6 starts with a comparative assessment of national settings in Germany and Spain in regard to *renewable energy cooperatives*, with possible factors accounting for differences in their uptake being briefly discussed afterwards. In the next step, the findings are tested against the test case of Poland. Chapter 7 entails a discussion of the empirical findings and the applicability of the theoretical foundation. The thesis ends with a brief summary, further suggesting possible strategies for stimulating the energy communities' development, addressing the limitations of the study and outlining avenues for further research.

2. History of the European Union's Energy Transition

To understand why energy communities are a vital element of the European – and indirectly global – path towards set sustainability targets, it is necessary to take a look at the long way the EU has come since the last century in order to combat climate change. In the following section, the milestones of EU emission reduction efforts and energy transition will be traced.

In 1988, the European Commission (EC) published its first communication on the topic of climate change, addressing the greenhouse effect explained as atmospheric warming caused by GHGs (EC, 1988: 13). The detailed report about the causes and risks of this development in the late 1980s underlined what policy-makers are still emphasizing in 2021, namely the role of fossil fuels and deforestation (ibid.: 5). The motivation for the EC to engage in global debates on climate change and the risks associated with it came from a process initiated shortly before by the Intergovernmental Panel on Climate Change (IPCC). This panel set up under the guidance of the US government was an early attempt to sensitize policy-makers to a topic that had brought concern to academic researchers in previous years (Jordan & Rayner, 2010: 54).

In the early 1990s, after months of internal struggles between different positions, the EC introduced a number of concrete suggestions for tackling climate change such as the combined energy/CO_2 tax (EC, 1992). However, the latter was perceived as too radical by some member states. Thus, following the Maastricht Treaty on deeper integration being voted down by the Danes in the wake of the 1992 Earth summit in Rio, the EU was ready to sacrifice environmental policy and thus abandoned the tax proposal in order to maintain own unity (Jordan & Rayner, 2010: 60).

In 1991 the Sustainability Achieved via Energy Efficiency (SAVE) programme laid a cornerstone for non-technological policies for energy efficiency. To reduce fuel consumption of cars and the associated CO_2 emissions, the frequent inspection of cars was suggested for all member states (EU, 1992: 2). Additionally, financial instruments such as tax incentives were chosen to support citizens in actively saving energy (ibid.: 3). To strengthen the use of RE energy sources, the separate Alternative Energy (ALTENER) programme in 1993 covered, inter alia, research on RE and measures for infrastructure development (Council of the EU, 1993). As a result, 278 projects were established to develop tools for energy planning, strengthen local energy development plans and train local authorities, project developers and others responsible for working with RE in the region (EC, 1997: 8f).

In 1998, the EC reached an agreement with the European Automobile Manufacturers' Association (ACEA) to reduce CO_2 emissions in future production (EC, 1998). The organization represented most of the major vehicle manufacturers such as BMW, Porsche, Renault and Volkswagen. Nonetheless, since there was no legal basis forcing manufacturers to comply with the suggestions, the agreement was barely successful (ten Brink, 2002: 153).

After years of smaller initiatives, the EC launched the European Climate Change Programme (ECCP) in 2000 with the aim “to help identify the most environmentally effective and most cost-effective policies and measures that can be taken at European level to cut greenhouse gas emissions” (EC, 2006: 5). A central motivation for the programme was to ensure that the EU could fulfill its commitment to the Kyoto Protocol that had been signed shortly before (Viguier et al., 2003: 459). A set of working groups was established to investigate challenges like energy supply, agricultural issues, emissions trading as well as the environmental impact of aviation and cars.

The following years were marked by efforts to comply with the expectations of the Kyoto Protocol. To implement these goals a number of measures were taken like the “20-20-20 by 2020” plan. This aimed at a 20% cut in GHG emissions compared to 1990 levels, a 20% share of EU RE use and a 20% improvement in energy efficiency (EC, 2008).

In 2015, in light of the energy crisis following the Russian military invasion in Ukraine, the Energy Union Strategy was launched addressing possible alternatives to gas to ensure the energy security of the member states (de Micco, 2014: 4). These questions were also picked up in the CEP, which was launched in March 2019. At that time, the EU had already signed the Paris Agreement (ratified in 2016), which placed additional pressure on the organization. The CEP comprised eight legislative acts that addressed RE, electricity, energy efficiency and governance, risk preparedness and strengthening the authority of the EU energy regulator ACER in cross-border energy matters (EC, n.d.-a).

By addressing “all Europeans” in the CEP, the EU sought to include as many stakeholders as possible into the climate change policy process (EC, 2019a: 1). Therefore, the strategy addressed measures and opportunities that could be taken by citizens of the EU such as building *energy communities*. Accordingly, citizens were to receive the opportunity to organize in such communities, “pooling their energy, and benefit from incentives for renewable energy production” (ibid.: 13).

Soon after, the EC introduced the European Green Deal, a roadmap for the resource-efficient and competitive European economy (EC, 2019b). The document included a proposal for the European Climate Law (which was published in June 2021) and announced a radical revision of the climate and energy legislation. The latter was picked up by the *Fit for 55* initiative in July 2021.

There are several reasons why the numerous attempts to address climate change since the 1980s did not deliver the necessary results. Some of the early policy approaches left a number of sectors untouched, including agriculture and transportation. Furthermore, unclear responsibilities regarding oversight or evaluation of climate policy integration in the EU were considered a problem (Rietig, 2021: 50f). The increasing demands of global agreements placed additional pressure on the EU to develop more efficient measures to address climate change and its related areas, especially since the EU had become an international role model in the field (ibid.: 57f). Growing knowledge on different aspects of climate change also demanded new and more precise policies to respond to new findings. Finally, the policy design never satisfied all actors involved in the process, which is why new measures were requested by the different stakeholders over time (ibid.: 63ff).

Now, *energy communities* have been recognized at the EU level as new actors to be involved into the energy transition process. Accordingly, this study seeks to shed a light on the established institutional environment they have become a part of. The next chapter further elaborates on what constitutes energy communities, how they can differ in their structure and activities, as well as what benefits one may expect from community energy besides the anticipated acceleration of the RE transition.

3. Energy Communities

3.1. What are energy communities?

In Europe, the number of energy communities has grown steadily over recent years. Local communities seek to independently organize their energy production and consumption in order to separate themselves from the "large, faceless energy companies" (Reijnders et al., 2020: 137). They believe that it is only possible to become more environmental-friendly by growing independent from the overall energy system (ibid.; Dóci & Vasileiadou, 2015: 45). For this purpose, a local energy system is organized in such a way that energy is produced, consumed, stored and shared more or less on site.

Despite the growing interest, a clear definition of energy communities is still lacking. Broadly speaking, community energy is a collective term for all activities related to energy production in a community setting. Energy communities is the term often used as an umbrella for community-oriented energy initiatives with collective participation by citizens and local actors in energy production and use, seeking collective outcomes for members locally and the broader community (Blasch et al., 2021; Caramizaru & Uhlein, 2020; Hicks & Ison, 2018).

Being related to various energy activities, energy communities also tend to be heterogeneous regarding their legal, financial and organizational models (Walker, 2008). This can take the form of rural communities or neighborhoods setting up their own wind turbine, collecting waste for a combined heat and power (CHP) plant or large-scale energy investments involving the surrounding communities (Brummer, 2018: 188). However, the most widespread technology is photovoltaics (PV) (Caramizaru & Uhlein, 2020: 25), which allows for economical, continuous and accessible energy generation.

In terms of legal structure, the energy cooperatives is the prime example and most common type of community energy model (Hewitt et al. 2019: 4). Specifically, RE cooperatives are the oldest and most popular form of community action around RE sources with the European federation of citizen energy cooperatives counting more than 1,900 cooperatives in 23 European states (with 17 of them being EU member states) with 1.25 million shareholders (REScoop.eu, 2021c). The cooperative model also resembles the quintessence of energy communities: it is open to the participation of a large number of members, all having equal decision power (one vote per each member) independent of their equity share, and thus benefiting all shareholders both financially and socially (Yildiz et al., 2015: 60).

Other forms include limited and public-private partnerships, community trusts and development foundations (Caramizaru & Uihlein, 2020: 5), all having common denominators, namely citizens' participation and a *bona fide* character.

As mentioned above, community energy is often associated with decentralized RE generation. Wind energy, solar power and co-generation of heat and power can realistically be implemented by local communities as they are easily scalable (ibid.). In addition, such projects are often subsidized by the government in order to achieve both CO_2 reduction and secure energy supplies. These subsidies play a crucial role in ensuring the economic viability of community energy (Horstink et al., 2020: 19). Further possible solutions may focus on the flexible demand at local levels such as (seasonal) electric and heat storage (Koirala et al., 2016: 18).

The reasons why communities and neighborhoods choose to engage in energy-related activities include conservation concerns, environmental protection and a greater degree of self-determination and self-reliance, in addition to financial interests (Bauwens, 2016). Indeed, some are driven by self-interest considerations such as energy autonomy and security of supply (Reijnders at al., 2020; Dóci & Vasileiadou, 2015), the possibility to benefit from government incentive programs and reduced energy bills (Seyfang et al., 2013). However, as studies have shown, there are many altruistic reasons for joining energy communities. Some people wish to improve their community by founding initiatives in response to the current needs of the region (Sperling, 2017) and generating income locally (Seyfang et al., 2013: 982). Others are willing to generate their own RE in order to contribute to environmental protection (Sloot et al., 2019: 2). A further reason is the determination to reform the energy market locally in response to national governments and established players failing to do so (Boon & Dieperink, 2014: 303). Finally, there is often simply a wish to establish better contacts with the community serving as an additional driver for participation in energy community projects (Sloot et al., 2019: 2).

Therefore, often people are driven by the benefits that they expect to gain from their activity in the community energy projects (Busch et al., 2021: 5). Although sometimes overlapping, motivations and potential benefits – i.e. the impact of energy communities on their members and larger community – are different terms, with the latter being discussed in the following section.

3.2. Potential benefits of energy communities

When deciding to cooperate, the members of energy communities primarily aim at the creation of benefits for themselves, the geographical area they operate in and the energy system as a whole. Accordingly, scholars believe that energy communities may contribute to the successful achievement of UNESCO's sustainable development goals (SDGs) (Wuebben, Romero-Luis & Gertrudix, 2020). More specifically, possible benefits identified in academic literature can be grouped into *environmental*, *economic* and *social* potentials.

3.2.1. Environmental potential

As the author of this paper mostly drew upon social science literature, studies on community energy do not go into detail on the environmental impact for which it accounts (Busch et al., 2021: 5). However, community energy initiatives are generally associated with contributing to climate change mitigation and reducing GHG emissions (see e.g., Wuebben, Romero-Luis & Gertrudix, 2020; Warbroek & Hoppe, 2017; Magnani et al., 2017). To give some numbers from technical research, it is believed that such community initiatives will potentially yield up to a 12% annual reduction of GHG emissions by 2050 (Harcourt et al., 2012). Furthermore, Weber and Shah (2011) show that when using a certain combination of technologies, energy communities may reduce the CO_2 emissions stemming from their energy services by 20%.

Some authors mention potentials regarding energy efficiency and optimization (Reijnders et al., 2020; Koirala et al., 2016). The major advantage of community energy is that decentralized solutions are often controllable by calculation. For instance, the participatory way of managing energy resources may be based on the basic quantification of total energy consumption (kWh/member) (Akizu et al., 2018: 8). Based on such calculations, consumption becomes more predictable, and the community may decide on the technologies and patterns of energy management that best suit its needs (ibid.).

Finally, strategies of efficient waste management are gaining popularity among RE communities, while techniques for transforming biomass waste into clean energy have become common practice (Koirala et al., 2016). In this way, energy communities play a significant role in waste reduction and the advancement of recycling solutions (ibid.).

The alleged impact on citizens' sustainable behavior around energy and a more responsible approach towards environment, both of which relate to the environmental potentials, are elaborated in further detail in section 3.2.3.

3.2.2. Economic potential

Multiple authors also see the potential of energy communities in boosting the local economy (McKenna, 2018; Koirala et al., 2016; Walker & Devine-Wright, 2008). In this regard, rural communities and those that are situated in close proximity to generation sites are most believed to benefit financially from energy projects (Shoeib, Hamin Infield & Renski, 2021; Brummer, 2018: 190). The members can, on the one hand, achieve direct revenues from energy sales or from the renting of land and roofs (ibid.). On the other hand, the gains from energy activities are fed back into the communities to combat economic, social and environmental problems (Devine-Wright, 2005).

An important aspect in this sense is the creation of new jobs. While professionals outside of the community provide the members with and install the necessary technologies, the locals take over the operation and maintenance of the plants, which creates employment, as seen in Denmark's success case of Samsø (Jakobsen 2008). This is confirmed by Bere et al. (2016: 369), who determine the important role of regional input sourcing in other activities such as surveying, ground works and even turbine fabrications of small hydropower in Wales.

Furthermore, advantageous decentralized solutions relieve the grid interconnection point of energy communities (Reijnders et al., 2020: 138). In such a way, both transport losses can be reduced, and lower loads extend the lifetime of most plants, reducing the need for (underground) cables in the future (ibid.).

The production of local RE, efficient energy management and reduced infrastructure costs result in major energy savings. The Italian renewable cooperative Val di Ledro, for instance, achieves up to a 25% saving on its annual energy bills (Magnani et al., 2017: 36). The savings can also be distributed among the members, although, as Walker (2008) notes, only those actors who are willing and have the financial capacity to invest in such community energy projects may enjoy the benefits described above. Alternatively, as already mentioned above, if small towns or villages hold shares in the projects, the savings can be reinvested in the community and thus benefit the whole local citizenship. The community may then use the funds to enhance public services, for example, through setting up a playground (Reijnders et al., 2020: 153) or advancing daycare in the community (Brummer, 2018).

3.2.3. Social potential

Many studies have addressed the positive impact of energy communities on ecological awareness and sustainable behaviors of the participants (see e.g., Berka & Creamer, 2018; Parra et al., 2017; Islar & Busch, 2016), inter alia, through the increased efficiency of energy management.

By following the basic calculation of energy consumption as described earlier, residents are encouraged to change their behavior towards a more responsible approach in various areas of energy consumption (Reijnders et al., 2020: 137f). The energy practices that emerge in a particular decentralized context can be scaled up and thus contribute to mutual learning (ibid.).

Energy communities also strengthen the collective identity of individual members and promote community bonding (Islar & Busch, 2016; Van der Schor & Scholtens, 2015). Through collective ownership and local participatory processes, there exists no usual division of those who directly benefit from the initiative and the "others" (Jakobsen, 2008). In this sense, as cooperatives are the oldest and most known business model of RE communities (Hewitt et al. 2019: 4), their reliance on clearly-defined values such as democracy, equality and solidarity may well contribute to the social coherence of the involved actors and broader community (Caramizaru & Uhlein 2020: 20).

Finally, energy communities are believed to have a positive impact on the acceptance of RE and its technologies (Warbroek & Hoppe, 2017; Ruggiero, Onkila & Kuittinen, 2014). Even if members were initially driven by expected financial gains, they show more positive attitudes towards RE than non-members in the course of a project (Bauwens & Devine-Wright, 2018: 623). A better understanding of the generation and use of energy as well “tangible" demonstrations of its potentials lead to positive attitudes towards RE (Rogers, Simmons, Convery & Weatherallet, 2008). The effect is stronger when community actors are involved in the initial stages of a project, are able to invest in installations and then benefit financially (Brummer, 2018). Being involved from the beginning, participants view the distribution of outcome as fair and are more willing to support the project (Bauwens, 2017: 20).

3.3. Energy communities in the European Union law

However, in order to achieve the benefits and unlock the potentials identified in the previous sections, many barriers to energy communities may still need to be overcome. One such obstacle for many years has been the failure of EU legislation to even recognize the existence of energy communities, thus denying them a noteworthy position as legal entities.

The recent CEP of the EC is a historic breakthrough for community energy projects. In an unprecedented move, EU law now recognizes the rights of individuals and municipalities to participate directly in the energy sector through the production, storage, consumption and trade of their own energy. This was established by officially acknowledging certain categories of energies that are used collectively as an *energy community*. The energy community is defined by two separate pieces of legislation as part of the CEP. In this way, the EU's recast RE Directive 2018/2001 (RED II) and the Internal Electricity Market Directive 2019/944 (IEMD) provide the frameworks for Citizen Energy Communities (CECs) and Renewable Energy Communities (RECs), respectively. These legal frameworks thereby introduce energy communities as a way of organizing collective, non-commercial action within the energy sector based on specific ownership and governance criteria (Roberts, Frieden & d’Herbemont, 2019: 7).

Accordingly, both CECs and RECs are voluntary, value-driven collective actions that are open to all consumers and require effective control by participants (IEMD, Art. 2/11.a; RED II, Art. 2/16.a). Such potential participants include natural or legal persons, municipalities as well as small and, in the case of the RECs, medium-sized enterprises. In the case of private companies, participation must not be their main commercial or professional activity (IEMD, recital 44; RED II, Art. 22/1). The members are allowed to consume, store and sell self-generated energy and leave energy communities without losing access to the power grid (IEMD, recital 43).

Despite CECs being technology-neutral, their activity comprises generation, distribution, supply, consumption, aggregation and storage of electricity (IEMD, Art. 2/11.c). In turn, RECs deal exclusively with both electricity and heat from renewable sources (RED II, Art. 2/16.a). Further, they must be situated close to the energy source (ibid.), while CECs require no such geographic proximity and allow for cross-border, supra-regional cooperation.

As the CEP sees energy communities as non-commercial type of actor, it is vital that they are able to resist the concurrency of energy enterprises and are able to participate freely in the market. Thus, both directives include a call for corresponding legal framework. According to the IEMD, the states must remove all discriminatory conditions and provide them a fair access to the market (Art. 16 and 17), while RED II also entails a requirement on the member states to enable energy communities to compete “on an equal footing” (recital 26) with large market players. Yet, both frameworks differ in their initial purpose: while the creation of a “level playing field” (IEMD, Ch. VII, Art. 65) for communities is the primary aim of the IEMD, the RED II pursues higher use of RE on national level and sees RECs as a promising means. The member states are therefore tasked with creation of an enabling framework to promote the *development* of the RECs – rather than just providing a “level playing field” for them (Roberts et al., 2019: 7). However, they are neither allowed to distort competition nor waive rights or obligations to other market participants (RED II, recital 16; IEMD, recital 46).

Besides the need for a structured organization and sufficient size to compete with larger players, a major obstacle for energy communities is the inadequacy of current legislation (Reijnders et al., 2020: 153). The new EU directives give energy communities a legal position, although their exact rights and obligations have yet to be defined. Only by embedding *enabling* frameworks into national legal systems can states fully experience the positive effect of energy communities on national economy and energy security. In this respect, this study offers insights into what such enabling framework might include.

3.4. Working definition

Given the official definitions of the EU law described above and the absence of a uniform, scientifically acknowledged definition of the term “energy community”, this thesis relies on the concept of *renewable energy communities*. Here, they are more broadly defined as locally embedded entities in which citizens alongside enterprises and local authorities actively participate in collective decision-making about the generation, storage, consumption, distribution and trade of energy from renewable sources.

The special focus of the study is motivated by the promising contribution of RECs in achieving the RE targets of the EU and the potentials arising from their local embeddedness, as elaborated in section 3.2. Notably, the countries that are far up in the implementation of the EU directives have also set their focus primarily on RECs (Frieden et al., 2020: 3). However, the application of RED II in the three countries selected for empirical analysis leaves something to be desired (Biresselioglu et al. 2021: 19; REScoop.eu, 2021b), adding to the relevance of this thesis. This study could help to identify institutional obstacles to the emergence of RECs that should be addressed by policies in the first place.

4. Theoretical Framework

4.1. Community energy as a solution to the collective action problem

In recent decades, the term *global public good*, which first originated in economics, has increasingly been used in regard to climate and energy issues. According to Samuelson (1954: 387), there exist two kinds of economic goods: public and private. Public goods differ from private ones in terms of non-rivalry, i.e., their use by one person does not restrict the others from the use of the same good. Moreover, no one can be excluded from consuming these goods, even those who did not pay for them. In terms of this non-excludability, there arises a so-called collective action problem (CAP). According to Olson (1965: 16), it seems rational for an individual actor, while he/she gets to consume a public good for free, to adopt the position of a free-rider and not to bear the costs of production. This poses a central problem for the provision of collective goods, because the more actors behave as free riders, the less adequate are the collective goods that can be provided. Here, the size of the group plays a determining role, since the absence of individual contributions is difficult to control and may go unnoticed.

At the end of the past century, the United Nations Development Programme (UNDP) also declared goods whose external effects extend beyond national borders – such as the environment – as public goods (UNDP, 1998: 98). The dangers of climate change and the benefits of the ongoing energy transition are shared by all individuals globally. This effect was not the case in the last energy transition when coal was replaced by hydrocarbons (mineral oil and natural gas). Back then, only a few consumers were able and ready to pay more for the beneficial effects associated with these “new” sources such as increased efficiency and reduced air pollution (Bauwens, 2017: 13), while making those sources theoretically match the definition of private goods.

The CAP has indeed been confirmed to be a barrier to sustainable behavior in households (Ohler & Billger, 2014). In this regard, RE technologies may also become an exclusive good due to their usually higher costs. However, energy communities can provide a solution to this problem, and not only regarding the lower cost of self-generated energy. Recent literature has argued in favor of decentralized action in terms of climate change mitigation to strengthen global efforts and secure their effectiveness at local levels (see e.g., Ostrom, 2010). After all, this would address the problem of group size. Such communities are social institutions that provide certain social norms, which in turn prevent individuals from free-riding. They are small-scale and rely on open participation, non-anonymity and durable personal interactions among members (Bauwens, 2017: 17). In such a way, energy communities pose a striking contrast to the existing market structures: while advancing the emergence of stable social norms like trust, solidarity and pride, they make the option of free-riding less attractive for their members (ibid.).

As such, national governments are viewed as being responsible for fostering the development of such collective action institutions that may “bring out the best in humans” (Ostrom, 2010: 23). This corresponds with existing empirical studies showing that the uptake and abundance of energy communities are largely related to the institutional framework of the energy sector, which can both hinder and promote their development (Blasch et al., 2021). In this respect, research on the development of energy communities should consider the whole complexity of institutional arrangements (Sovacool, 2016), and the present study readily draws upon this appeal.

The author believes that the policy arrangement approach or PAA (Leroy & Arts, 2006; Arts, Leroy & van Tatenhove, 2006; Arts & van Tatenhove, 2006) and the institutional space concept (Oteman et al., 2014) may help in assessing complex constellations surrounding energy communities in different nation-states. The following section elaborates on this theoretical perspective in further detail.

4.2. Policy arrangement approach

While some countries have seen major success in developing community energy projects, others have not. It is to be presumed that there are systemic differences that have a decisive influence on enabling or impeding the uptake and goal achievement of energy communities. Challenged with the application of theory in explaining such national differences, it is worth taking a step back to identify two main types of prominent theoretical approaches in social sciences: agency-based and structure-based.

While agency-based approaches tend to stress the importance of social, “soft”, micro-level aspects, the structure-based approaches focus on institutional, “hard”, macro-level factors. This *structure versus agency* conflict is not only one of the most central issues in social sciences, but, according to McAnulla (2002: 271), it should also be considered as an essential concept in terms of how we study politics. The conflict encompasses the question of whether agents and actors shape structures or vice versa. Structuralists consider that social texture is determined by material and cultural structures, while opposite theorists are of the opinion that agents and actors possess capabilities to shape their surroundings and are to be seen as more influential than the structures that they shape. It goes without saying that both perspectives produce valuable insights into the topic at hand and several practical theories deal with aspects of this debate, such as the policy network and advocacy coalition approaches as well as discourse analysis (Liefferink, 2006: 45).

However, in a third, relatively modern approach – that is, the PAA – neither agency nor structure are considered in singularity, as “structural processes in and structural properties of social systems constrain and enable meaningful action, while agents (re)produce and transform these processes and properties" (Arts & van Tatenhove, 2006: 21). The PAA translates the assumption about the duality of structures, i.e., the equivalence of agents and structures, into an operational concept built on the separate theories mentioned above (ibid.: 27). This approach aims to link everyday practices of policy making (by the agents) to a broader spectrum of political and societal (structural) changes, which in turn may or may not prompt agents to react. A *policy arrangement* is then defined as "the temporary stabilisation of the content and organisation of a particular policy domain" (Leroy & Arts, 2006: 13), which means that agents and structures have reached a (temporary) stabilized state or, simply put, an agreement. This is not so much characterized by voluntarism or mutual congruence, but is rather an understanding of the necessity of stability within the process of political modernization. The latter is understood here as a transformation in society that bears consequences for politics and policy-making (Arts & van Tatenhove, 2006: 21f).

Hence, this paper is guided by the extensive publications of Arts, Leroy and van Tatenhove, as they have shaped the understanding of such transformation in the context of environmental policy with their research and publications from 2000 onwards. The authors acknowledge that their approach is a work in progress that may require further theoretical, methodological and empirical elaboration (Arts et al.: 104). Nonetheless, the PAA "has proved inspirational and fruitful […] for an analysis and classification of a number of structural political developments *and* for assessing the impact of these long-term processes" (ibid.).

Leroy and Arts (2006: 13) define the PAA as an *institutional* concept that is able to classify and characterize arrangements resulting from "contextual societal and political trends and processes". They distinguish four dimensions that influence policy arrangements: *Actors* (and their constellations), *Rules of the game* (in terms of formal procedures and informal routines), *Resources* (likely leading to an imbalance in power) and *Discourses* (social norms and values, approaches to solutions) (ibid.). As all four dimensions are linked, a shift in one pertains to all of them (Arts et al., 2006: 99f). The appearance of new actors or the dissipation of old alliances contributes to a shift in resources. The internal or external acquisition of power through financial means or immaterial capacities such as knowledge or perception may also be the cause of substantial change. Likewise, a transformation of the rules may be caused through a shift in discourse, which in turn may free up resources for certain actors or their alliances (ibid.).

The four dimensions in combination are able to provide insights into a policy domain, i.e., political and economic ecosystems. In this thesis, the general principles of the PAA are used to position energy communities in their respective institutional contexts. In order to make use of the PAA in the context required for this study, Duncan Liefferink's (2006) ideal types of policy arrangements are adapted to characterize the national environments in which energy communities must operate.

4.3. Ideal types of institutional configurations and the concept of institutional space

Thanks to its versatility, the PAA can be deployed in any given situation where political modernization is examined, with political subsystems such as the energy sector being particularly suited for it. In order to provide insights into the factors inhibiting or supporting the development of energy communities that depend on national policy-making, it is necessary to abstract the PAA from subsystems towards states and national polity.

Previous authors, such as Oteman et al. (2014), followed Arts et al. and used the PAA to solely examine the respective national energy sectors as the environmental subsystems that exert decisive power on the development of energy communities.This study argues that while a thorough analysis of the national energy sectors provides much-needed insights into associated power dynamics, it fails to explain why energy communities appear in the ways observed in different European countries. The application of the PAA in this field of study is therefore in urgent need of improvement to provide a robust explanation for national differences.

For this reason, the author employs Liefferink's (2006) basic typology of national policy arrangements. Just like previous scholars, Liefferink stresses that four dimensions of the PAA are inseparably interwoven: a change in one must have an effect on the others. Adding to Arts and van Tatenhove (2006), Liefferink states in reference to Hajer's (2003) policy analysis that inharmony between these four dimensions might lead to institutional voids, i.e., an absence of shared rules (ibid.: 49). Liefferink's theory also introduces the idea that while the four dimensions cover almost all aspects of political life, broader changes in society or even the physical environment – such as noticeable changes in climate and, accordingly, more frequent occurrences of extreme weather – may alter power relations that initiate changes in individual policy arrangements (ibid.).

All of the above sets the stage for Liefferink's typology, which, keeping in mind that the policy dimensions are interlinked, assumes that once one dimension is entirely controlled for, all other dimensions adjust accordingly. For this reason, Liefferink suggests a deductive approach, employing a traditional triad of etatism, liberal-pluralism and neo-corporatism as points of departure. This is mainly because these established concepts focus attention on certain characteristics (ibid.: 61). These types are assigned by their respective patterns in the aforementioned dimensions of policy arrangements.

In an etatist state, state actors control resources, while non-state actors are mostly excluded from participation and put in a dependent position. This also entails a corset of rules that directs the necessary authority towards the state. The public discourse is either heavily monitored or even controlled by the authorities. Nationally, this would be exemplified by authoritarian states, while in policy subsystems examples can be found in the public health sector of several European countries which, counterintuitively, are mostly social market economies (ibid.).

Liberal-pluralism is a market-oriented model where all actors have an access to resources which they then compete for in an open manner, while no single actor dominates. Newcomers, in turn, can enter the arrangement fairly easily. The discourse is expected to be open and confrontational. A prime example of such a system is seen in the US (ibid.).

Neo-corporatism is dominated by the state and monopolising associations (the market and civil society) that share major resources in highly institutionalized settings. Policies are made and implemented in collaboration, including negotiations with the goal of building consensus. In contrast to the liberal-pluralistic type, it is rather impossible for newcomers to gain a foothold in this system. (ibid.: 62)

Liefferink's critique of this triad is that their logic is directed towards public policy-making, which – even though it is made jointly under neo-corporatism – does not account for initiatives that occur outside of the "system" (ibid.). Again referring to Hajer (2003), Liefferink reintroduces the concept of *institutional voids* that, as laid out before, may occur when friction in the process of political modernization occurs. Such frictions create unregulated "grey" areas, in which initiatives are possible. The latter in turn have the potential to become external impulses for the entirety of the policy arrangement.

An ideal type from the perspective of (energy) communities – in the sense that it can be characterized in terms of the aforementioned traditional typologies – would be an arrangement where actors' membership and range of action is limited to the problem at hand (Liefferink, 2006: 62). The state's interference is minimal, and resources are owned and managed by private actors. The major driving factor within the arrangement is neither power nor capital but rather solidarity. Liefferink refers to this type as *sub-politics* (ibid.).

These ideal types will almost certainly never present themselves in practice, yet the national setting may trend towards one of them (ibid.: 63). Going forward, these ideal types may be able to provide guidance by answering the question of why certain states are able to nourish community energy initiatives and how they do it.

Following Oteman et al. (2014), this research applies the concept of *institutional space* in connection with Liefferink's ideal types of policy arrangements.

The central assumption is based on Hajer's (2003) proposition: the state of the political arrangement between the market, state and civil society will (or will not) allow for institutional space that can build the foundation upon which energy communities are formed (Oteman et al., 2014: 4). Institutional space is defined as the degree of freedom energy communities have when initiating and conducting energy-related activities (ibid.). Where institutional space is the largest, energy communities may freely set their own goals, develop strategies, design and implement energy projects, without impediments but with support from the state, market and civil society. Therefore, institutional space is considered both the relative absence of constraints as well as the presence of enabling conditions (ibid.). The given institutional space will influence how many energy communities will emerge in the respective system and consequently how successful they will be in achieving their goals.

While institutional space has previously been used to define the way in which energy *sub*systems in Germany and Nordic countries are advantageous to energy communities (ibid.), using Liefferink's ideal typology, this thesis focuses on how a national approach might signal the presence of a broader structural problem within different nation-states in the EU.

4.4. Making theory applicable

Based on the previous chapter and Liefferink's ideal types of national policy arrangements, these ideal types will now be considered in relation to the institutional space they potentially offer for energy communities.

As the state – or rather state actors – control all or most resources in etatism, non-state actors are placed in a dependent position. This does not necessarily mean that community energy initiatives are not to be found in those systems at all as the state, if it is willing to, may very well support them through funding schemes and supportive regulatory frameworks. It rather means that the state dictates how the energy communities operate. As etatism is characterized by strict top-down policy-making, in this context the progress is likely to be slow, and its one-fits-all approach for fundable solutions might inhibit necessary local flexibility. In practice, state-level control will account for little institutional space, hinder innovation and operation outside state-defined norms in the absence of "grey" areas. This will likely lead to an underrepresentation of energy communities in these systems as they need to be able to customize available solutions to respective communal needs.

Liberal-pluralist state, in its turn, is characterized by economic competition and minimal state intervention, thus leading to an abundance in institutional space. This drives the options of support for energy communities by the state towards nil and makes them interact with other market players in a bid for resources. This minimal top-down policy-making enables such initiatives to be versatile in tailoring market solutions towards their needs. However, the typical market-based financing models like market-rate loans or commercial investment could render energy communities – as non-commercial newcomers – unviable, thus hindering their emergence. Although discourse is expected to be open and confrontational, it is to be assumed that public discourse in liberal-pluralist environments discourages actors from developing small-scale non-profit energy communities as collectivist engagement in public welfare and sustainability may be valued less. Therefore, despite being based on open participation, such an arrangement may possibly lead to an underrepresentation of energy communities in these systems, with the CAP being the strongest here.

A neo-corporatist order, defined by strong associations of interest, makes market access for newcomers generally harder. The emergence of energy communities is thus expected to depend on a consensus of dominating associations to create a respective space for the former. To have a chance on a long-term developmental success, community initiatives would need to organize themselves into respective associations, thus gaining access to policy-making. It would, hence, require a concerted effort of many willing community actors to unionize, as organizational advantage would likely depend on the size of alliances. Yet, if successfully done, the system could benefit energy communities. As policies would be made in collaboration and in accordance with representatives of the factions concerned, the rules of the game would be rigid and the decision-making process slow yet stable and democratic. Such a negotiation culture may lead to positive discourse in regard to collective action and public goods, while the public might be more open to the idea of supporting solutions to collective action problems. Yet, as bargaining powers are hard to earn, it is to be expected that the abundance of energy communities would be largely dependent on public and private actors' support. Otherwise, the community initiatives would not gain a foothold in the system.

Liefferink's (2006: 62) novel ideal type of sub-politics, where interference by both the market and the state in the development of energy communities is minimal, initially seems to provide the most promising outlook in fostering the development of energy communities. In practice, there may still exist an imbalance as the nation-state at least partly manages important resources such as the national power-grid, while financial means, skills and brainpower mostly reside within the market. The rules of the game are of medium rigidity, as respective institutional spaces are negotiated at a local or regional level, which allows for more flexibility. Actors are thus able to focus on the problem at hand and resources are allocated without economic pressure. A collectivist and solidary approach is pursuant to favorable public discourse, which means that a solution to the CAP might best be realized in sub-politics settings.

Following this framework, it is now possible to characterize nations with the aid of empirical data, while relating observed institutional and regulatory phenomena to their effect on the development of energy communities.

5. Analytical Framework and Methodological Approach

Before applying the PAA approach and conducting an empirical analysis, it is necessary to make the phenomenon of interest tangible and operationalize the four dimensions of institutional arrangements described above.

Thus, in the first step the author elaborates on how the *development* of energy communities is defined in this study. Subsequently, existing case studies are briefly drawn upon to identify enabling or hindering conditions for the uptake and abundance of energy communities in the countries not restricted to the EU region. In the next step, selected factors are matched with the four PAA dimensions, providing an analytical framework for the country comparison in

Chapter 6. Lastly, the research method, case selection strategy and data sources will be elaborated regarding their specific advantage for the empirical analysis.

5.1. Defining development

With reference to the research question, this study aims to examine which factors affect the *general trends* in the development of energy communities in the EU member states. Broadly speaking, development is defined here as the *emergence* and *abundance* of community energy initiatives. As this study is of an explorative nature, with its main objective being to provide an overview of facilitating and constraining national settings, the derivation of a specific, rigorous measure of the phenomenon in question would narrow the potential value and generalizability of the findings.

Nonetheless, as the outcome is relevant for the selection of countries justified in 5.6., the existing number of energy community initiatives and RE cooperatives – as the most common cooperation form for RECs – in selected countries serve as indicators for the state of the *development* of energy communities as the outcome of interest. This means that regarding policies, laws and regulatory frameworks, only those that are relevant to the RE and cooperative model will be analyzed.

The decision to include cooperatives into the analysis was based on the following methodological rationale. First, in order to enable a comprehensive analysis of the context in several countries, it is necessary to 1) restrict the span of available entities in relation to which the national setting is examined, and 2) make them comparable. Second, it stands to reason to analyze formalized communities – such as cooperatives that are registered legal entities – instead of informal groupings (Bauwens et al., 2016: 139), as the former are addressed by the national law and directly benefit from or are restricted by national policies. Third, as cooperatives are well-established in other sectors across the EU such as agriculture (EC, n.d.-b), the countries may be willing to adopt a model they are well acquainted with on their way to decentralized energy supply. This would, in turn, increase the relevance of the empirical findings. Finally, this model best suits the democratic and inclusive principles of the energy community ideal type.

5.2. Determinants for the development of energy communities

5.2.1. The role of agency

To start with, the successful uptake of energy communities largely depends on the characteristics of their members and external actors in the broader context of the social community. Sometimes, agents seek to induce institutional change (Sotarauta, 2017: 591f). In Hamburg, for example, in the course of a public referendum initiated by the civil society, the energy grids were handed over into public hands (Becker, Blanchet & Kunze, 2016: 233). The cooperative Citizen Energy Berlin could not achieve the re-municipalization of the energy grids, but was able to affect the policy-making process and instigate a wide public debate on the future of the electricity network in the city (ibid.: 232). However, more frequently actors try to overcome contextual barriers by pursuing their own strategies *within* the existing institutional context (Sotarauta, 2017: 592), adapting to institutional changes rather than causing them (Oteman et al., 2017: 62).

In this sense, the leadership dimension is often addressed in literature, with an emphasis on *local champions* – local community members that take a lead in the planning and realization of a community energy project (Ruggiero et al., 2014: 59). The extent of their technical knowledge, practical experience as well as legal, financial and project management expertise either facilitates or hinders the development of energy communities (ibid.).

Further, a networking potential is considered crucial in establishing a project as “anything was possible as long as you had the right people involved” (Martiskainen, 2017: 87). Such contacts may include existing energy communities or educational organizations that may consult the members on technical issues or, for example, the best-suited ownership structure for the energy source at stake (Ruggiero et al., 2018: 586). Existing ties of project *champions* with local citizens, business actors and government facilitate a project’s uptake due to their access to knowledge concerning local business structures and funding options (Martiskainen, 2017: 86). Moreover, in such a way, members and non-members are likely to develop a stronger emotional connection (ibid.).

Positive relationships with local landlords may facilitate access to the land with energy communities being offered a lower price or prioritized as tenants or buyers in competitive situations (Ruggiero et al., 2014: 58). Closer ties to local government are especially advantageous when an energy community tries to access the electricity network or applies for a planning permit (Warbroek, Hoppe, Bressers & Coenen, 2019: 10). If the agents are already known to public officials, they are regarded as more trustworthy (ibid.), and permits are thus granted without any objection (Ruggiero et al., 2014: 58).

However, not only the characteristics of individual members but also the specific features of the projects, such as the selected business model, may secure or be fatal to the survival of community energy initiatives (Warbroek et al., 2019: 2; Koirala et al., 2016: 740).

5.2.2. The role of context

A broader institutional, political and socio-cultural environment is also crucial for the development of energy communities as the success of such projects largely depends on their ability to identify and tap into the opportunities arising from the external context (Park, 2012: 388f).

Basic conditions

There exists a set of boundary conditions that determine the possibility of community energy projects to exist per se. To start with, natural conditions define the availability of energy sources which are the basic physical precondition for the formation of energy communities (Oteman et al., 2014: 3). Higher levels of technological (Gjorgievski, Cundeva & Georghiou, 2021: 1143) and socio-economic (Romero-Rubio & de Andrés Díaz, 2015) development of a country may then enhance the physical *capability* of people to establish energy communities, i.e., access the infrastructure and buy equity shares. A high degree of urbanization also plays an important role, as it may increase the costs of locating plants in cities and at the same time impede access to the grid for residents of rural areas (Oteman et al., 2014: 3).

Socio-cultural environment

If the basic conditions are in place, other factors become relevant. For example, cultural differences arising from different geographical settings account for various dynamics in energy systems (Bridge, Bouzarovski, Bradshaw & Eyre, 2013: 335f). Thus, socio-cultural attributes of the national environment may help to explain national differences in the uptake of energy communities. More precisely, socio-cultural attributes are understood here as trends in attitudes, beliefs and behavior in society.

To start with, the networking aspect addressed in the previous sections aligns with the finding that the lack of *local public support* for a project – in this sense, that of the local non-members – is considered as a significant threat to the uptake and development of energy communities (Seyfang et al., 2013: 985). As mentioned in 3.1., energy communities are often founded in response to the current needs of the region, which underlines the important role that local community attitudes play in their success. Communities with high external public engagement and support have ties to public institutions such as schools or churches (ibid.), which again supports the premise of the importance of a wide range of contacts.

Further, strong involvement of local citizens in the planning and implementation of the project is necessary for the emergence and viability of energy communities (Walker & Devine-Wright, 2008: 498). In this sense, the national *customs of social enterprises*, i.e., the extent to which the society is acquainted with cooperatives and associations as well as the connotations that such experience has, affect the prospects of public involvement in community energy.

For example, countries with strong traditions of social enterprises, such as Denmark, offer a facilitating environment for an energy community to emerge as the society is aware of the returns that such a model may provide and thus is more likely to start such a cooperation (Simcock, Willis & Capener, 2016: 5f). Where such models are new, there is a lack of understanding of the benefits and functioning of such models which may result in the low support and engagement (Huybrechts & Mertens, 2014: 207f). In Eastern Europe, collective ownership is often associated with its socialist past, including the governmental practice of information dissemination and the exploitation of cooperative institutional arrangements (Spasova & Braungardt, 2021: 12). In turn, this may account for the sluggish development of community energy initiatives in those states (ibid.).

Furthermore, the degree of *trust in the people of community* is considered a critical factor that influences the willingness of individuals to engage in collaborations and, more specifically, in community energy, as shown by a large survey of Dutch citizens (Koirala et al., 2018). Essentially, trust stands for the mutual confidence that neither of the actors in exchange would take advantage of each other's vulnerability (Sabel, 1993: 1133; Kalkbrenner & Roosen, 2016: 62). However, this aspect is claimed to be underrated in the field of energy research (Greenberg, 2014) and only a few studies thematize trust in regard to energy communities (Kalkbrenner & Roosen, 2016; Yildiz et al., 2015).

Environmental attitudes in the society also influence the uptake of energy communities, since, as mentioned earlier, the individual motivation to participate may be a result of an altruistic wish to contribute to environmental protection. If there exists a broader unawareness regarding ecological matters and the importance of sustainable behavior in society, individuals are less willing to inform themselves about the benefits of RE (Boon & Dieperink, 2014: 299). Thus, an awareness of environmental issues is one of the determining factors for participating in such projects and investing in RE technologies (ibid.).

Moreover, the some authors link the *tradition of environmental social movements* to the emergence of energy activism (Breukers & Wolsink, 2007: 2745), of which RECs may be seen as a part. Local grassroot activism traditions, for example the intensity of anti-nuclear movements, help energy communities to recruit members (Warbroek et al., 2019: 10). In Denmark, strong anti-nuclear activism provoked the search for alternatives such as wind power (ibid.) as well as the emergence of energy communities initiated by citizens and local farmers as a way to generate such energy (Bauwens et al., 2016: 141). In contrast, in the UK, an almost non-existent opposition to nuclear power and a strong tradition of landscape protection movement are believed to be among the reasons why few wind turbines are owned by locals (ibid.: 144).

Economic and political structures

The degree of *market decentralization* is also recognized as a determining factor. Market decentralization stands for the transfer of the decision-making power from public to private organizations, either through *privatization,* i.e., the transfer of service provision and management to private companies, or *deregulation*, which means the removal of legal and regulatory barriers for competition in certain markets (Cistulli, 2002, Ch. 2). Evidence exists that decentralized energy markets with multiple actors involved in energy production – especially if these actors are small energy companies – facilitate market entry for new actors such as energy communities (Simcock et al., 2016; Kooij et al., 2018). By contrast, centralized markets are characterized by regulations tailored to a few dominating actors with a powerful lobby, hindering the progression of smaller-scale entrants. Systems tailored towards centralized energy production are especially ill-suited for RE, as their normally scattered and unreliable mode of production fails to align with the needs of large industries (Kooij et al., 2018: 59f). It is also argued that centralized markets provide less room for innovation and cause a so-called carbon lock-in (ibid.), when large investments in fossil fuel systems secure their long-time dominance, while hindering the participation of RE actors and thus delaying energy transition.

By contrast, the manipulation of *energy prices* by the market actors may positively affect the willingness to invest in energy community initiatives. For instance, an increase in energy prices by Finnish suppliers boosted the search for a more affordable solution and resulted in the formation of new energy communities in the country (Ruggiero et al., 2014: 56).

Further, *political decentralization,* meaning an increase in the competences and responsibilities of regional and local governments, may affect the development of energy communities. As such initiatives are embedded locally, local governments are in a more convenient position to react to the problems of the local community and bridge their interests with national objectives (Mey, Diesendorf & MacGill, 2016: 34). In states with higher levels of municipal autonomy, local authorities may take over the responsibility for energy supply in the region, while distancing themselves from corporate energy. With sufficient authority, they may tailor the rules of the game to the needs of energy communities, for example, through the adaptation of spatial policies (Waerbrok et al., 2017: 27). However, in Sweden, the proactivity of municipalities that largely started and implemented community energy projects seized the opportunities for citizens to take over the initiative (Magnusson & Palm, 2019: 14). Interestingly, there still exists a multitude of citizen-led energy communities (ibid.), mitigating this constraining aspect of political decentralization.

Policy instruments

Government instruments are said to hold strong importance for energy transition. Dependent on their design, they may either open or close opportunities for energy communities to emerge and successfully develop. At the meta-level, the emergence of energy communities may be facilitated by *target-setting on the part of national or local governments*, especially if done collectively with the participation of local communities (Koirala et al., 2016: 739). Alongside the formal need to comply with them (Chmutina, 2014: 66), such targets are inevitably interconnected with corresponding funding programmes (ibid.), thus leading to the creation of an environment in which cooperation becomes a usual practice (Mey & Diesendorf, 2018: 114).

Among policy instruments, financial assistance to energy communities is considered to play a critical role in their development (Leonhardt et al., 2022: 4). This is especially the case for RECs, as they cannot compete against conventional technologies under current market conditions (Bauwens et al., 2016: 138). Energy communities often face costs they cannot cover by themselves as they have limited resources, depending to large extent on the equity of their members and external support (ibid.). Accordingly, energy communities are often supported by *one-time payments* such as grants that help to cover initial expenses (Mirzania et al., 2019: 1286), for instance, the feasibility study costs (Hicks & Ison, 2018: 531). However, because these grants are only available through competition, they only benefit selected projects for a definite period of time and cannot secure their long-term viability and success (Nolden, 2013: 547). Nonetheless, the lack of such financial support, despite its irregular nature, makes projects unfeasible and endangers the initiatives' formation, as shown in Australia (Hicks & Ison, 2018).

Further financial mechanisms are fixed *feed-in tariffs (FiTs)* and market-based *feed-in premiums (FiPs)*. They allow communities to raise revenue through remunerating the self-produced energy that has been fed into the grid, which also attracts new members. FiPs are considered less favorable for risk-averse energy communities as they are based on unstable energy prices. This makes energy communities respond to the price changes and thus increases the costs of marketing the electricity (Bauwens et al., 2016: 138). In Denmark, the introduction of FiPs has even placed a halt on energy communities, while hindering the emergence of new projects (Mey & Diesendorf, 2018: 113). By contrast, the market-independent FiT mechanism is considered to be one of the enabling factors securing long-term project viability whenever grants are not available (Nolden, 2013: 547). However, economic viability alone does not determine the development of energy communities (ibid.), and FiTs cannot serve as a panacea as they are unable to benefit rural communities which often operate off-grid (Guerreiro & Botetzagias, 2018).

Fiscal incentives can also be an important supporting instrument, since they allow taxpayers to obtain a high return on their investments due to tax relief policies (Mey & Diesendorf, 2018: 112). Similar to FiTs, fiscal measures reduce the investment risks (Bauwens et al., 2016: 140). The introduction of tax exemption has boosted the formation of wind cooperatives in Denmark (ibid.) and Sweden (Magnusson & Palm, 2019: 12), whereas their removal in the 2000s slowed down the emergence of new communities.

In terms of regulations, the process of connecting a local generator to the national electricity and heat network is considered a powerful constraining factor in the pursuit of community energy. This is especially relevant for energy communities situated in rural areas (Mey & Diesendorf, 2018; Ruggiero et al., 2014). When the costs of applying for a grid connection are overly high, they may even undermine the overall feasibility of a project, as found in the UK (Nolden, 2013: 547). For example, in Finland, the distribution costs are half the overall price of the electricity, which makes locally-produced energy unprofitable (Ruggiero et al., 2018: 586). Further, the complexity of admission criteria, bureaucracy and delays in grid connection process may hinder and slow down project completion (Ruggiero et al., 2014: 57).

Finally, both financial and administrative barriers may characterize provisions directed at, for example, ownership (e.g., licensing process) or spatial planning (e.g., distance regulations or noise assessment) (Bauwens et al., 2016: 144). However, the lack of regulations can also block the implementation of community energy projects (see Baldinelli et al., 2015), whereby regulations per se cannot be defined as constraining factors.

In sum, the recognition of community energy initiatives as new actors in a national energy market and, as a result, the embeddedness of entrants into policy structures and discourses is vital for their development as it determines their position in the competition for resources and legitimacy (Oteman et al., 2017: 2). In addition, clearly-defined legal and regulatory frameworks, consistent policies and simplified administrative procedures may promote investment security and facilitate the formation of community energy projects (Williams, Jaramillo, Taneja & Ustun, 2015: 1271).

5.3. Operationalization

As explained above, the following study takes the different number of energy communities within the EU states as its starting point and seeks to shed light on possible causes of such contrasting development. The determinants derived from the examination of separate initiatives may explain different rationales behind participants' engagement in such initiatives, as well as their success or failure. The idiosyncratic attributes of community energy projects may therefore account for divergences *between* the initiatives, even within the same country or region, but they are unable to explain why various EU member states demonstrate different numbers of (renewable) energy communities.

Hence, the author argues that the contrasting development of energy communities may be the result of the distinctive systemic features of each country. Therefore, the agency approach in its narrow sense, i.e., related to individual characteristics of members and projects, does not suit the elaborated theoretical argument and will not be included in the analysis. While the broader society may also be seen as an agent, belonging to the social capital on which energy communities may build their membership base, the socio-cultural factors are seen here as part of the context that "encases" the formation of the initiatives and into which the latter try to fit.

Although being part of the broader context, natural conditions and the degree of development will not be further followed through. The EU member states are all industrialized economies with a developed market. They all lie in the moderate continental climate zone and in the case of RE, all possess the potential of generating solar, wind or water energy. Moreover, the EU is considered a global frontrunner in wind and solar power generation (EC, 2020). As these factors are considered prerequisites for the physical existence of energy communities, EU citizens have, in principle, the capacity to initiate community energy projects if they were *willing* and *enabled to*. Hence, there are other reasons why these existing possibilities have not been utilized in several countries.

To make the complex concept of institutional arrangements tangible and translate it into measurable aspects, the next step is to identify relevant variables from the previous section and match them with an appropriate PAA dimension. The following variables were chosen in adherence to the theoretical framework presented in Chapter 3. The choice was mostly motivated by the prevalence of the factors in scientific studies on energy communities worldwide, which indicates their potential determining power.

Actors

Here, the domestic market and political structures will be examined in regard to the degree of their decentralization.

First, the key energy market players will be identified. If there exist only a few dominant enterprises that own most of the energy sources – whether renewables or fossil fuels – it is likely that they have a strong lobby and may influence policy-making in such a way that suits their need the most, while preventing small-scale entrants from participation.

Further, as shown in the previous section, a high degree of political decentralization may open new participatory channels for energy communities as municipalities have the authority to set up enabling policies either pro-actively or in response to energy communities' calls. Members of energy communities could benefit from political decentralization through electoral participation, influencing budget and, possibly, setting up strategic alliances with local government.

Rules

In terms of the rules of the game, the national legal provisions such as grid regulations and provisions on the location of RE installations will be examined. Further, the author briefly draws upon current legislation on cooperative models to identify opportunities for actors to engage in collective action.

Resources

Here, the focus is placed on mechanisms that provide financial assistance and investment security to the members of RECs. Accordingly, policies such as FiT and fiscal incentives will first be approached in a dichotomy manner, i.e., examined against their absence or existence. In the positive case, it can be further analyzed what conditions are imposed on RECs to make use of these support schemes. Derived from the country comparison, the author hopes to determine whether the incentives at stake are sufficiently high to ensure investment security and offset the transaction costs, i.e., whether the support mechanisms may be indeed considered *enabling* factors in the respective country.

Discourse

As previously discussed, the environmental awareness may affect the development of community energy. However, the recent Eurobarometer survey results indicate a high level of environmental concerns across all EU countries. A total of 91% of respondents consider climate change to be a fairly to very serious problem in the EU, with the perceived importance of environmental protection (94%) not having changed since 2017 and ranging from 94% to 96% in the last decade (Eurobarometer, 2020). As these figures do not reflect the contrasting numbers of energy communities across the EU, the author will search for other possible explanations in the traditions of cooperative model, energy activism and general trust in people, political and legal systems (in relation to the EU average).

As energy communities draw upon *existing* social capital, while attracting individuals who have been already actively engaged socially and politically (Radtke, 2014: 239), the author examines traditions of energy activism in the selected countries as an indicator of the public readiness to proactively engage itself in energy transition. In this regard, it is of interest to determine whether anti-nuclear and anti-fossil movements were present in the last decades as well as whether environmental organizations spoke out for or against RE and energy communities, specifically.

Further, trust in the community can be translated into general trust in people, political and legal systems as an indicator of the social readiness to cooperate with others. General trust is argued to be generally positively associated with decisions to volunteer and invest (Kalkbrenner & Roosen, 2016: 67). Mistrust towards legal and political systems may, therefore, deter citizens from investing in novel projects, as they cannot be certain of being protected in case of misuse or conflicts. Furthermore, as local authorities are usually shareholders, citizens could fear being manipulated due to possible strategic alliances with larger business actors.

In this thesis, the indicators of general trust are derived from the 2013 Eurostat survey, based on a scale from 0 (low trust) to 10 (high trust). The ratings of the selected countries are interpreted in relation to the respective EU average.

5.4. Conceptual contribution

It should be noted that some authors (Oteman et al., 2014) have already applied the PAA approach in their research of energy communities. However, their empirical focus was set on describing institutional arrangements in three pioneering countries: Germany, the Netherlands and Denmark. The present study seeks to obtain a more comprehensive picture of significant preconditions, while carefully examining the environment in the countries that have not boasted numerous energy communities to date. To enable a systemic comparison of the states with different trends in uptake and abundance of energy communities, a more exquisite approach to the variable selection is needed.

Oteman et al. (ibid.: 6) included political culture and power relations of political and market actors into the *Rules* and *Resource* dimensions. By contrast, political and market decentralization (as part of the *Actors* dimension) serve in this study as indicators for both which actors are relevant in the national context and how their interactions and constellations impact the entire political system and energy sector. *Rules of game* and *Resources* are then interpreted as legal and financial instruments that target community energy and thus affect RECs' interactions with the environment, while restricting or providing opportunities for them to start up activities.

In addition to a more extensive analysis of policies and regulations, the concept has also been advanced through including the socio-cultural perspective in the *Discourse* dimension. By contrast, Oteman et al. (ibid.: 6) place their focus on the leading ideas in government policy-making. The author of this thesis is, however, guided by the assumption that the dominant policy discourse on (community) energy is reflected in legal provisions and the existence or absence of support mechanisms. Thus, public beliefs are granted priority in the analysis as issues on political agenda in the representative democracies stem a priori from the public discourse, while political parties can be assumed to act on public opinion in order to retain votes.

In sum, the most debated barriers that energy communities face are governance-related (Chmutina & Goodier, 2014: 67f; Leonhardt et al., 2022), whereas some authors claim the role of policy instruments to be neglected in the field of energy transition (Aklin & Urpelainen, 2018). Other authors claim that social factors could also play an important part in providing energy communities with opportunities for their development, while also being under-appreciated in energy research literature (Kalkbrenner & Roosen, 2016). Hence, this study may provide more clarity to the relative importance of each of these dimensions and the anticipated different degrees of *institutional space* that such interplays provide for energy communities, at least in the selected EU countries.

5.5. Research method

As already stated above, regarding the different state of energy communities development across the EU, this study seeks to link the number of energy communities in the countries to the conditions in which they are placed. The choice was made in favor of a qualitative research method, as there is no adequate information on energy communities in separate countries and, when there is, this data is highly contextual, making a quantitative approach inappropriate for addressing the phenomenon in the focus of this thesis. Thus, the present study applies the comparative small-N method of research. A comparison of several EU states provides information on the development of energy communities under different conditions and thus helps to identify factors that either facilitate or hinder their uptake.

Within comparative studies investigating only a small number of cases, John Stuart Mill's (1882: 280f) inductive methods of analysis occupy a prominent place. The emphasis is put onto covariance, i.e., the interaction between independent and dependent variables. Accordingly, the method of agreement aims at unfolding simple necessary causes while exploring similar conditions in cases with the same outcome. Hence, the causal relationship should be crystallized through the elimination of the explanatory factors that differ across cases and, logically, cannot influence a similar outcome.

By contrast, Mill’s method of difference seeks to examine the similarity in explanatory variables and the variety of dependent variables in different systems. Mill considered it more convincing than the method of agreement and refers to it as “the most perfect of the methods of experimental inquiry" (ibid.: 1069). This method follows the assumption that the difference in the explanatory variable between the two cases explains the difference in the dependent variable if that is the only difference between the two otherwise identical cases (Schneider & Wagemann 2007: 73). The entire research strategy is based on the *logics of elimination*: the conditions that can be detected in both cases cannot account for the differences in their outcomes. The researcher should match and contrast various cases in order to discover a causal relationship by excluding the factors that are present in all cases under scrutiny (Mill, 1882: 483f).

The first step is to identify the variables that could influence the outcome. In a second step, one excludes the variables that coincide in the different cases to find those variables that differ between the cases. Therefore, it can be concluded that the influencing factors that differ between the cases are those that cause the differences in the occurrence of the phenomenon (Mill, 1882: 483fff).

Since this thesis seeks to explain differences in the outcome, i.e., in the uptake of energy communities by different EU member states, and investigate the particular institutional conditions under which such divergence occurs, this method has the potential to answer the research question. First, the possible determining factors will be derived from the existing empirical research on community energy projects in the EU and other regions to reinforce their universal relevance. In the next step, the author will identify the factors that have led to different results in the chosen countries, as required by Mill's method of difference. An in-depth look is taken at the dynamics and current state of the PAA dimensions in the two chosen states.

However, by applying this method, it is also important to recognize the possibility of a false positive, when the link between the independent and dependent variables might be spurious and may not occur in other cases with the same outcome (George & Bennett, 2005: 156). The main critique of this research method refers to its putative inability to analyze multiple and linked causalities (Ragin, 1987: 39ff), which are common in the field of political science. On the one hand, the researcher cannot be certain that he/she has exhaustively identified all relevant explanatory variables, while on the other hand the analysis of only a few cases makes testing of all potentially relevant independent variables impossible. The latter is commonly known as "too many variables, too few cases" (George & Bennett, 2005: 156). However, in contrast to quantitative studies that aim to simultaneously test of multiple independent variables, the comparative study at hand investigates a crisply formulated theoretical proposition with few given variables being identified in previous case studies, which alleviates the aforementioned methodological problem.

Nonetheless, the alleged causal relationship needs to be validated in a more robust analysis. Hence, the author seeks to corroborate and refine the findings obtained from the in-depth country comparison in a test case and thus increase their external validity.[1] Put simply, after outlining the possible causes of divergent outcomes in the selected empirical cases, i.e., the ones that differ across the two selected countries, the presence and characteristics of the crucial causal factors are investigated in a third country. If the identified enabling conditions indeed hold explanatory power, they are assumed to be absent or weakly pronounced in the test case with the opposite outcome characteristic, and vice versa. Similarly, those factors can be eliminated, which do not play a determining role.

5.6. Selection of countries

The selection of countries is based primarily on the estimated number of energy communities. Because, due to different legal forms and organisational characteristics, there is a lack of data on the definite number of energy communities in EU countries, this thesis utilises the information gathered by Caramizaru and Uhlein (2020) and Wierling et al. (2018) as its starting point. The main interest lies in comparing countries with many such initiatives to countries with only a few.

This *extreme case method* (Seawright & Gerring, 2008: 301) goes against the common principle in social sciences of never selecting the cases based on a dependent variable. King, Keohane and Verba (1994: 129) hold the absence of variance in the dependent variable for problematic as “nothing whatsoever can be learned about the causes of the dependent variable without taking into account other instances when the dependent variable takes on other values”. This thesis responds to this argument by choosing cases in a manner that maximizes the variation in the outcome. Hereby, the EU states under scrutiny exhibit different values of the dependent variable, i.e., the number of (renewable) energy communities. By the inclusion of extreme cases at both ends of the scale – clear leaders *and* laggards – into the analysis, the thesis aims to depict the full range of variation in the number of energy communities in the EU member states. The countries were chosen in a matching manner in terms of the physical conditions, GDP per capita as well as the overall share of renewable sources in energy consumption.

This paper investigates the institutional context in three EU member states: Germany, Spain and Poland, the latter serving as a test case according to the research design developed in the previous section. Existing research shows that Western and Northern Europe boast a higher number of community RE initiatives than the Southern, Central and Eastern European countries (Caramizaru & Uhlein 2020: 17). As Germany is considered a pioneer and model in the field of community energy, its energy transition and the high share of citizen energy projects have been subjects of extensive research. Conversely, Poland (34) and Spain (33) are both countries with the lowest number of community-based energy initiatives (ibid.: 5, see Figure 1).

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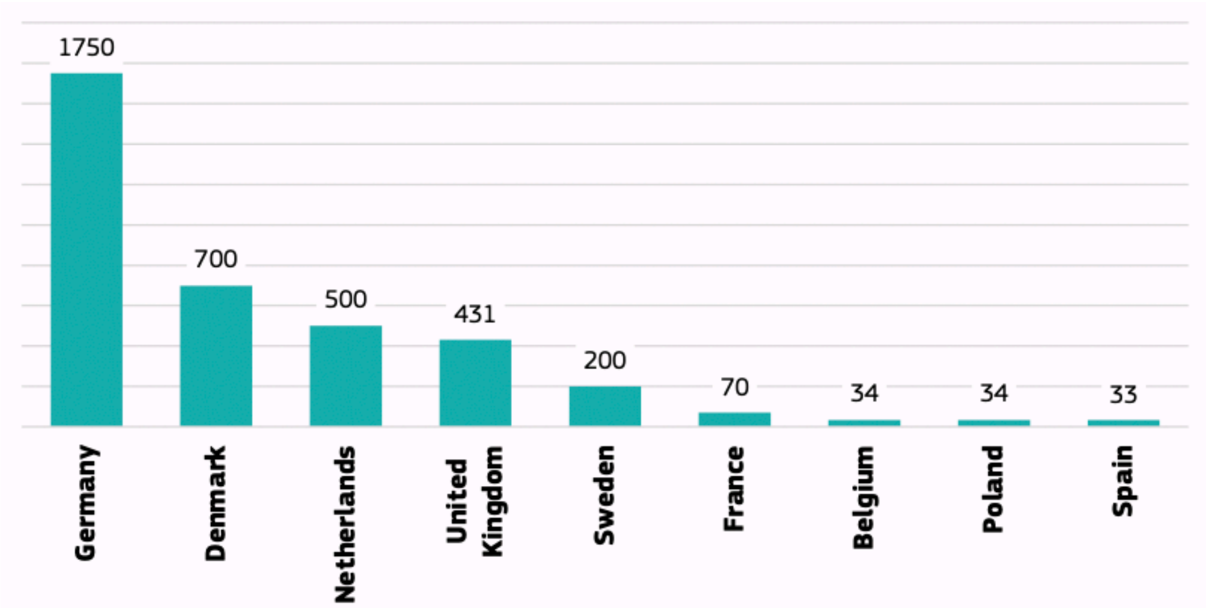
[1] The inspiration for the two-step approach stems from the work of Hinterleitner (2020) on political blame games.

Given the substantial lack of data on the specific number of (renewable) energy communities and the research focus on the enabling and hindering factors, the point of departure is the obvious difference in the number of (renewable) energy communities in different states. Remarkably, the number of RE cooperatives in Germany is far greater than in Spain or Poland, with 896 (DGRV, 2021) versus 19 (Union Renovables, 2021) and 1 (Hewitt et al., 2019: 14), respectively.

Figure 1 Approximate number of community energy initiatives in the EU member states



Source: Caramizaru and Uhlein, 2020: 5.

All three countries are among the largest (Worldbank, 2020) and most densely populated countries in the EU (Eurostat, 2019a). The assumption of natural conditions not playing *the* determining role is underpinned by the fact that Spain and Poland *do* have several community energy initiatives, and some of them *do* focus on RE.

Furthermore, Spain leads in terms of the share of RE in consumption with 18.4% against 17.4% in Germany (Eurostat, 2019b). Nonetheless, it is in Germany where 42% of installed RE capacity is placed in public hands (Aryblia et al., 2018: 17). The difference in the number of initiatives and RE cooperatives are even starker, as both countries were found to have large wind and solar capacities (Hewitt et al., 2019: 4), with Spain having the fourth-largest hydropower capacity in Europe (IRENA, 2021: 6).

Poland in turn is an interesting empirical case in so far as its 12.2% share of RE in total energy consumption (Eurostat, 2019b) is lower than that of Germany and Spain, but is, for example, still greater than that of another RECs leader, namely the Netherlands.[2]

[2] In the Netherlands, renewables account for “only” 8,8% of national energy consumption (Eurostat, 2019b) and yet there exist 623 energy cooperatives in the country (REScoop.eu, 2021a), at least 392 of which deal with RE (Proka, Loorbach & Hisschemöller, 2018: 1).

Although the Polish share of renewables is low, out of 34 identified energy communities in Poland, 20 are based on RE (Staszków, Borychowski & Nowacki, 2017: 286), whereas only one is a registered biomass energy cooperative Spółdzielnia Nasza Energia (Hewitt et al., 2019: 14; Caramizaru & Uhlein, 2020: 49f). Indeed, this is despite Poland having a good potential in PV and wind power due to its geographical conditions (Marks-Bielska, Bielski, Pik & Kurowska, 2020: 2). With solar and wind facilities now being called the cheapest energy generation technologies (IEA, 2020c: 18f), it is surprising that the existence of favorable natural conditions has not resulted in either a booming RE sector or the formation of many RECs.

Another relevant variable could be GDP per capita, which limits the financial ability of citizens to invest in community energy initiatives (Romero-Rubio & de Andrés Díaz, 2015: 406). In 2019, Germany led with 41,800 euro per capita, followed by Spain (26,420 euro per capita) and Poland (13,900 euro per capita) (Eurostat, 2020). However, as Poland and Spain have almost the same number of community energy initiatives, there ought to exist other reasons as to why the given physical opportunities are not being taken full advantage of.

There exists another problem that one needs to be aware of when orienting oneself to the outcome. According to Mahoney and Goetz (2004), the case selection based on the dependent variable is often associated with the introduction of too many positive cases, which leads to biased findings. A solution to this would be the inclusion of negative cases, where the outcome has yet a real possibility of occurring (ibid.: 2). This study focuses on the different *pronunciation* of the outcome, rather than its simple presence or absence. In these terms, the case of Poland may be seen as approaching the "negative case" type with its sole cooperative suiting the working definition of a REC in this paper as a project with possibilities for citizen participation, although it was initiated by business actors (Hewitt et al., 2019: 14). Nonetheless, the existence of several energy communities and a RE cooperative in the country confirms the "non-zero probability" (Mahoney & Goetz, 2004: 2), making Poland a good candidate for the comparative analysis.

In summary, the goal of this study is to outline possible relations between an institutional context and the emergence of energy communities in an open-ended manner, while providing insights into what combination of precedent factors constitutes a favorable environment for the emergence of energy communities. Therefore, the applied case selection strategy fits well the explorative nature of the thesis and serves as an entrée to the question at issue, also matching the position of Seawright and Gerring (2008: 302).

5.7. Data sources

The selection of data used for the extensive analysis follows the logics of the *triangulation of qualitative data* by drawing upon a large variety of sources. Data triangulation is often used synonymously with the mixed-method research, which combines elements of qualitative and quantitative data collection approaches (see e.g., Erzberger & Prein, 1997). Broadly speaking, triangulation yet refers to an analysis of the same event, concept or variable by combining several different angles or perspectives (King, Keohane & Verba, 1995; Marks, 2007).

The analysis of the relevant national legislation and regulations in the selected countries builds the core of the thesis and accounts for most findings. More specifically, the main focus is placed on policy instruments addressing the electricity sector and RE. The author supplements this data with an analysis of the reports and statistics provided by, for example, the International Energy Agency (IEA), Eurostat, national governmental bodies (including studies commissioned by them) and umbrella organizations such as the European federation of renewable energy cooperatives (REScoop.eu).[3]

To account for the *Actors* and *Discourse* dimensions, the thesis draws, inter alia, upon media coverage of national newspapers. Regarding *Actors*, other valuable sources are releases and reports of existing energy companies. In the case of *Discourse*, (non-)governmental organizations, in particular, deliver useful information.

In the sense of data triangulation, the author also draws upon grey literature and existing research papers on the topic of energy communities. The main aim behind the inclusion of previous academic research is not so much to account for the lack of data that may reduce the reliability of the findings. Rather, this thesis gathers secondary evidence to possibly obtain notices on the relevant *primary* data sources and advance the author's interpretation of the latter. Nevertheless, in the former case, the reliability of such findings could be corroborated through their consistency across the large variety of data sources.

To identify contextual developments that had accompanied energy communities for most of their evolution in the selected countries, the author draws upon data on national settings departing from the market liberalization in the late 1990s until the end of 2018, when the RED II came into effect. Although there is no information indicating that the number of energy communities in the analyzed countries has changed since 2019, most member states have been making efforts to incorporate the EU directives into national law. If included in the main analysis, the possible presence of a more progressive legal and policy frameworks in Spain or Poland would distort the anticipated association between those mechanisms and the number of communities. The newest developments will thus only be broached as an additional outlook.

[3] Any information published in German, Spanish or Polish languages was translated by the author.

6. Empirical Analysis of Institutional Arrangements

The first country to be analyzed along the four dimensions of institutional arrangements is Germany, followed by Spain. Hereafter, the findings from both cases are summarized and compared to identify differing factors that are expected to account for the differences in the RECs' uptake and abundance. The identified causes will then be corroborated in the Polish context.

6.1. Germany

6.1.1. Actors

Market structures

While Germany is generally counted among the global group of social market economies, the electricity market in Germany was fully deregulated in the late 1990s under the influence of Atlantic neoliberalism. A crucial part of that process was the unbundling of electricity production, transmission and retail activities, while creating three separate sub-markets.

Compared to other EU member states, the liberalization of the German energy market has progressed relatively far, thus in theory allowing a multitude of actors to take part (Deutsche Energie-Agentur, n.d.). In reality, the German electricity market is dominated by the so-called *großen Vier* (Big Four). Together, E.ON, Vattenfall, EnBW and RWE account for the majority (somewhere between 50% and 70%) of energy production, splitting Germany into key service regions from East to West (Bieler & Amelang, 2018). While RWE dominates the Northwest, EnBW leads in the Southwest, E.ON has a market majority on a north-south axis and Vattenfall is the major energy producer in eastern Germany (ibid.). Around a quarter of the domestic energy production is in the hands of regional or even city-level public utility companies.

There are around 800 distribution system operators (DSOs) (IEA, 2020a: 129), i.e., those who manage and sometimes own power lines leading to consumers. However, the high-voltage transmission system itself is owned by four companies: Amprion, TenneT, 50Hertz and TransnetBW (ibid.). Similarly, 40% of the retail market is again controlled by the aforementioned Big Four, but consumers may choose between more than a hundred different providers (ibid.), which often focus on either economical or green tariffs.

This is largely a side effect of the energy market liberalization, in which long-term planning of fixed demands by few actors was supposedly replaced by a highly dynamic day-to-day or even intra-day trading of electricity. This accommodates RE producers as their output is volatile and they may not be able to guarantee fixed daily or seasonal supplies (Deutsche Energie-Agentur, 2021). Energy production as a whole is, by a staggering amount, still dependent on non-renewable energy sources, mainly fossil fuels (Burger, 2019: 12). As this mode of generation requires a highly technological environment, the sector is mostly in control of the large actors. On the other hand, the market for RE deals with a multitude of heterogenous actors such as developers, investors, private companies and other associations or even private citizens. Notably, as the share of RE energy generation grows, the market share of the Big Four has decreased (AEE, 2018). Nonetheless, the established players have also been slowly entering this market since the mid-2010s, by either buying into sustainable projects, creating subsidiaries that target a “green” customer base such as RWE Innogy (RWE, n.d.) or jointly restructuring the energy market. In this regard, the E.ON took over the RWE Innogy’s sales and grid divisions in 2018, while RWE kept the renewable energy business of Innogy and took over that of the E.ON (E.ON, 2018).

With increasing investment from the large players, the share of small-scale actors and *Bürgerenergie*, logically, declined. However, in 2019 Vattenfall, RWE and EnBW still only held about 5.8% of the share of installed capacity of renewable electricity sources, with wind power accounting for 3.9% of the owned technologies (AEE, 2021).

Since the Chornobyl disaster in 1986, there has been a broad movement towards more sustainable energy consumption (Roose, 2003: 242). Although the world witnessed a German head start in RE policies (IEA, 2020a: 32), a strong lobby culture led to delays and the weakening of multiple energy policy proposals brought before the German parliament. It has been reported that studies concerning the emission of GHGs and some proposed laws such as the Renewable Energy Sources Act (EEG) were influenced by individual corporations such as RWE and E.ON as well as umbrella associations of large fossil energy companies (Haas, 2017: 194; Trittin, 2015: 10ff).

Underlining this close cooperation between state actors and fossil energy interest groups are numerous *revolving door* cases. This is famously exemplified by the former German chancellor Gerhard Schröder taking on a position within the notorious Gazprom subsidiary Nord Stream (Müller, 2018: 74), which in turn is dependent on political support to finish its notorious gas pipeline project in the Baltic Sea. The *revolving door* in the energy sector creates a personal incentive for former politicians to reduce the costs of climate change policy for the fossil fuel industry (ibid.: 75). Greenpeace (2013: 4) documents as many as 45 cases in which incumbent German politicians had extensive contacts and financial relations with representatives of the coal industry.

Supporting RE enterprises is the German Renewable Energy Federation (BEE), although it is considered to be relatively weak (Haas, 2017: 167f). The RECs associations have in turn professionalized since the 2000s. Advocates of RECs are the German Cooperative and Raiffeisen Confederation (DGRV) and the Citizens' Energy Alliance (*Bündnis Bürgerenergie* or BBEn). The BBEn is a platform for like-minded individuals, communities and companies conducting educational and advocacy work (BBEn, n.d.). The DGRV is more professionalized, with a special federal office representing the interests of energy cooperatives vis-à-vis political decision-makers at the federal and EU level (DGRV, n.d.).

Political decentralization

According to its Constitution (GG, Art. 20/1), Germany is defined by federalism: it has 16 federal states – or *Bundesländer* – that received a guaranteed range of competencies in the aftermath of World War II. As the German states have their own constitution, legislation, judiciary and executive powers, they are independent from each other and from the federal government in a multitude of aspects (Art. 24/1 and 32/3). Among other things, the states are allowed to legislate nature conservation and landscape management, land distribution, spatial planning, the water balance and property tax (Art. 72/3). Energy policy, in its turn, is both a federal and state-issue, as it falls under the constitutional category of concurrent legislation. However, the states' laws can, in principle, be overruled by federal law (Art. 72/1 and 31). At the same time, while the federal government passes laws into effect, the states take part in shaping them through the *Bundesrat* (Art. 50).

Regarding energy, the largest institutional player at the federal level is the Federal Ministry for Economic Affairs and Energy (BMWi). Its competencies include policy-making for the energy sector in general and, more recently, the transition towards RE sources while guaranteeing the competitiveness of the energy industry (BMWi, n.d.-a). Adjunct to it is the Federal Cartel Office or *Bundeskartellamt,* tasked with protecting competition and fair market practices, and the Federal Network Agency or *Bundesnetzagentur*. The latter has been overseeing the privatization of electricity, gas, telecommunications, post and railways. In addition, it manages grid access as well as network planning, permitting high-voltage lines and overseeing energy trade (ibid.).

Reporting to the BMWi, is the Federal Office for Economic Affairs and Export Control (BAFA) that, among other things, is tasked with helping SMEs and, more importantly, encouraging the use of renewable sources in the energy sector through financial means (BMWi, n.d.-b). Another player in the RE field is the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). It controls environmental policies and is charged with developing of new environmental technologies (BMU, n.d). Finally, tasked with fiscal matters and therefore responsible for taxation in the energy sector is the Federal Ministry of Finance (BMF, n.d).

At the local level, the government structure is made up of the county administrations at the upper level and municipalities at the lower level. Municipalities, in general, have the right to local self-government (GG, Art. 28/2). This largely manifests itself in the right to levy taxes on trade, commerce and property to finance municipal services. The latter include, but are not limited to, environmental protection, utilities, administrative services and spatial planning. In fact, up to 80% of state, federal and EU law is applied and implemented by the municipalities (Fuhr, Fleischer & Kuhlmann, 2018: 13). Energy-wise, municipalities are obliged to provide the residents with public utilities in terms of the *Daseinsvorsorge* (Neu, 2009: 9f). This includes securing the residents supply with electricity and gas (EnWG, § 1/1). Furthermore, the law suggests an increase of the use of renewable sources in the implementation of this obligation (ibid.).

Historically, energy supply in Germany has been organized in a decentralized manner. Today, almost all municipalities have some form of public utility company (Fuhr et al., 2018: 14). The so-called *Stadtwerke* are either directly responsible for the infrastructure, thus taking responsibility for energy delivery to the consumers, or they produce electricity or heat themselves. In some cases, municipalities outsource supply responsibilities to private actors through concession agreements (based on EnWG, § 46).

In terms of facilitation of RE, municipalities have a diverse array of options. As they generate their own revenue, they are able to pledge support schemes and incentives, can assign land to the development of RE sources or initiate private-public ownerships as one of the REC types (see e.g., Meister et al., 2020).

6.1.2. Rules

As previously outlined, the German energy market is, in principle, a free-market economy that subjects all actors to the same conditions. Energy consumers normally buy a product from retailers, who in turn independently procure the product from different producers. Nonetheless, like in any other market, all interactions underlie federal regulations and monitoring.

From its conception in 2000 onwards, the EEG has become the central instrument that shaped the market conditions for RE producers. Its original purpose was to mobilize private investments (Deutscher Bundestag, 2000: 1), in order to ensure the competitiveness of the whole variety of RE sources against conventional energy sources and thus contribute to energy security (ibid.: 18). Accordingly, it introduced financial incentives for and a compulsory prioritization of RE through energy suppliers, attracting investors and easing operations for existing producers.

The EEG (§ 3/1) mandates grid operators to not only grant RE plants access to grids, but also to give those plants output priority. The grid system operators also bear the cost of maintaining and expanding the grid to the relevant connection points (§ 17). However, they may add these costs to the consumers' price, the concept being known as *EEG-Umlage* (§ 60). Grid operators are only exempt from this duty if the costs for the necessary grid expansion are economically unreasonable, namely exceeding 25% of the initial installation costs (Binder, 2019: 43).

RE producers are in turn obliged to pay for the physical connection to the grid (EEG, § 16/1) at the nearest and the most economical connection point, the search for which is the task of the grid operator (§ 8/1). Plant owners are eligible to propose another connection point as long as this does not pose a significant financial burden on the grid operator (§ 8/2).

The EEG does not define the necessary steps of the grid connection process, so the requirements depend on the respective DSO. Usually, documents for a smaller installation include 1) a site plan with parcel numbers, property boundaries and the location of the planned generating facility, 2) a certificate of the installer regarding fire and electrical protection measures, and 3) information on measuring devices (Bayernwerk Netz, n.d.). Remarkably, most application procedures may be conducted online, both on the part of the grid operators as well as in regard to the final registration in the *Marktstammdatenregister* of the Federal Network Agency.

If grid operators fail to fulfill their duties – e.g., unnecessarily prolong the expansion of networks for over eight weeks – plant operators may claim for compensation (EEG, §§ 8/6, 12/1 and 13) and take procedures to the civil court to enforce their rights (Brückmann et al., 2011: 28). However, usually neither party is interested in confronting judicial proceedings and rather exploit the option of doing so in prior negotiations (ibid.; Binder, 2019). In some cases, conflicts are taken to the EEG clearing office, which provides answers about the implementation of the EEG circumventing lengthy bureaucratic procedures (Clearingstelle EEG|KWKG, n.d.). However, if conflicts require judicial decisions, proceedings are usually slow but can be accelerated via an urgent procedure and the payment of a fee (Brückmann et al., 2011: 28). Thus, in general such legal support provides RECs with a relative safety of investment.

The task of connecting plants to the grid is considered to be the most difficult step in the establishment of RECs. However, the whole project development process is short when compared to other European countries (ibid.: 23).

The construction permits are then regulated by states, but PV and other smaller systems mostly do not require permission (SFV, 2012). Depending on their size, the plants may also be subject to clearing according to the Federal Emissions Control Act which targets wind energy facilities. As part of the clearing process, the construction of wind farms with 20 or more turbines with a total height of more than 50 meters is subject to an environmental impact assessment (UVPG, Annex 1/1.6). If the project is planned to only consist of 3 to 19 turbines with the same height threshold applied, a closer examination of the project is required by means of a site-specific or general preliminary assessment (ibid.). In addition, certain distances have to be kept between wind turbines and residential areas, issued at the discretion of the states (BauGB, § 249/3). Notably, municipalities are entitled to make exceptions to this rule by issuing construction authorizations through a land development plan (BauNVO, § 11/2).

In 2014, the State of Bavaria issued the “10H-rule”, stating that the distance between any newly constructed wind turbine and residential areas had to be tenfold to its absolute height (BayBO, Art. 82/1). Between the availability of suitable building plots and grid infrastructure, this drastically reduced spatial opportunities and, in 2019, no new wind turbines were built in the state (BUND, 2019).

German law has also historically supported (energy) cooperatives. The long history of the latter is reflected in the Cooperatives Act from 1889. Amended in 2006, the law sets the minimum membership count at three natural persons (GenG, § 4) and reduced audit responsibilities for small cooperatives (§ 53), thus lowering entry barriers. The cooperatives are also freed from prospectus requirements (VermAnlG, § 2/1). Hence, the RECs were exempt from producing elaborate compilations of corporate data needed for broader public investment, thus suspending potentially costly legal and advisory assistance. To still ensure investment security, the cooperatives are mandated to belong to an association to which the right of audit is granted, a so-called *Prüfungsverband* (GenG, § 54). These associations provide vital consultancy and advisory services and conduct audits which in turn means that cooperatives in Germany are among the best protected entities against bankruptcy (Romero-Rubio & Diaz, 2015: 127).

Remarkably, the government issued its first definition of citizens energy companies or *Bürgerenergiegesellschaften* in 2017, approaching the concept of energy communities in terms of participation provisions and the local embeddedness requirement. Accordingly, 1) they are to comprise at least ten natural persons, 2) 51% of votes should remain with natural persons who have lived within the greater vicinity of the project for at least one year, and 3) no member may hold more than 10% of the votes (EEG, § 3/15).

6.1.3. Resources

Beginning in 1990, the federal government intervened in the “free choice of procurement” for DSOs by mandating electricity supply companies to remunerate producers of RE based on the average revenues of the suppliers in the previous year (StromEinspG, §§ 2 and 3). Electricity from wind and PV facilities was remunerated at a 90% rate of the revenues (ibid.). This provision massively influenced investments in RE utilization: had the output of the aforementioned sources in 1998 accumulated to 25 TWh in gross electricity generation, it increased by 683.6% by 2015, tallying an output of 195.9 TWh (BMWi, 2021b: 6).

In 2000, the red-green government introduced the FiTs as the minimal allowed remuneration rates with a 20-year guarantee for new facilities (EEG of 2000, § 9/1), thus offering RE producers a more secure basis. Even for old plants, 2000 was then considered as the year of commission by law (ibid.). However, the FiTs were gradually reduced, depending on operational indicators such as the technical state and runtime of the plant (§§ 5/2, 7/1 and 8/1), in order to secure the efficiency of the technologies (Deutscher Bundestag, 2000: 19).

Since 2008, the BMU’s National Climate Protection Initiative has pledged support to the various forms of community action in the field of RE in excess of 900 million euros, thus complementing FiTs by the BMWi (Morris, 2019: 8). It contributed to around 29,000 projects and has extended its program until the end of 2022, earmarking an annual budget of 200 million euros (ibid.).

To raise the share of RE used in heating, in 2009 the government earmarked subsidies in sum of 500 million euros annually (EEWärmeG, § 13). It also equipped municipalities with the power to order access and use of local or district heating supply grids (§ 16). This led to a growth in the share of renewable energies in final energy consumption for heating and cooling of 3.7% between 2008 and 2013, missing the 2020 target by a 2% margin (BMWi, 2015c: 11).

In 2012, 34% of all installed capacity of RE[4] in Germany was in the hands of citizens, while only 9% was accounted for by the traditional energy suppliers, indicating that the strategy of decentralization of RE production had succeeded (Aryblia et al., 2018: 17).

The EEG amendment of 2014 led to a phase-out of FiTs for wind and PV plants over 750 KW and introduced auctions instead, in a bid to increase competition and reduce overall subsidy costs (Klessmann et al., 2015: 4). According to the *pay-as-bid* principle, the winner is the most efficient project that demands the lowest state aid and thus provides energy at the lowest cost for customers. If the prices had been previously controlled via fixed remuneration, they would henceforth be controlled via quantity or power output (BMWi 2015a: 8).

Preceding and following the 2014 EEG amendment, there has been an intensive debate on whether energy cooperatives and other smaller and locally-embedded investors should be provided with a special status in the auctions (Klessmann et al., 2015: 14; BMWi 2015a: 5). In response, the government freed *Bürgerenergiegesellschaften* from the duty to present an emission control permit and extended the project implementation period (Tiedemann et. al., 2019: 73). As a result, 65 of the 70 winning projects in the first round of the 2017 tenders were, on paper, citizen energy companies as per EEG definition (BMWi, 2017). However, it was later found that larger project planning offices founded *Bürgerenergiegesellschaften* to make use of the tender loopholes (Federal Government, 2020; Karl & Tenk, 2019: 1). As a result, the number of newly founded energy companies dropped to 14 in 2018, as most applicants were not granted the required permit (Tiedemann et. al., 2019: 75). Following this, the government suspended the permit privilege (Federal Government, 2020).

Overall, the tenders did not increase competition as hoped, as the award probability for the 2018 auction rounds averaged 88.75%, guaranteeing almost all bidders a funding approval (Karl & Tenk, 2019: 11). Yet, the switch from FiTs towards auctions was followed by an overall reduction in the emergence of RE cooperatives. If the year 2012 registered 150 new energy cooperatives, only 54 of them emerged in 2014 (AEE, 2020: 5).

In 2017, to support RE self-consumption, the EEG levy was cancelled for the prosumers[5] of energy from installations with a capacity of up to 10 KW (EEG, § 61a/4).[6] In case of the bigger facilities, the levy was reduced to 40% of the original sum (§ 61b/1). To simultaneously

[4] The numbers exclude pumped storage, offshore wind power, geothermal energy and biological waste.

[5] Prosumers are self-consumers, i.e., those who both produce and consume the self-generated energy.

[6] The EEG amendment of 2021 lifted the exemption threshold to 30 KW (Clearingstelle EEG|KWKG, 2021), while the new government plans to entirely finance the EEG levy with federal budget, beginning in 2023 (SPD, Bündnis 90/Die Grünen & FDP, 2021: 62).

encourage the *collective* energy use, the concept of tenant electricity tariffs, *Mieterstrom*, was introduced (§ 21/3). Accordingly, the owners of PV systems of up to 100 KW[7] in a multi-family house are entitled to payments per KWh, if selling their energy to the tenants (BMWi, 2021a), and, in such a way, reduce electricity bills for the latter. The concept is also given special importance due to the fact that over half of the German households live in rented accommodation (StBA, 2018). The *Mieterstrom* has, however, been criticized by the BBEn (2020: 5) for falling far short of its aspirations. Instead, in order to boost energy communities, the association demands, inter alia, binding feedback deadlines for DSOs and the abolition of the trade tax on solar energy (ibid.).

In regard to public funding, another valuable resource is the national development bank KfW. It offers long-term financing at a 1% interest rate, covers 100% of the investment costs and can be combined with other public funds (KfW, n.d.). The KfW established its first programme for RE in 1990, issuing credits with a repayment period of up to 20 years (Dóci, 2017: 96). From 2012 to 2017, it offered around 100 billion euros for all kinds of RE projects (Oteman et al., 2014: 10). In 2015 and 2016 alone, nearly half of the RE projects were financed through KfW loans (KfW, 2018). Besides credits, the KfW also issues repayment grants. For example, municipalities can benefit from 5% repayment grants if investing in energy-efficient urban districts (LECo, 2019: 5). In such a way, RECs can also gain direct benefits if cooperating with local authorities.

Nonetheless, most energy cooperatives were found to take on loans from local cooperative banks (Klagge & Meister, 2018: 706), again making the most of the large cooperative network in Germany.

Finally, the umbrella organizations specialized in cooperatives – at both the national and regional level – provide valuable know-how in development, training and advice (Romero-Rubio & Díaz, 2015: 133).

6.1.4. Discourse

Traditions of energy activism

Germany is famous for its strong anti-nuclear movement and severe confrontations. It started in the 1970s with local environmental groups protesting against the construction of nuclear plants (Roose, 2010: 87). After the Chornobyl explosion, the number of protesters tripled during 1986 and almost reached the 400,000 mark (ibid.). The anti-nuclear movement was accompanied by the search for alternative energy sources. Right after Chornobyl, a citizen initiative was started that became a base for what is now the largest German community energy cooperative ElektrizitätsWerke Schönau. With a focus on RE, the initiate took over the local electricity grid in 1997, with Schönau becoming independent from nuclear power (EWS

[7] Normally, residential PV installations have a capacity of below 40 KW (BMWi, 2015b: 7).

Schönau, n.d.). The introduction of FiT is also reported to be a result of the grassroots pressure (Toke, 2011: 132).

In March 2011, the Fukushima explosion brought around 250,000 people onto the streets all over Germany (Radkau & Hahn, 2013: 363). With the decision on a nuclear phase-out by the end of 2022, the protests have weakened, especially as calls have been made to use nuclear power as a climate-friendly bridging technology until it can be fully replaced by RE.

In this sense, the anti-nuclear protests have been replaced in their intensity by anti-coal activism. It could not mobilize as many people at once but still became globally famous due to some powerful actions. In 2003, the national branch of the World Wide Fund for Nature (WWF) cast the first stone for the German anti-coal movement with its "Power Switch" campaign (WWF, 2020). In the 2010s, after the Copenhagen UN Climate Summit, the anti-coal actions intensified (Haas, 2017: 297). For instance, in 2015, protesters managed to paralyze an RWE opencast coal mine in the Rhineland for one day, while in May 2016, the Vattenfall mine in Lusatia was blocked for 48 hours (Ende Gelände, 2016). Since the start in 2003, the construction of around 20 coal plants has been prevented due to the united efforts of anti-coal activists (WWF, 2020).

The powerful environmental organizations are BUND, NABU and the national branches of Greenpeace and the WWF. Although the environmental activists' primary concern is nature conservation and biodiversity, this goal is not to think apart from climate protection. Thus, such groups demand the introduction of state support mechanisms for nature-friendly RE projects like rooftop PV systems (NABU, 2010). Overall, they actively promote energy transition and, more specifically, ally in the struggles with *Bürgerenergie* initiatives (e.g., BUND & BBEn, 2021).

Nonetheless, there has also been activism against energy transition in Germany. Although wind is Germany's main source of RE, there exists a strong anti-wind energy opposition. For instance, local protests in 2012 in Saxony achieved a reduction of both the state's RE targets and areas designated for wind farms (Lintz and Leibenath: 12f). Today, the association *Vernunftkraft* unites around 920 anti-wind power citizen initiatives all over Germany (Vernunftkraft, 2019)[8] and demands the abolition of the EEG and support schemes for the wind and solar facilities (Vernunftkraft, n.d.).

Traditions of the cooperative model

As in most of Europe, the first cooperatives in Germany emerged in response to the industrialization and economic hardship of the population in the 19th century. The movement originated in the foundation of the two world's first credit cooperatives (Greve, 2001: 107), followed by consumer and producer cooperatives that also purchased agricultural products (Guinnane, 2020: 378). These developments resulted in the first cooperative law being is-

[8] Notably, the first chairperson of Vernunftkraft Nikolai Ziegler has been a senior civil servant in the Federal Ministry of Economics since 2010 (Redelfs, 2021: 1).

sued in Prussia in 1867 (ibid.). Strikingly, a large number these cooperatives dealt with local generation and distribution of electricity in rural areas. In the 1920s, there existed around 6.000 electricity cooperatives in Germany, with only a little over 40 surviving the centralization wave after World War II (Holstenkamp, 2015: 6f).

After 1945, cooperatives strongly contributed to the reconstruction of the economy in West Germany and regained their strength (Greve, 2001: 113). In East Germany, there also existed many cooperatives, yet they were quickly forced to give up their autonomy. The socialist government charged both the existing cooperatives and specially created ones with the task of abolishing private property (ibid.: 114). This understanding contradicted the basic principle of cooperative, as a model with voluntary and inclusive decision-making by its members. After the unification, most cooperatives were dissolved as the socialist model did not correspond to the legal entity defined by the "old" states. In this way, the number of cooperatives in East Germany fell from 9,300 in 1989 to 2,500 in 1991 (ibid.). Notably, today the cooperatives are found to be less spread in the "new" German states (Bauwens et al., 2016: 142).

A boom in the establishment of the last-generation cooperatives was observed in 2006, caused by the Cooperative Law amendment (Holstenkamp, 2015: 2). Today, cooperatives are present in all economic sectors, actively developing in new sectors like ICT or media (ICA, 2017). The model also enjoys wide public support, whereby every fourth German is a member of at least one cooperative (ibid.).

Trust

Public trust in German political (4.9) and legal (5.3) systems is above the EU average of 3.5 and 4.6, respectively. Remarkably, Germany belongs to the group of countries with a lower level of social trust (5.5) in comparison to other European countries (5.8). (Eurostat, 2013)

While the low level of social trust may indicate a low willingness to engage in collective action, it seems that the political and legal systems provide factual security, which enables the establishment of RECs and especially in the form of cooperatives.

6.2. Spain

As previously shown, Germany as a federation is a highly decentralized country, with the largest market players mostly dealing with conventional energy sources. It also has a highly complex legal and regulatory framework as regarding renewable and community energy. To compare the countries equitably, the context in Spain will be analyzed in a similar manner.

6.2.1. Actors

Market structure

In the Spanish energy business, energy generation and marketing are marked by the participation of many actors. In 2017, there were 83 actors involved in energy generation, while the number of energy marketers involved 330 companies (CNMC, 2017: 5). Transport and distribution are, by contrast, concentrated in a few hands. The whole national grid – meaning transport, technical maintenance of the network and energy storage – lies in hands of the partly state-owned transmission system operator Red Eléctrica de España (REE, 2020). Distribution is a subject to regional monopoly as five largest companies referred to as *las cinco grandes* (Great Five) account for almost 100% of the distribution network, at the same time dominating over 70% of electricity generation and 90% of final electricity commercialization (Palazuelos, 2019: 9). In this sense, Iberdrola, Naturgy[9], Endesa, Viesgo and EDP deal mostly with natural gas, nuclear fuel and electricity from some kind of RE source like hydro-, wind, solar and thermal power.

In 2018, the Great Five controlled 86.5% of the total number of customers in the market (CNMC, 2019: 14). However, one should note some – albeit rather unremarkable – power loss of energy giants, as in 2014 the market share of traditional key players was almost 91%, denoting a loss of 2 million customers in four years (ibid.). Accordingly, almost 200 of small electricity companies (Page, 2019), the so-called *independents*, have gained strength and now account for 13.5% of the Spanish market, compared to 9.2% four years earlier (CNMC, 2019: 14). Geographically, these large players dominate in each of the 50 Spanish provinces, with their individual market shares skyrocketing up to 99% in some regions (ibid.: 17).

RE is also popular among large companies and the well-established names. Together, the Big Five generate around 46% of national RE (CNMC, 2019: 58). Some companies even reset their *main* focus on renewables, such as Endesa whose electricity production is now to 86% emission-free (Endesa, n.d.). Regarding wind energy, four of the five largest – Iberdrola, EDP, Enesa, Naturgy – along with the multinational RE conglomerate Acciona account for more than 50% of the market share across energy suppliers (Association of Wind Companies, 2020: 12). By contrast, the PV market is quite scattered due to smaller size of solar parks and the lack of interest of larger companies, which only started entering the market in 2017 (Palazuelos, 2019: 175). In 2019, 90% of megawatts in auction were distributed among fewer than 30 companies and, by some accounts, more than 25% are now in the hands of international funds (ANPIER, 2019).

In the past, such dominance displaced some foreign enterprises, like in the case of Gas de France Suez, which could not prevail over national competitors (Marco, 2014), or the German E.ON, which gave up its Spanish Viesgo business aiming at financial flexibility and balance sheets strength (E.ON, 2014). Today, foreign players are (re-)entering Spanish market, such as the French company Total in December 2021, due to the EDP selling its low-carbon combined-cycled gas plants and focusing on RE generation, distribution and trade (EDP, 2020).

The Spanish government has long been accused of playing along with the Great Five. Cuts of RE subsidies in 2010 and 2013 and the introduction of a “sun tax” on self-generated solar

[9] Until 2018, Naturgy was known as Gas Natural Fenosa.

energy in 2015 are reported to have been a product of these close ties between the key market players and the government (Reyes, 2018: 111). The government has also consistently managed to protect fossil fuel subsidies and maintain the lowest environmental tax in the EU (Sérvulo González, 2017).

For 75 years, the Great Five have been united under the aegis of AELÉC (formerly Unesa), one of the most influential trade associations in Spain (Carcar, 2021). Yet, in 2018, the AELÉC's mission was limited to the defense of the state-regulated business of electricity *distribution* networks (ibid.). Since then, large-scale companies have planned to create a common platform to defend their generation and commercialization businesses, but without success. In 2021, Naturgy left the association, "blowing up" the electricity lobby (Esteller, 2021).

The close ties of leading energy-sector businesses with the Spanish government in conjunction with policies favoring established market players are also the product of the *revolving doors* syndrome. In 2016, 26 leading energy companies – among them Iberdrola, Naturgy, Endesa and Repsol – could boast having former government ministers and senior party officials on their boards (Publico, 2016). With personalities possessing an extensive knowledge of political structures and connections to incumbent political elites in the ranks, large businesses can, in the prospect, balance out the loss of Naturgy in the formal lobby.

Their "renewable" counterparts are the Association of Renewable Energy Companies (APPA), the Association of Wind Companies (AEE)[10] and the Spanish Photovoltaic Union (UNEF). Representing small-scale businesses and respective investors is the Spanish National Association of Solar Power Producers (ANPIER).

RECs are, in their turn, united under the roof of the Union Renovables, which focuses, according to its homepage[11], on *internal* organization activities such as sharing knowledge and experience across members. Some of the RECs, such as Som Energia and Goiener, execute common projects in Spain, also being members of the REScoop.eu and networking actively across the EU (Heras-Saizarbitoria et al., 2018: 1042).

Political decentralization

Spain is commonly recognized to have a decentralized political system, with its two autonomous cities, Ceuta and Melilla, and 17 autonomous communities having their own parliaments (DGGP, n.d.). The Communities may approve certain laws and perform executive functions in various spheres, such as urban and rural planning, environmental protection management, consumer protection and economic development in accordance with national objectives (Spanish Constitution, Art. 148/1), if the matters are not exclusively reserved to the central government. Moreover, the Communities have jurisdiction over the cooperative law,

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10 As the abbreviation is identical to that of the German Agency for Renewable Energies (also AEE), the name of the association will henceforth be spelled out.

11 Homepage: https://www.unionrenovables.coop/

whereas the national law serves as a general rule in case of legislation gaps (Fajardo García, 2021: 4f).

Regarding energy, the Ministry for the Ecological Transition (MITECO) is in charge of basic energy legislation, but it usually develops energy policies and measures in co-ordination with the Autonomous Communities, which are then responsible for their implementation (IEA, 2021: 61).

The Autonomous Communities authorize the construction, operation, transmission and closure of RE facilities of less than 50 MW (Royal Decree [RD] 661/2007, Art. 4), indeed covering most renewable power plants (IEA, 2021: 21), as well as local secondary transportation and distribution installations (MITECO, n.d.-c). In cases where projected power output does not exceed 100 KW, regional administration is even allowed to simplify procedures of their authorization (RD 661/2007, Art. 5). In all other cases, the central government takes over the authority but should consult the community affected (ibid., Art. 4/2b).

The Autonomous Communities are also responsible for promoting RE and energy efficiency on their territory, for instance, through offering subsidies and grants (Curli et al., 2020: 86). The municipalities can in turn provide installation provisions in terms of spatial planning and building (ibid.).

At the national level, there also exist special agencies overseeing the energy sector like the National Commission of Markets and Competition (CNMC, former CNE) and the Institute for Diversification and Saving of Energy (IDAE).

The independent CNMC reports to the national parliament and ensures market transparency, competitiveness as well as sets network access tariffs (Curli et al., 2020: 85f). The government is in charge of the other costs like remuneration schemes for (renewable) energy facilities (Law 24/2013, Art. 3/5). The IDAE under the MITECO, in its turn, was created to support the energy transition and competitiveness of the energy market through information dissemination, offering training and technical advice. It also has competence to finance decarbonization technology projects (IDAE, n.d.).

6.2.2. Rules

In contrast to the generally free energy generation and marketing activities, the subsidized production of renewables and co-generation is regulated by the government. In this sense, the national setting in Spain has been supportive of RECs since the liberalization of the market from 1997 to 2012. Along with waste-to-energy (not limited to biomass) and co-generation (from gas), RE became part of the so-called "special regime" (RD 54/1997). In contrast to conventional facilities, the renewables could profit from subsidies (see 6.2.3) as well as priority of network access (RD 661/2007), thus attracting more investors.

Grid operators are, however, not explicitly obliged to expand the grid and, even in a positive case, the administrative process takes a long time (Sonvilla et al., 2012: 27), especially, in the absence of binding deadlines. This is despite the fact that the plant owner bears costs for both the grid connection and its expansion (RD 1955/2000, Art. 32/2). Thus, both the legal gap and bureaucracy constitute a hindering condition despite the overall favorable legal provisions.

The plant owners can file a complaint to the CNMC regarding the denial of grid access and infrastructure expansion. However, this occurs rarely as the RECs rely on friendly terms with grid operators and local authorities (Sonvilla et al., 2012: 27). Today, the CNMC has about 158 complaints in process, but the processing time is one year instead of the three months defined by law (La Información, 2021).

Remarkably, it was not until 2010 that RE cooperatives could also benefit from the “special regime” explained above. Until then, both cooperatives and marketers were obliged to register in the cooperative and commercial registries, respectively (de Andres & Diaz, 2015: 404). Due to concurring entry requirements, cooperatives were not allowed to commercialize the self-produced electricity. Such permission was solely granted in 2010, so cooperatives can now both market and distribute electricity (Law 24/2013, Art. 6/f). In any other matter, cooperatives are subject to the exclusive authority of the Autonomous Communities, but the existing legislation is considered “fairly friendly” towards cooperatives (Fajardo García, 2021: 22).

Nonetheless, in 2015, the controversial “sun tax” – the name under which the RD 900/2015 is often referred to – was passed. Accordingly, the owners of solar power systems with a capacity of over 10 KW were required to pay the “normal” grid access fees as all consumers and an additional tax on the self-produced energy (Art. 7). Moreover, systems with fewer than 100 KW were prohibited to sell electricity (Art. 14) and, if connected to the grid, had to “donate” energy for free. But, more dramatically, the same decree prohibited shared self-consumption as such. It was forbidden to connect the generator to the internal network of several consumers (Art. 4/3), i.e., the energy could not even be shared by the residents of the same building. As 66% of Spain’s population resides in flats – reflecting the highest share across the EU (Eurostat, 2017) – this regulation not only made such kind of RECs illegal but also remarkably hindered energy transition in general. Interestingly, in 2017 the Constitutional Court cancelled this provision and allowed shared consumption (Judgement 68/2017).

In 2018, the administrative procedures were revised and collective self-consumption was recognized with the more “generous” condition of being placed simply in proximity of consumers (RD-law 15/2018, Art. 2). The controversial “sun tax” was repealed, exempting self-consumed energy from renewable sources, co-generation and waste from all types of charges and tolls (Art. 5).[12] Further, the second additional provision exempted micro-installations under 15 KW from obtaining grid access permissions. Facilities below 100 KW in turn are no longer obliged to register in the state registry, and the owners only need to notify the corresponding community of the installation (Art. 4). Now, only those RECs reselling energy

[12] This, however, does not exempt energy intended for sale from usual taxes.

from third parties need to be authorized by the MITECO, prove their legal, technical and economic capacity as well as pay network access tolls and charges (Curli, Ferrero, Perugini & Ruozzi, 2020: 88). In this respect, such facilitations regarding the administrative processes could encourage the launch of PV power plants, however, the anticipated effect remains to be seen.[13]

Planning permission is a regional matter, but solar panels are exempted from obtaining the permit in 13 out of 17 Autonomous Communities (UNEF, 2021). In regard to authorization, the facility owner has to provide a deposit, submit a preliminary project draft and – only for large plants[14] – an environmental impact study to the regional authorities.[15] If the facility is over 50 MW, the documents are sent over to the state institution, which makes the decision following a report from the CNMC (MITECO, n.d.-c).

After the facility is built and prior to requesting access to the grid, installations above 15 KW, which are not intended solely for self-consumption, must provide an economic guarantee.[16] Grid access and connection permits are obtained from the network manager, in most cases, the Big Five. However, the administrative burden of the grid connection process has become anecdotical. Although the application process should last a few weeks, sometimes it takes up to a year until the plants are approved (Holaluz, 2018: 1). More recently, Endesa was publicly accused of slowing down the revision process of the grid requests on the Canary Islands, breaking the deadlines established by law (Barrero, 2021).

Regarding certification, of all technologies, only thermal solar heating systems need to be certified according to the international standards with laboratory assessment and certificate of production quality (Order ITC / 71/2007, Annex, para. 1 and 2). Electricity from RES may be granted a guarantee of origin by the CNMC, which is, however, optional (Circular 1/2018). The certification is directed more towards the end consumers to inform them about the origin of electricity.

6.2.3. Resources

From 1997 until 2012, RE profited from subsidies such as FiP (RD 2818/1998), of which Spain was an EU pioneer (Mir-Artigues & del Río, 2016: 296), and – as an alternative – FiT, which was to be reduced every 5, 10 or 20 years depending on source and facility size (RD

[13] In April 2019, the Council of Ministers reinforced all provisions and also set a maximum distance between the generator and consumers at 500 meters (RD 244/2019). To comply with both distance and capacity limitations, the existing energy communities may need to divide their site area into smaller entities (Frieden & Türk, 2020: 55).

[14] If the wind facilities exceed 30 MW (or 100 KW in case of self-consumption only) and for larger sun plants that are not placed on the roofs (see Law 21/2013, Annex I Group 3 and Annex II Group 4).

[15] Except for environmental impact assessment in selected cases, there exists no specific regulation targeting land development which has been subject to wide criticism (see 6.2.4). In response to the calls of environmental organizations, the MITECO (2020a) created an environmental sensitivity map, however, of a non-binding nature.

[16] Until 2018, the guarantee was 10 euros per installed KW capacity, later being raised to 40 euros (RD1955 / 2000, Art. 59).

436/2004). Such conditions resulted in expansion of RE installations (Romero-Rubio & de Andres Diaz, 2015: 403). Nonetheless, the incentives were insufficient for the RECs to take up activities, so the RE investment was mostly made by large companies (Romero-Rubio, 2015: 182).

However, in 2012, the government sounded an alarm due to a tariff deficit[17] of 24 million euros in the electricity system budget (Carcar, 2012). The largest energy companies seized the opportunity to link this to the growth of RE installations, their prioritised treatment and subsidies, which alleged posed unbearable costs on the electricity system (Haas, 2017: 255f). Although 76% of the deficit was reported as not being related to RE (APPA, 2013), the government rapidly changed its course of action, constraining RE and, consequently, RECs.

Accordingly, all subsidies for new RE facilities were cancelled (RD-law 1/2012) and electricity production became subject to a 7% tax (Law 15/2012). The existing plants could still make use of the FiT mechanism, which was, however, retroactively reduced (RD-law 2/2013). These amendments created legal and financial uncertainty, hindering the creation of new RECs. Whereas earlier the banks were satisfied with FiT's stability and thus generous in offering non-recourse loans[18] with fixed interest rates, this practice was abandoned from 2013 onwards (García, Marín & Stirzaker, 2021: 6f). As the RECs were no longer secured against price volatility, it became complicated to develop a secure investment plan. Collective energy production was now largely possible if the REC's members were able to bear all the costs from their own pocket. This constituted a problem in so far as large investment – as start capital – is vital for the founding and registering of cooperatives (Fajardo García, 2021). Moreover, in such a way, the prospect of benefiting financially from the projects was taken away, reducing the motivation to initiate new communities.

Existing plants were also endangered as the financing system providing gains for the contributors had crumbled. Existing financing schemes and business plans had to be recalculated, which to a large extent meant that the owners had to find new financial sources, sell their assets or close down. In that period, many of the privately owned facilities became bankrupt and were confiscated by banks (Capellán-Pérez et al., 2018: 222).

Ironically, some RECs managed to take over such confiscated facilities, relying on very small contributions from their large membership base (ibid.). A prominent example is Som Energia. In 2015, in response to the withdrawal of incentives for renewable projects by the government, the cooperative launched its own financing project *Generation kWh* (Som Energia, 2015). People could "buy" energy shares at cost price at an amount that was annually needed for one's own household. Those contributions were to be returned during 25 years with a

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[17] The tariff deficit means that the government-regulated electricity prices are not sufficient to cover the costs of electricity generation (Haas, 2017: 218).

[18] Non-recourse loans mean that in case of default, the borrower is not personally liable and the lender may only seize the collateral, i.e., previously agreed security for a loan (Andries et al., 2021: 2). Such type of loans favor the borrower as the lender is not allowed to go over the agreed collateral, even if its market price is lower than the debt itself (ibid.).

zero interest rate. On this basis, the cooperative could buy its first PV plant with no state aid (ibid.). Still, the case of Som Energia can be seen as an exception, as by that time it already had a large member base of over 20,000 shareholders (ibid.). Their success could also be a result of large public attention to the *first* Spanish energy community ever and strong support from anti-oligopoly citizen initiatives.

Despite opening up towards RECs in 2018, Spain has not returned its old FiTs model. Instead, two mutually exclusive options exist: REC's members can either sell the surplus energy with a 7% tax applied or make a saving on their annual energy bills in amount of the energy surplus (only valid for facilities under 100 KW) (MITECO, n.d.-a).

In 2017, the Spanish government also introduced auctions where bidders competed for rights to supply RE at the market price with investment and operation returns also being possible (MITECO, n.d.-b). The principle was the same as in Germany: the lowest bid wins, RECs were yet not granted any privileges. In the first auction, the winning projects fully waived state support (Ministry of Energy, Tourism and Digital Agenda, 2017). In such a way, large market players were favored: to guarantee the project implementation, public contracts require solvency guarantees and financial commitments which RECs and other small-scale actors cannot easily provide (Heras-Saizarbitoria et al., 2018: 1041). In 2020, though, the remuneration framework was changed in favor of traditional FiTs between 10 and 15 years as auction prizes, in the hope of stimulating the participation of small actors (RD 960/2020, Art. 16/1).

There exist no extra support schemes for heating and cooling. The last programme ran out of budget in 2017 (RES Legal Europe, 2019). As it financed large thermal plants and was aimed at energy service companies (FEMPA, 2011), the RECs could not fulfill the requirements and benefit from the money offered.

Finally, many municipalities are reported to support RE facilities through generous rebates on real estate (IBI) or building and installations (ICIO) taxes (González González & Ortín Sidrach de Cardona, 2018: 20). Nonetheless, several local authorities impose limitations that make the projects unfeasible in practice (ibid.).

As a response to the EU directives, the IDAE issued a preliminary version of the guide on the establishment of energy communities and possibilities for their promotion (IDAE, 2019). Notably, as a state institution, it explicitly acknowledged the restrictiveness of previous legal and policy frameworks (ibid.: 40). Recently, the new Spanish national energy and climate plan has set a 42% target of RE energy consumption by 2030 and formulated an objective to promote energy communities through adjusting the legal framework to the needs of different entities and capacity building programmes (MITECO, 2020b: 105f).

6.2.4. Discourse

Traditions of energy activism

In the 1980s, Spain had a strong anti-nuclear movement of a regional character. The sentiments merged with Basque and Catalan anti-Franco and nationalist struggles (Toke, 2011: 138). The most intensive confrontations were over the construction of the Lemoniz power plant, owned by the Franco regime favoring the energy company Iburduero (Markham, 1979). The plant became subject to the largest anti-nuclear demonstration ever (Toke, 2011: 138) and was associated with 13 deaths between 1977 and 1983 (Rubio-Varas et al., 2018: 48).

A compromise was reached in 1984 when the government posed a nuclear moratorium on new power plants (Haas, 2017: 274). The anti-nuclear movement also gave important impulses to the development of RE sources (ibid.). In response, the IDAE was found, charged with the promotion of RE (Toke, 2011: 139). After that, the anti-nuclear movement lost its strength and could not achieve the full shutdown of nuclear power plants (Haas, 2017: 281).[19]

Since then, the energy transition has mostly been supported by ecological groups such as Greenpeace, Ecologistas en Acción, WWF/Adena, SEO/Birdslife and Friends of the Earth. Like in Germany, they are strongly in favor of RE, mostly fighting for the tighter regulation of spatial planning and environmental impact assessments in order to protect biodiversity. In the early 2010s, the RECs were also thematized in the context of energy justice and sovereignty (Friends of the Earth, 2013). Today, often in joint statements, these groups actively speak out for citizens' participation in energy transition and still demand revisions of spatial planning regulation (e.g., Ecologistas en Acción, 2021). This call is underlined by large street demonstrations against renewable mega projects, with the most recent gathering thousands of participants under the slogan "Renewables yes, but not like this" (Medina, 2021).

Still, in contrast to Germany, the wider public largely accept wind power installations due to the possibility of profiting from land rental and job creation (Romero-Rubio & de Andrés Díaz, 2015: 405).

In the last decade, energy movements have been actively standing out against energy poverty and market oligopoly. In this sense, particularly noteworthy is the citizens' initiative Platform for a New Energy Model (Px1NME). Px1NME is particularly famous for exposing the close connections of the AELĖC companies to the Spanish political elites in their documentary sequences *Oligopoly* (Corominas Balseyro, 2014: 154). In 2014, in response to the call of Px1NME, opposition parties made a commitment to prohibit fracking if elected (Gil, 2014). Notably, the currently governing coalition of the Social Worker's Party (PSOE) and Union Podemos – both parties having been among the signees – passed a respective bill in May

[19] Currently, there are five active nuclear power plants with seven reactors in Spain (CSN, n.d.).

2021. The Px1NME has also been active at the EU level: for instance, in 2016, Px1NME – alongside UNEF and ANPIER – attended the meeting of the Committee on Petitions of the European Parliament in Brussels to denounce the mistreatment of renewables by the national government (WWF, 2016).

Traditions of the cooperative model

Similar to Germany, Spain boasts a very rich tradition of cooperatives. The first cooperatives in the 19th century focused mostly on agriculture and manufacturing (López-Belmonte, Moreno Guerrero & Fuentes Cabrera, 2018). In 1931, cooperatives were given their own legal status, and in 1932, Spain already had around 600 cooperatives (ibid.: 64). The anti-nuclear movement inspired the creation of the workers' cooperative Ecotècnia in 1981, which actively took up the building of wind turbines (Toke, 2011: 138).[20] Today, there exist around 20,792 cooperatives in all economic sectors (Eurofound, 2019: 75) and the federation of Spanish worker cooperatives Mondragón Corporation is the largest cooperatives' group in the world (CICOPA, 2020).

Energy cooperatives were established in rural areas at the end of the 19th century, focusing on energy distribution of, inter alia, hydropower (Heras-Saizarbitoria et al., 2018: 1039). Most of them ceased to operate after the Civil War (ibid.), with the second wave of RE cooperatives starting in 2010 after cooperatives were allowed to market electricity. As the FiPs and FiTs were insufficient for cooperatives to take up RE production activity, they mostly started reselling energy to raise enough money for their own facilities (Romero-Rubio, 2015: 182). Unlike the first-generation cooperatives that were created as a solution for the pressing problem of energy poverty in rural areas and inaction of the government, the newest generation was also driven by ideas of social empowerment and RE transition (Capellán-Pérez, Campos-Celador & Terés-Zubiaga, 2016: 13).

In general, the Spanish society appears to be well acquainted with cooperatives and the benefits such an organizational model offers, albeit unreflected in the number of RE cooperatives.

Trust

Among EU states, Spain has the third-highest level of distrust in its political system (1.9) after Slovenia and Portugal. It is also below average in its level of trust in the legal system (3.1), the European average being 4.5. The Spanish citizens, however, tend to trust other people (6.3) even slightly more than the EU average (5.8). (Eurostat, 2013)

The latter is overall a positive precondition for the establishment of RECs, as citizens are not forced to cooperate with local authorities and can establish community energy projects on

[20] In the early 2000s, Ecotècnia became part of the Spanish worker cooperative group Mondragón Corporation and was later sold to the French transport and energy group Alstrom (Cerrillo, 2020, Ch. 3.2).

their own. Yet, the lack of legal security could discourage participation as personal investments may be in danger.

6.3. Summary of the findings

As outlined in the section 5.5., the empirical evidence from Germany and Spain will be evaluated in the following step, in order to identify the factors that differ between the countries and are therefore expected to account for the difference in the REC uptake and abundance. The identified causes are then to be corroborated in the Polish context. The analyzed factors and their respective national expressions are summarized below in Table 1.[21]

The comparison of Germany and Spain indicates that the overall degree of energy market decentralization does not have a significant effect on the number of energy communities, since in both Germany and Spain the market structures have oligopolistic characteristics. The decentralization of political structures has also not been found to affect the development of RECs, as in both countries regional and local governance levels are actively involved in the operation of the energy market. Similarly, neither the long-standing traditions of the cooperative model nor the history of public anti-fossil fuel sentiments – both being present in the countries analyzed – can be expected to advance the cause of RECs. Thus, the comparison concludes that the *Actors* and *Discourse* dimensions in the PAA terms of the RE market seem to have an overall limited effect on the growth of RE cooperatives.

Nevertheless, in the framework of the *Actors* dimension, low levels of large-scale player participation in the RE sector are likely to promote the development of energy communities. This is also underpinned by the multiplicity of DSOs in Germany, together with the high number of RECs. Large players have only recently begun to enter the RE market, thus offering community initiatives space to take on the activities. Hence, RECs have had time to gain strength based on the financial support offered by the government and private cooperative networks. In this respect, Spain serves as a corroborating counterexample, since the dominance of the Great Five corporations in the RE sector has apparently stymied the energy community growth.

Further, it was observed that the provision of a policy-making priority to RE on its own is insufficient for their sustained propagation. In this regard, it is the predominance of the rule-related aspects in these countries that strongly indicates a decisive role of the regulatory environment for the energy community sector. Especially regarding the grid connection, rule clarity, conflict resolution mechanisms and online application in Germany are associated with a high growth of energy communities. In Spain, the opacity and cost-inefficiency of the regulatory field, existing bureaucratic hurdles and explicit regulatory discrimination of community actors have apparently marginalized RECs from the electricity market. This indicates a positive association between clear-cut regulatory incentives and REC development.

21 The four factors that have been found to differ in the German and Spanish contexts and thus ought to be tested against the Polish case are underlined in the table.

In both countries, cooperative law has been, at least in the last decade, overall supportive of this business model and will thus not be investigated further. Nonetheless, in Germany RE cooperatives can take advantage of tailored legislative regimes and financial guarantees, whereas in Spain communities have largely shouldered the responsibility for the failure of RE projects. Thus, the facilitating legal, financial, and policy-making environment needs to be strongly in favor of energy communities for them to flourish. This is a testament to the importance of the consistency on the *Rules* dimension for the success of RECs.

However, one cannot underestimate the likely critical effect of the *Resources* dimension on the number of RECs as an outcome variable. Accordingly, the comprehensiveness of the financial support for the RE sector at the national level has been found to be an important precondition for energy community growth in Germany. Conversely, the limited access of small-scale market players to state-backed financial resources appears to have suppressed the proliferation of community energy initiatives in Spain. Beneficial conditions at the municipal level and the efforts of some RECs to develop innovative funding models have been unable to compensate for the absence of general investment security. Therefore, this study indicates that the presence of available financial support in country is positively and closely associated with the number of RECs.

This study, however, provides mixed evidence regarding the question of whether the *Discourse* dimension makes a strong contribution to energy community development. Both Germany and Spain have a long history of energy activism. What is more, in Spain the anti-nuclear movement has been amplified by anti-oligopolistic protests, which actively promote community energy. Overall, high levels of environmental group support for RECs can be observed, even taking into account the high level of opposition to wind energy in Germany. Cooperatives, in turn, are popular across all economic sectors in both countries, and the history of state socialism in former East German states could not hinder the nationwide growth of RECs. As the aim of the study is to explain pan-European trends, this variable will be excluded from further analysis.

In this PAA dimension, the most significant variable for the researched outcome is trust. Contrary to expectation, the level of interpersonal trust in Spain was higher than in Germany. Conversely, the high level of trust in the political and legal systems in Germany correlates with high numbers of RECs, whereas low levels of both the independent and outcome variable were observed in Spain. Hence, to account for the ambiguous findings, the trust variable needs to be further tested in the Polish context.

In summary, market liberalization cannot be expected on its own to create favorable conditions for the market entry of small-scale agents such as energy communities. At the same time, this research strongly suggests that the predominance of several large-scale players *per se* also does not represent a barrier for new market entrants. In this regard, the rule-bound, regulatory environment that governs RECs' access to financial support is likely to facilitate their entry into the energy market. Rather than market structures, supportive discourse or cooperative traditions, it is high-trust, equity-supporting and highly transparent institutional and regulatory environments that can be expected to stimulate the development of the RECs.

Based on these findings, in the following step only those components that have been found to differ in the German and Spanish contexts will be explored in the Polish context. Accordingly, four factors will be examined: 1) market structure in order to establish whether existing business players allow the entry of smaller RE players, 2) grid access and connection provisions, 3) existing financial support mechanism and their characteristics, as well as the 4) level of general trust in the Polish society.

Table 1 Summary of the similarities (+) and differences (-) in national settings of Germany and Spain along the PAA dimensions

PAA Dimension	Indicators	Germany	Spain
Actors	Market structure (+-)	Oligopoly, but low participation in RE sector; numerous DSOs	Oligopoly, also in the RE sector, grid controlled by the Great Five
	Political decentralization (+)	Decentralized, with regional and local government active in the energy sector	Decentralized, with regional and local government active in the energy sector
Rules	Grid regulation (-)	Prioritized for RE, with clear obligations, an exquisite conflict solving mechanism and online applications	Prioritized for RE, but ambiguously defined, high cost burden for investors
	Planning policies (+)	States are in charge, municipalities issue approvals, standard procedures for bigger wind turbines	Construction permits for small plants are issued regionally, environmental impact assessment for larger facilities
	Cooperative law (+)	Strongly supportive legislation and protection from bankruptcy	Responsibility of the Autonomous Communities, “fairly friendly” legislation
Resources	Financial support (-)	Numerous options, some of which contain specific provisions for community energy	Very limited options for RE favoring large businesses, RECs develop own financing models and benefit from municipal support
Discourse	Traditions of energy activism (+)	Strong anti-nuclear and anti-coal movements, strong anti-wind opposition, but environmental groups are in favor of RE	Strong anti-nuclear movement until 1980s, now: environmental groups in favor of RE and special anti-oligopoly initiatives
	Traditions of cooperative model (+)	Long tradition and very popular, less developed in the “new” states	Long tradition and very popular in all economic sectors
	Trust (-)	Average trust in others, high trust in political and legal systems	Low trust in political and legal systems, high trust in others

Source: Own research.

6.4. Test case Poland

Actors

Despite the market liberalization process in 1997, the largest energy businesses are the State Treasury companies, meaning that the Polish state holds their shares and may control them to some extent. For instance, the government still owns the largest coal-producing enterprise Katowicki Holding Węglowy S.A. and remains the largest shareholder in the leading gas and oil enterprise – the Polish Oil and Gas Company (PGNiG) – which accounts for 81% of national oil production (OECD, 2020: 1). The electricity sector is also highly concentrated: a group of the four largest capital groups – Polska Grupa Energetyczna (PGE), Tauron, Energa and Enea – dominate the market. They account for 74% of national electricity production and own 87% of the retailing market, despite the presence of over 100 active suppliers (RAP, 2018: 11). As in Spain, only one company is in charge of the national grid, namely the state-owned PSE-Operator S.A. (OECD, 2020: 1), which is responsible for the high-voltage network and is therefore not relevant for RECs. Yet, the distribution networks are owned by the same four largest companies that 1) mainly deal in mining, distribution and marketing of coal and 2) are partly state-owned (IEA, 2017: 77f).

Remarkably, even in the RE sector, 90% of the installed national capacity is in the possession of the six largest energy companies, mainly investing in wind energy and biomass (Goebel, 2019: 348). The latter accounts for 45% of all RE generation, as the government supports co-firing of biomass with fossil fuels (Paska & Surma, 2014: 290). Wind energy is the second most popular RE source, with nearly half of the national facilities being owned by foreign giants like Iberdrola and RWE Innogy (Goebel, 2019: 348f). Finally, solar energy is generally attributed with having the lowest entry hurdle for small-scale actors, attracting investments from municipalities and citizens in other European countries. In Poland, the share of solar energy in national electricity generation is just 0.04% (IEA, 2017: 95), signalling the overall absence of smaller independent producers.

During the early 2010s, the government started thematising the energy sector in the context of national security, thereby justifying the nomination of political personnel in key companies (e.g., Forbes, 2012). In 2016, the government pronounced the Big Four as being essential to national security (Szulecki & Kusznir, 2018: 143). Under this status, they may be forced to abolish market logic and adjust their behavior according to the state's security needs (ibid.).[22] Given such a strong interplay of the market and state, it is difficult to analyze Polish energy *lobbying* as such. As Ministers appoint members to supervisory boards of the energy giants – as, for instance, in the most recent case of Tauron (CIRE, 2020) – the management of companies is often a political decision. The *revolving doors* is a usual practice with valuable personnel circling between politics, public administration and business. Still, this may be justified by the necessity of the government's partial ownership (Szulecki, 2018: 100). Besides that,

[22] The statutory change was, however, rejected by the supervisory board of Tauron (ibid.).

an interesting dynamic is observed after national elections: the supervisory board positions in the energy giants are renewed on a regular basis with trusted contacts and family members of political personnel (ibid.).

Given how closely powerful companies that dominate in both conventional and RE sectors intertwine with political actors, the question of why smaller players cannot gain access to the market becomes less mystifying. This is underlined by the circumstance that the umbrella associations of "alternative" players mostly represent large businesses. For instance, the Renewable Energy Association (SEO, n.d.) has Europe's largest players E.ON, RWE, Acciona and EDP among its supporting members. Further, the organizations of photovoltaic (SBF) and wind power (PSEW) focus on large-scale energy development. The PSEW (n.d.) in turn includes a range of large foreign investors such as Enel Green Power.

Grid regulation

As in Spain, the Polish legal system is marked by its volatility. For instance, the Energy Law that regulates all activities in the energy sector had been amended 66 times by 2015 (Dolega, 2016: 276).[23] It was not until 2015 that the Polish government issued a separate Renewable Energy Sources Act (RES Act), hoping to promote the use of RE according to the EU Directive of 2009 (Energy Regulatory Office, 2020).

The DSOs are generally obliged to grant priority to RE if technically and economically possible (Energy Law, Art. 7/1). Today, the RES Act (Art. 41/1) *obliges* grid operators to acquire energy from RE installations of up to 40 KW, in addition to the energy stemming from the auction winners (see *Financial support* below). The grid connection costs are carried by the plant owners, yet RE installations with a capacity of up to 5 MW are charged only half of the connection fee, while the connection of the micro-installations is free of charge (Energy Law, Art. 7/8.3). Yet, the overall sum, as well as the connection terms, are subject to the individual decisions of the grid operators (ECORYS, 2010: 97f). As the latter often set a high price to compensate for expenses associated with the advancement of the old infrastructure, the rates may range from a few thousand to several million zlotys per output MW (Dolega, 2016: 280).

There are no defined deadlines for DSOs to provide network access, so the grid connection process alone may take up to three years (ECORYS, 2010: 11), with the project implementation taking from four to seven years (Dolega, 2016: 276). Although the DSO today is obliged to provide connection terms within 21 or 30 days after receiving an application – for installations under and over 40 KW, respectively (Energy Law, Art. 7/8g) – the factual deadlines for network access as stated in the contract remains subject to the decision of the grid operator. In case of neglecting the aforementioned deadlines or connection denial, the applicant may send a complaint to the President of the Energy Regulatory Office (ibid., Art. 8/1).

[23] It is worth noting that the author encountered barriers in the process of identifying relevant legislation, the order of its amendments and additional ministerial regulations due to perceived intransparency of official communication. The convoluted legal situation may also potentially reduce the motivation of consumers to take on a more proactive role in the energy sector.

Financial support

For almost 20 years since market liberalization, the sole support mechanism for the RE development was a quota system based on so-called green certificates, introduced in 2005 (Ministry of State Assets, 2016). A certificate was issued for each unit of produced RE electricity, in line with the defined national share of RE electricity that was to be sold to final consumers in the respective year (Paska & Surma, 2014: 289). RE producers could then either market electricity on their own or sell it to energy suppliers at market price. If the quota obligation could not be fulfilled, the eligible actor had to pay a substitution fee (RES Act, Art. 52/1).

However, the certificates were only issued to actors with a RE production license (Adamczyk & Graczyk, 2020: 6582) which in turn was only granted to the large installations above 50 MW (Energy Law, Art. 32/1b). Since its introduction, the mechanism could merely increase the share of energy obtained from wind and biomass that was co-fired with coal (Paska & Surma, 2014: 290). Although the latter was recognized as a RE source by the Ministry of Energy, Poland has failed to achieve its RE energy target for 2010 (ibid.).

The RES Act of 2015 then introduced *pay-as-bid* auctions for new facilities, with a fixed price being, generally, guaranteed for 15 years (Art. 41/4). The Minister of Economy was yet granted rights to reduce the support period (Goebel, 2019: 360). In the same vein, the Prime Minister and Minister of Economy could adjust the parameters of the individual auctions (Dolega, 2016: 282). This made it directly subject to political considerations and may have potentially lessened the perceived stability of the mechanism.

However, in the beginning, they were seen as a favorable mechanism, in contrast to the outdated certificate system (ibid.: 270). The launch of the first auction in 2016 was yet tempered by a technical problem preventing applicants from placing bids and resulting in an investigation by the Prosecutor's Office (Supreme Audit Office, 2017: 47f).[24] Further, two auctions were cancelled in the next year due to suspected incompatibility with the EU competition rules (IEA, 2020b). These issues, which made subsequent amendments of the RES Act necessary, may have only conditionally contributed to the overall sense of investment security.

The act also included a provision targeting prosumers. If RE was intended only for self-consumption, in case of its under-generation, such actors received a 20-30% discount on energy from the grid (RES Act, Art. 4/1). Self-consumed RE was, further, exempted from tax (Minister of Finance, 2018), as well as RE in general, albeit based on redeemed certificates (Tax Act, Art. 30/1). In the case of supplying energy into the grid, the 2015 Act guaranteed a FiT mechanism for facilities under 10 KW (RES Act of 2015, Art. 41/10 and 15) which was, however, abolished a year later (Act of 2016, Art. 1/20). Since 2018, the FiT scheme has been introduced solely to biogas and hydropower facilities of up to 500 KW (RES Act, Art. 70a/1), as an alternative to the auctions.

[24] The issues were reported to have been caused by server overload and thus provided no grounds for cancellation of the auction (ibid.).

In the same year, the auction participants were divided into “small” and “large” bidder groups within each RE technology pool. The groups now target facilities with a capacity of less and more than 1 MW, respectively (Art. 73/4). The altered design is again likely to benefit established actors, as the “small” group has a relatively high upper threshold, thus attracting actors with sufficient experience and resources to implement projects of such size.

Additionally, since 2014 the National Fund for Environmental Protection and Water Management (NFOŚiGW) has offered the *PROSUMENT* programme, with a budget of around 800 million zlotys.[25] Attractive 1% interest loans along with subsidies for up to 15 years are possible for residential RE installations of up to 40 KW (NFOŚiGW, 2016). Depending on the project, the maximum sum of financing may not surpass 500,000 zlotys. If it does, in the case of FiT remunerated micro-installations, the energy excess fed into the grid is reimbursed at market price. Moreover, the project financing cannot be combined with any other public funding. Notably, applications through a municipality are promised high subsidies (ibid.), encouraging, like in Germany, the public-private cooperation.

Trust

Surprisingly, Polish citizen trust in the legal (4.2) and political (3.5) institutions, both closely approaching the EU average, far exceeds the level of trust in Spain. Concerning social trust, Poland lies above the EU average with its score of 6.0, surpassing Germany by several positions. (Eurostat, 2013)

7. Interpretation and Discussion

Having tested the case of Poland against variables derived from the analyses of Germany and Spain, it is possible to deduct a pattern shaping the RECs’ ability to emerge and develop. Given the inadequate presence of energy communities in Poland, with all of them having been initiated by business actors, it is interesting to observe a more extreme pronunciation of all but one of the institutional *barriers* identified in the Spanish context.

Accordingly, the market structures are again marked by an oligopolist energy industry that – despite market liberalization – is still partly owned by the state. In the electricity sector, the business giants focus on fossil fuels as means for national security, while also being in charge of the entire RE sector. In this regard, the Big Four focus on large-scale RE technologies such as biomass and wind, only allowing for investments from large international companies into the latter. Further, the energy suppliers and grid operators, i.e., mostly the Big Four, are largely able to shape market conditions, creating impeding conditions – high financial and temporal costs for the grid connection – for unassociated players. There have also been no support mechanisms for community energy until recently, when the auctions were introduced. At present, the high legal and financial instability associated with tender schemes

[25] 800 million zlotys amount to around 174 million euros as of December 2021 (National Bank of Poland, 2021).

as well as the technical and legal issues with some previous auctions may hinder the uptake of energy communities in terms of insufficient investment security that such a mechanism offers. The FiTs are predisposed towards biogas and wind energy as technologies requiring large initial investments, thus favoring larger energy producers. The only other financial support mechanisms in place – tax exemptions and the public fund programmes – mainly address self-consumption while neglecting collective energy-sharing and trade.

Such findings support the expectations derived from the country comparison of Germany and Spain. Accordingly, the level of market decentralization and, more specifically, the involvement of large enterprises in the RE sector, as well as the financial and temporal costs of grid connection and the availability of financial support mechanisms were all proven to play a relevant part for energy community development.

First, the attitude of the state towards the market seems to strongly contribute to the specific policy design. Besides hindering state regulations, if large market actors are empowered by the state, they are able to directly prevent RECs from establishing though denying them access to the network. On the other hand, the state may facilitate the uptake of energy communities through drawing explicit boundaries for the market actors, while effectively controlling the adherence to the rules. In addition, the availability of financial support mechanisms is also critical for the RECs' emergence, as they do not seem to benefit from a simple guarantee of freedom and access to the market. Especially in the initial stage, they need to be supported by simplified administrative procedures and *non-market-based* financial mechanisms which secure investment and reduce costs of operation. Such financial assistance is likely to maintain its long-term relevance for most RECs, given their non-commercial nature.[26]

Additionally, it seems that the overall clarity and stability provided by different settings also play an important part in the development of RECs, as it enables necessary long-term planning security and allows players to design projects tailored to the existing boundaries. While Germany has been credibly following a designated policy path, the amendments of the Spanish and Polish laws in recent years and the stop-and-go of the state aid is likely to create uncertainty towards rules and injected resources, leaving potential investors with no knowledge of their avenues of action.

By contrast, as previously mentioned in section 6.3., the regional and local governmental regulations and support as well as the socio-cultural environment have not been proven to have as much determining power as expected. Even in highly decentralized states such as both Spain and Germany, the autonomy of the *Bundesländer* and *comunidades autónomas,* respectively, is insufficient to compensate or oppose the course of the state. Regional and local authorities can partly feather the effects of central governments though fiscal or spatial planning provisions. However, a national government has not only more resources and

[26] In this regard, it remains to be seen whether and how the recent expiration of the 20-year FiTs will affect the development of the existing energy communities in Germany.

mechanisms at its disposal, it can also partly override decentralized structures by national law.

In turn, the broad social support of and willingness to engage in collective energy activities may be seen as a precondition for RECs to emerge. Nonetheless, if the government and the market are unwilling or unable to open respective avenues of action, the cost-risk calculations outweigh the disposition to act accordingly. It becomes evident that the abundance of RECs is not related to the socio-cultural dimension, at least not in the way operationalized in this research. Interpersonal trust cannot compensate for the feared exploitation of institutional power by political officials and perceived individual inability to rely on legal institutions in the case of a conflict. Conversely, if official institutions and their conflict resolution mechanisms are perceived as reliable, this is likely to compensate for the slightly lower level of social trust, as shown in Germany.

To relate empirical findings to the theoretical framework, the researched national settings are to be placed within Liefferink's ideal typology of policy arrangements. This is in order to evaluate the national context in terms of its enabling or hindering influence on the development of RECs and to advance the theoretical concept.

Following Liefferink's ideal typology, the policy or, better said, institutional arrangement in Germany can be defined as etatist with characteristics of sub-politics. Accordingly, a large number of governmental agencies regulate market relations and oversee the division of resources between the fossil and RE sectors, as well as between large players, small business actors and citizen collectives with the RE sector. The powerful state creates space for community energy projects – and RE cooperatives, in particular – to develop activities, while explicitly shielding them from market uncertainties through state regulations. While the latter force the economic actors to offer RECs access to the market, to help RE producers to compete against conventional technologies, the state provides energy communities with direct financial assistance in the initial phases through public funds. Equally importantly, the RECs are supported in raising own revenues due to the non-market-based FiTs and thus can autonomously secure their long-term viability. A theoretically assumed sluggishness and rigidity associated with etatist states is compensated for by a federal system that enables high regional and local autonomy. In this way, RECs are allowed to develop parallel to an otherwise highly competitive and "non-solidary" market model. This unique ecosystem – geared towards enabling RECs by protecting and providing supportive conditions to them – has to be considered as the major cause for the relative abundance of energy communities in Germany.

The Spanish institutional arrangement in turn can be positioned between liberal-pluralist and neo-corporatist types, tending more towards the latter. Market and civil actors are now theoretically allowed to compete for resources, but only the best organized are granted access to policy-making. Hence, in the energy sector, there exists a plurality of different players, yet only with a few of them being able to take over the most resources. The established market players have organized themselves into a powerful association in order to gain the most access to the government. Through negotiations with the state, they have managed to jointly overturn policy-making in their favor and take over the lead in the energy sector, including the RE. Accordingly, the Big Five now compete with energy communities, as they would lose customers if citizens provided for their own energy supply. Existing regulations give established businesses relative freedom of action, with the latter tending to directly hinder small RE producers from developing projects by, for example, artificially extending the grid connection process. In addition, although all RE activities are subjects to state regulation – which can be a favorable condition, as seen in Germany – the state seems to have been facilitating the participation for dominating players through placing administrative and financial burdens on small-scale RE producers and withdrawing the respective aid. Like in Germany, the public discourse is in favor of RECs, yet the “closed” space at the state level deprives RECs of the chances to start an activity in a stable and protected environment as seen in Germany.

In the case of Poland, the institutional arrangement tends towards etatism in that the state firmly controls the market by being its major shareholder and explicitly promoting the energy sector as a means of national security. This has created a protected space for the largest market actors. The latter are taken care of by the state as they are believed to strengthen the country’s position in the international arena.

The etatist type – contradicting initial theoretical expectations – may very well offer the most favoring institutional space for energy communities. To achieve positive results, state dominance must deliberately secure an artificially created “sub-politics”, in terms of a playing field for community actors. In such a protected space, the latter may receive the necessary resources and freedom to manage the energy supply issue at hand, while not being forced to orient themselves towards financial gain. Such state dominance is therefore decisive, as energy communities are often unable to raise sufficient economic or political capital to autonomously compete for resources with other market actors. Nonetheless, if the state’s interest in RECs is minimal, the etatist type is also the most likely to exclude them from the game entirely, as seen in Poland.

By contrast, while it was expected that liberal-pluralist and neo-corporatist states provide more institutional space, it becomes clear that these types of arrangements tend to reduce the option of small, decentralized non-profit initiatives engagement in the production of public goods. This is a result of the mechanism of profitability in liberal-pluralism and through the mechanism of collective advocacy in neo-corporatism. It furthermore becomes clear that without state regulation, the liberal-pluralist type tends to concentrate decision-making power in the hands of a few well-organized and profitable actors, likewise neo-corporatism. In theory, these actors are able to create favorable conditions for RECs, yet in practice – like in the case of Spain – they are not.

Thus, these modifications need to be accounted for, when applying Liefferink's ideal types of policy arrangements to the analysis of national systems and their ability to create favorable conditions for RECs.

8. Conclusion

Regarding the ambitious targets of the EU to become climate-neutral by 2050, the member states were obliged to ensure energy communities a level playing field within the energy sector. However, transposing the manifold potential that emanates from energy communities requires an understanding of the existing measures affecting their development. As this issue has been neglected in academic literature, the research question of the present thesis was: *What institutional factors affect the development of energy communities in the EU member states?* More specifically, the present study has sought to identify factors that contribute to differences in the uptake and abundance of energy communities across the EU member states and assess the relative importance of the market-related, political and socio-cultural environments.

These aims were met through the application of the PAA and the concept of institutional space to identify enabling and hindering factors for the development of renewable energy cooperatives in the EU member states. The research was conducted in a two-step manner: the possible determining factors were first derived from the comparative assessment of Germany and Spain based on John Mill's method of difference and then tested for their validity in the Polish context. The respective findings then enabled country-specific classification into Duncan Liefferink's ideal types of policy arrangements, providing theoretical guidance into states' general ability to foster community energy initiatives.

The empirical findings suggest that governance-related factors are those that exert critical influence. Depending on the regulations concerning market relations, access to the grid and financial support, the state may both enable and hinder the uptake of RECs. The market structure as such plays a secondary role, as market players are also largely dependent on the space the state provides for them. The socio-cultural environment in turn is important in delivering social capital for RECs but cannot break through a "closed" space from above. The most beneficial policy arrangement for the emergence of RECs is the one where the state artificially creates a space where the RECs are protected from the manipulation of large market actors by law and given the necessary freedoms and resources to emerge and develop.

In this regard, it is important to make the establishment of RE cooperatives more lucrative for citizens and provide them with legal and investment security. A central platform could support interested citizens with relevant knowledge on viable business models, relevant administrative procedures and project management. It is also necessary that the state explicitly targets the local embeddedness and participation of citizens in competitive situations, in order to protect the latter from manipulation by larger players. Finally, the existing bureaucratic complexity and regulatory intransparency are likely to be reduced in the course of the worldwide digitalization.

This thesis is one of the first of its kind to investigate community energy in national institutional settings from a political science standpoint. It simultaneously fills several research gaps, by 1) conducting a multidimensional analysis of national settings in great detail, 2) comparing enabling and hindering environments in the countries with high and low numbers of RECs, respectively, and 3) shedding light on the under-researched region of Southeast Europe. The work contributes to the theoretical discussion on actor-structure debate, by applying and advancing Lifferink’s typology of policy arrangements in the field of community energy.

Nonetheless, the present thesis has placed its focus on formal legal entities in those EU member states that exhibit extreme expressions on the outcome, while only offering an overview of possible causes due to the research method applied. Therefore, the study provides a solid base for the future research to address the issues that remain unconsidered.

Focusing on power dynamics, it could be helpful to investigate how dominant political parties shape the public perception of RECs as the EU increases its pressure on the members states to promote community energy. In this sense, the national choice of policy instruments and their effects are of great scientific interest. Further research may also profit from the selection of less extreme outliers within the EU, as represented by Germany, Spain and Poland. When more data on the history and distribution of energy communities are available, it may analyzed via the process tracing method how certain policies produce the respective outcome as well as whether and how the assumed causal factors interrelate with each other.

As the findings possess general relevance for EU member states and have the potential to find application in most Western market economies, it could useful to closely examine developing countries of Eastern Europe and Latin America. The set of factors playing an important role may differ in the countries, where energy communities are likely to emerge in rural areas as self-help grassroots initiatives because the state and market do not provide them with adequate energy supply. The informal rule-making and the socio-cultural environment may also strongly differ from the Western habits. At the same time, North American countries may experience other governance-related issues due to the different geographical challenges and libertarian culture.

As the EU now takes energy communities under its wing, it can be assumed that both nation-states and their societies will become increasingly aware of the benefits of such ventures. The introduction of long-term national strategies and commitments to promote community energy in accordance with the EU directives may hence give the actors a sense of security and attract new investors. It is also aspired that the complexity and dynamic development of this phenomenon will increasingly appeal to scholars of social disciplines in the future, with this thesis representing a beginning.

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