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**UNDERSTANDING JUSTICE REGARDING RENEWABLE ENERGY  
PROJECTS: ROLE OF SOCIAL NORMS, LOCAL ACTORS AND  
GENDER**

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**Irmak Naz Karakislak**

Aus Istanbul, Türkei

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Der Dekan:

Univ.-Prof. Dr. Peter Loos

Berichterstatter\*innen:

Herr Prof. Dr. Wolfgang Meyer

Frau Prof. Dr. Petra Schweizer-Ries

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## **List of Abbreviations**

CO<sub>2</sub>: Carbon dioxide

EU: European Union

IEA: International Energy Agency

IPCC: Intergovernmental Panel on Climate Change

UN: United Nations

UK: United Kingdom

US: United States

WEP: Wind Energy Projects



## **Abstract**

A shift from fossil fuels to renewable energy technologies is crucial for reaching climate neutrality goals. Achieving this transition requires policy-makers, industry stakeholders, and civil societies to cooperate and support each other. Despite ambitious policy reforms and incentives toward low-carbon energy technologies, the deployment of projects is not exempt from encounters with local conflicts. A better understanding of communities' claims, concerns, and needs is essential for supporting appropriate energy projects. This study examines three pillars of environmental justice claims – distributive, procedural, and recognition – concerning renewable energy projects through three research papers.

*Paper 1* intends to conceptualize the role of social norms concerning justice concerns. Results show that justice claims towards energy projects – whether participation in planning or financial benefits – are linked with the community's social norms (i.e., expectations of others). Project developers may examine the contextual conditions of localities and use communication strategies that align with the community's perceived sense of fairness.

*Paper 2* focuses on local political actors (i.e., mayors and council members) as influencing factors of community norms by comparing four German case studies. Reporting on two successfully implemented and two conflicted wind energy projects, the findings define the municipal mayors as key actors who may mediate and lead the process. Even though the support of mayors alone cannot guarantee acceptance, their responsibilities should be reinforced and supported by energy policies and project developers.

*Paper 3* investigates the recognition justice aspect of renewable energy cooperatives in Germany, which are pillars of decentralized energy sources. A sex ratio analysis of over three hundred cooperatives, a survey, and interviews reveal that only a small proportion of the public (i.e., older and middle-class men) dominate the energy cooperatives in Germany, and several other social groups, including women, are underrepresented. Findings also highlight that reluctance to address gender inequality stereotypes women as uninspired, unwilling, and lacking technical skills to take on leadership roles. This paper presents recommendations to energy cooperatives and policy-makers for government-supported programs for cooperatives to attract more women and a broader range of social groups.

In summary, these results show that environmental justice concerns of societies can take different forms, ranging from responses to energy projects according to group norms to embedded inequalities within the distribution of benefits from the energy transition.

## **Zusammenfassung**

Eine Umstellung von fossilen Brennstoffen auf erneuerbare Energietechnologien ist entscheidend, um die Klimaneutralitätsziele zu erreichen. Zur Umsetzung dieser Umstellung ist eine Zusammenarbeit und Unterstützung zwischen politischen Entscheidungsträgern, Industrieakteuren und Zivilgesellschaften erforderlich. Trotz ambitionierter politischer Reformen und Anreize für energiearme Technologien bleibt die Umsetzung von Projekten nicht von lokalen Konflikten verschont. Ein besseres Verständnis der Ansprüche, Bedenken und Bedürfnisse der Gemeinden ist unerlässlich, um angemessene Energieprojekte zu unterstützen. Diese Studie untersucht drei Säulen der Umweltgerechtigkeitsansprüche - distributiv, prozedural und anerkennend - im Zusammenhang mit erneuerbaren Energieprojekten durch drei Forschungspapiere.

*Papier 1* beabsichtigt, die Rolle sozialer Normen in Bezug auf Gerechtigkeitsbedenken zu konzeptualisieren. Die Ergebnisse zeigen, dass Gerechtigkeitsansprüche gegenüber Energieprojekten - ob Teilnahme an der Planung oder finanzielle Vorteile - mit den sozialen Normen der Gemeinschaft verbunden sind (d. h. Erwartungen anderer). Projektentwickler können die kontextuellen Bedingungen der Orte prüfen und Kommunikationsstrategien nutzen, die den geschätzten Erwartungen der Gemeinschaft entsprechen, was als fair empfunden wird.

*Papier 2* konzentriert sich auf lokale politische Akteure (z. B. Bürgermeister und Ratsmitglieder) als Einflussfaktoren auf Gemeinschaftsnormen durch den Vergleich von vier deutschen Fallstudien. Die Ergebnisse definieren die Bürgermeister der Gemeinden als Schlüsselakteure, die den Prozess vermitteln und führen können. Obwohl die Unterstützung allein durch Bürgermeister keine Akzeptanz garantieren kann, sollten ihre Verantwortlichkeiten durch Energiepolitiken und Projektentwickler verstärkt und unterstützt werden.

*Papier 3* untersucht den Aspekt der Anerkennungsgerechtigkeit von Erneuerbare-Energie-Genossenschaften in Deutschland, die als Säulen dezentraler Energiequellen gelten. Eine Geschlechterverhältnisanalyse von über dreihundert Genossenschaften, eine Umfrage und Interviews zeigen, dass nur ein kleiner Teil der Bevölkerung (d. h. ältere und mittelständische Männer) die Energiegenossenschaften in Deutschland dominieren und mehrere andere soziale Gruppen, einschließlich Frauen, unterrepräsentiert sind. Die Ergebnisse zeigen auch, dass die Zurückhaltung, Geschlechterungleichheit anzugehen, Frauen als uninspiriert, unwillig und technisch unqualifiziert darstellt, um Führungspositionen zu übernehmen. Dieses Papier präsentiert Empfehlungen für Energiegenossenschaften und politische Entscheidungsträger für

regierungsunterstützte Programme für Genossenschaften, um mehr Frauen und eine breitere Palette sozialer Gruppen anzulocken.

Zusammenfassend zeigen diese Ergebnisse, dass Umweltgerechtigkeitsfragen der Gesellschaft unterschiedliche Formen annehmen können, von Reaktionen auf Energieprojekte gemäß Gruppennormen bis hin zu eingebetteten Ungleichheiten bei der Verteilung von Vorteilen aus dem Energiewandel.



## 1. Introduction

Dependence on fossil fuels and nuclear energy is the leading cause of climate change. According to United Nations (UN), over 75% of global greenhouse gas emissions and 90% of carbon dioxide (CO<sub>2</sub>) emissions are produced by fossil fuels, including coal, oil and gas (UN, 2021). Moreover, the energy demand is rapidly increasing. (IEA, 2022). Global electricity demand grew 5% in 2021 and is set to grow 4% in 2022 (IEA, 2021). Therefore, recognising the status quo and moving towards a sustainable implementation of the energy sources and reducing CO<sub>2</sub> emissions is critical.

One promising milestone is the Paris Agreement, which is a legally binding international treaty on climate change mitigation (UNFCCC, 2015). This agreement have defined goals for the energy transition as a pathway for achieving keeping the rise in mean global temperature to well below 2, preferably 1.5 degrees Celsius by 2030 (UNFCCC, 2015). One hundred ninety-seven parties such as the United Kingdom (UK), United States (US), European Union (EU) and China have committed to formulating strategies to lower their greenhouse gas emission and reporting on their actions (UNFCCC, 2015). Investing in low-carbon energy and shifting the energy sources from fossil fuels to renewable energy is one of the strategies for decarbonisation (IPCC, 2022). According to the International Energy Agency (IEA), renewable energy investment plans for 2021-2023 would only cover 40% of the demand for the climate neutrality goals (IEA, 2022). Thus, there is an urgent need for a systematic change not only in the existing business models but also in societies and how renewable energy developments are understood.

In the case of Germany, anti-nuclear movement after the Fukushima disaster influenced the deployment of renewable energy technologies (Strunz, 2014). The German government introduced the Climate Action Plan 2050 with long-term goals to lower carbon emissions under the Paris Agreement (BMUV, 2016). Although, Germany has been committed to phase-out nuclear power and shifting towards renewable energy sources since the beginning of the 2000s, known as *Energiewende* (Energy Transition) (Strunz, 2014). More recently, coal phase-out plans set new goals of switching to low-carbon energy sources by 2030<sup>1</sup>. The past two decades have shown the structural changes in technologies, policies, frameworks, and investments that carried a transformational process (Musall & Kuik, 2011). However, these rapid changes are having a severe effect on public perceptions, tendencies and responses.

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<sup>1</sup> See German legislative package the Coal Phase Out Act (*Kohleausstiegsgesetz*) and the Law on Structural Transition of Coal Regions (*Strukturstärkungsgesetzes Kohleregionen*). <https://dserver.bundestag.de/btd/19/173/1917342.pdf>

Renewable energy technologies, particularly wind turbines, have been the focus of public debates concerning their impacts on the changing landscape and financial and social consequences (IRENA, 2022). National surveys on public opinions, attitudes and perceptions of wind energy have shown consistent support in many countries such as the UK, US, Germany and Denmark, neglecting the contextual aspects at the local level (Devine-Wright, 2005). Thus, investigating social acceptance of renewable energy at different scales (i.e., socio-political, market, community) has evolved into a continuing interest within the field of research (Wolsink, 2006; Wüstenhagen et al., 2007).

Likewise, the promotion of renewable energies in Germany receives public support according to national acceptance surveys (see FA Wind, 2021b). Nonetheless, public support and acceptance are still challenging on the local level. Concerns over the changes in the landscape and visual impacts of power plants (Bertsch et al., 2016), procedural aspects and participation (Langer et al., 2018; Rau et al., 2012), financial benefits (Yildiz, 2014), increase in electricity prices (Frondel et al., 2015) and trust in stakeholders (Gölz & Wedderhoff, 2018; Kalkbrenner & Roosen, 2016) are some factors causing local conflicts. Decentralised renewable energy technologies have been a crucial pillar for the German energy transition, aiming to overcome some encounters over procedural and distributive justice claims (Fraune, 2015). Community-owned projects<sup>2</sup>, in particular, have created awareness and a sense of ownership in citizens for renewable energy development (Yildiz et al., 2015). However, studies indicate that citizen ownership and distribution of benefits do not guarantee local acceptance of projects (Langer et al., 2017). Thus, the legislative framework, environmental policies, and local protests and conflicts show Germany to be a relevant and dynamic context for research.

A considerable amount of literature has been published on community acceptance and local responses regarding renewable energy technologies (Batel & Devine-Wright, 2015a; Gross, 2007; Velasco-Herrejon & Bauwens, 2020). This line of research has investigated the role of participation (Rau et al., 2012), justice (Cowell et al., 2011), place attachment (Devine-Wright & Batel, 2017) and other factors to fill the gap between the support in national polls and various attitudes at the local project level. However, far too little attention has been paid to understand environmental justice claims towards renewable energy projects through its three pillars (i.e., distributive, procedural and recognition) (Schlosberg, 2007).

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<sup>2</sup> The local population partially and fully invests in and owns renewable energy projects.

This study will examine how justice-related issues concerning renewable energy technologies are shaped by addressing the significance of social norms, local actors that influence them and gender inequalities. The first study (*Paper 1*) aims to contribute to this growing area of research by providing a conceptual framework applicable in different social and cultural contexts. The second study (*Paper 2*), focusing on the role of local political actors, offers interesting insights and results that would be relevant in many locations to understand and overcome wind energy conflicts. The third study (*Paper 3*) intends to create awareness of gender and intersectionality as environmental justice claims. Overall results and recommendations from this cumulative research aim to significantly contribute to understanding the dynamics of local responses to renewable energy projects to achieve a more fair energy transition.

Chapter 2 begins by laying out the theoretical dimensions of the research. Chapter 3 explains the overall research questions and the design of three empirical studies. Chapter 4 describes the research methodology and data used in this study. Chapter 5 discusses the findings, recommendations for key stakeholders and implications for future research. Finally, Chapter 6 consists of the three research papers carried out as part of this study.

## 2. Theoretical Background

This chapter provides a summary of the theoretical background of the study. First, the role of the energy transition in climate adaptation is discussed. Second, the social acceptance of renewable energy projects is introduced and explored as a model to understand different aspects of this transformation. Third, the critical notion of environmental justice is presented. Fourth, social norms theory is discussed as an approach to explaining justice perceptions. Lastly, the intersectionality approach for expanding justice concerns and claims is explained.

### 2.1. Energy transition as socio-technical change

Studying the relationship between environmental issues and society has been in the interest of sociological research since the 1970s (Dunlap & Michelson, 2002). A large and growing body of literature by sociologists has shown the nature of environmentalism and the impacts of environmental change (Hannigan, 2006). Sociological theory contributes to environmental research by applying its science and knowledge, which enrich the interdisciplinary nature of environmental issues (Shove, 1994). Moreover, it seeks to understand the changes within societies and recognize how natural resources should be maintained and managed (Redclift & Woodgate, 1994). Thus, the notions of environmental change (i.e., climate change) should be approached from a sociological perspective.

The urgency of climate crisis obligates all countries worldwide to find solutions and adapt them. Intergovernmental Panel on Climate Change (IPCC) describes the urgent and timely actions toward reducing climate risks under two main categories: human systems and ecosystem transitions (IPCC, 2022). Protecting and restoring the livelihood of the ecosystems (e.g., land, ocean, coastal) and their biodiversity is part of this transformation. The second part is the human-centred systematic change that impacts societies, industries and markets (IPCC, 2022). These solutions require holistic, innovative and transformative actions (Grubler, 2012). Society and governments should support upgrading infrastructures, buildings, energy, storage and heating systems and strengthening the knowledge and capacity (Pittock, 2009). Thus, energy transition is one but a crucial piece of this puzzle.

Transitioning from fossil fuels to low-carbon energy systems (i.e., renewable energies) impacts society on multiple levels. It is not only affecting economic, political and technological components, but it systematically changes embedded social practices (Miller et al., 2013). The energy transition involves altering individual and collective energy behaviour, such as shifting to sustainable energy sources (e.g., using smart meters) and energy-efficient technologies (e.g., switching to LED lights) (Lopes et al., 2019). Some studies argue that knowledge, motivations



and contextual factors are the main determinants for changing energy behaviour (Steg et al., 2015). Similarly, the Energy Cultures framework provides an understanding of energy behaviour as the interactions between cognitive norms (e.g. beliefs), material culture (e.g. available technologies) and energy practices (e.g. current activities) (Stephenson et al., 2010). The contexts influencing behaviour could be understood as organisational, geographical and social practice context (Heiskanen et al., 2019). Overall, energy transition impacts people's attitudes, behaviour, and practices.

On the other hand, beliefs, norms and cultures influence energy transition in ways that might complicate, promote or reject these changes (Sovacool & Griffiths, 2020). Thus, the energy-related problems mirror social concerns in societies, which is a fundamental interest of sociological research (Lutzenhiser et al., 2002). This study explores the aspects of energy-society dynamics with a sociological approach.

## ***2.2. Understanding responses to renewable energy projects***

### *2.2.1. Acceptance, acceptability, and public response spectrum*

Shifting away from fossil fuels and increasing the deployment of renewable energy have a crucial role in climate mitigation (European Commission, 2022). However, there tends to be a gap between general public attitudes towards renewable energy technologies and public responses to energy projects (Bell et al., 2005). Project planners and authorities have used the narrative of “not in my backyard” (NIMBY) as the cause of this gap for many years, which fails to capture the complexity of different dynamics (Wolsink, 2007). To investigate this further and to move beyond oversimplified explanations, Wüstenhagen et al. (2007) introduced the concept of social acceptance.

Wüstenhagen et al. (2007) provided a three-dimensional approach to social acceptance, namely socio-political acceptance, market acceptance and community acceptance (see **Figure 1**). National and local energy policies and the role of stakeholders and policy actors are socio-political acceptance topics. The market adoption of renewable energy infrastructure is another aspect of acceptance. Lastly, community acceptance discusses the dynamics of local actors (e.g. residents, authorities) concerning specific energy projects (Wüstenhagen et al., 2007). With these interlinked levels, an interdisciplinary approach is formed to recognize renewable energy technologies' environmental, political, social, and economic impacts.



**Figure 1:** The triangle of social acceptance (Source; Wüstenhagen et al., 2007)

A considerable amount of literature has been published on empirical applications of social acceptance in Germany (Zoellner et al., 2008), France (Jobert et al., 2007), Finland (E. Moula et al., 2013), Italy (Caporale & Lucia, 2015), Switzerland (Soland et al., 2013), Mexico (Mallett, 2007), the UK (Warren et al., 2005) and the US (Firestone et al., 2012). Moreover, several researchers have provided models to understand acceptance through psychological factors such as perceived behavioural control, attitudes, valuation, perceptions, and personal and social norms (Huijts et al., 2012; Schweizer-Ries, 2008).

Studies with critical approaches have also challenged the concept. Batel et al. (2013) and Batel (2018) raised the question of using the word “acceptance” as being a constraint of the concept and suggested critically approaching public responses towards renewable energy infrastructures. Similarly, Fournis and Fortin (2016) proposed a socially constructed term of “acceptability” to consider all the social processes and not only the acceptance/unacceptance curve. On the other hand, Upham et al. (2015) suggested an analytical framework that has a context-based classification, including social acceptance (i.e. general, community and market), the object (i.e. technology, infrastructure and application) and the level of approach (i.e. general, local and end-user). Some social acceptance studies were also criticized by Aitken (2010) for their normative stance on taking opposition as merely a hurdle to overcome.

Batel (2020) sums up the trends in the research on the social acceptance of renewable energies in three waves: normative, criticism and critical. The first wave with normative approaches that focused on characterizing and overcoming opposition shifted to criticizing NIMBY discourse and understanding opposition (Aitken, 2010; Batel, 2020). The second wave had a more

criticism approach towards NIMBYism that aimed to understand local opposition and support the energy transition. The third wave of research on acceptance, acceptability and local responses recognizes and adopts critical approaches that focus on power relations and ideologies (Batel, 2020). Debate continues about the best approaches for potentially transcending the biases of the concept. The central theory of this study is based on the critical discussions of social acceptance, mainly focusing on developing the normative approach of acceptance/opposition to the multiplicity of local responses to renewable energy projects.

### 2.2.2. *Defining community*

Questions have been raised about the definition and the scope of the *community*. It remains partly unclear which people could be considered as a community; therefore, it needs further investigation (Goedkoop & Devine-Wright, 2016). Some studies suggest that communities are identified by a particular place or common interest (Musall & Kuik, 2011). Others expanded the notion of local individuals living nearby a renewable energy infrastructure and being affected by it to the concept of *communities of relevance* (Batel, 2018). This definition includes communities as actors in developing energy projects that have an impact instead of portraying them as only affected people (Batel, 2018). Devine-Wright and Wiersma (2013) found from their case studies in the UK that private sector actors emphasize the physical aspects of “local”. In contracts, the community actors highlight social, cultural and political features. Thus, examining the local communities’ responses, concerns and interests need a holistic framework. This dissertation will review the community as the group of people with involvement and interest in or direct or in-direct connection with energy projects.

Studies explained community-led energy projects from different angles as well. *Community energy projects* are defined as projects in which local communities have a high degree of ownership and engagement (Walker & Devine-Wright, 2008; Walsh, 2016). Similarly, energy citizenship offers a concept that people can engage and take a role in energy systems (Devine-Wright, 2007a; Ryghaug et al., 2018). In a recent study, Beauchamp and Walsh (2021) found energy citizenship to have the potential to engage communities in the energy transition but also emphasized its limitations (e.g. perceptions of extreme convictions regarding gas-like energy sources).

Another form of community involvement in localised energy production is renewable energy cooperatives (Schreuer & Weismeier-Sammer, 2010; Soeiro & Ferreira Dias, 2019). Cooperatives have a democratic structure in which the shares are owned by their members (primarily local individuals or companies) (Bauwens et al., 2016). In their review of German

renewable energy cooperatives, Yildiz et al. (2015) identified these organizations as an important source of analysing participation, conflict and trust on the local level. Together, these studies outline that community ownership and local involvement in energy projects have are essential in accelerating decentralized energy production.

### 2.2.3. *Factors influencing community concerns*

Community-level concerns about renewable energy projects consider different factors. One key aspect of these concerns is related to people-place bonds (i.e. place attachment and place identity) (Devine-Wright, 2009). People-place bonds suggests that public responses to specific energy projects may be linked to people`s affinity and connection to a particular place which tend to create a protective attitude towards environmental change (Devine-Wright, 2011). Surveys such as that conducted by Devine-Wright and Batel (2017) in the UK have shown that strong attachments at local, national and global levels impact the willingness to support energy projects.

Social and personal factors of local community members play a role in explaining their responses as well. Personal attitudes toward renewable energy technologies (Devine-Wright, 2007b), proximity to a power plant (Swofford & Slattery, 2010), familiarity and experience with infrastructures (Dällenbach & Wüstenhagen, 2022) and socio-demographics (e.g. gender, age, social status) of the community (Bertsch et al., 2016) can influence acceptance. As Batel and Devine-Wright (2015a) noted, responses to energy projects are far more complex and therefore require layered explanations.

To better understand the responses to renewable energy projects, researchers have considered additional factors. Annoyance (Bakker et al., 2012; Haac et al., 2019) and visual impacts (Johansson & Laike, 2007) of projects have also been shown to influence acceptance. A recent comparative study in Denmark, Germany and Switzerland by Pohl et al. (2021) found that annoyance stress caused by wind turbines is linked to perceived fairness, community involvement, landscape change, visibility and age. Similarly, Delicado et al. (2016) comparative case study in Portugal showed that concerns about landscape change and visual impacts are connected to project planners and authorities neglecting local views. Thus, involving the concerns of local communities in siting decisions proves to impact acceptability.

Feelings of injustice about the procedures, decision-making processes and distribution of benefits are recognized as hindrances to energy development (Gross, 2007; Wolsink, 2007). Moreover, trust in stakeholders has been considered to play a crucial part in how people evaluate

the processes of this development (Dwyer & Bidwell, 2019; Fast & Mabee, 2015). An in-depth study in England by Simcock (2016) concludes that even community energy projects with public involvement and investment could raise questions about procedural fairness. Walker and Baxter (2017) also discuss the critical relationship between the amount and fairness of distribution which should be considered more in-depth to address the locals' concerns.

It has been suggested that levels of participation play a crucial role in perceptions of energy projects to be fair or unfair (Gross, 2007; Liebe et al., 2017; van der Horst, 2007). Rau et al. (2012) discuss the role of participation as being the 'silver bullet' for projects to be perceived as fair. A recent study by Stadelmann-Steffen and Dermont (2021) in Switzerland shows that public engagement events might not be enough for the local community to perceive as they politically participated in the process and therefore may cause conflicts. Even though voting preferences for projects are subject to change within cultures, transparency in the processes and interactive and meaningful participation of the local community are necessary aspects of energy development that could contribute to a just energy transition.

The studies presented thus far provide evidence that understanding local dynamics of socio-technical change is key to finding innovative and appropriate solutions for communities. Moreover, this study aims to investigate them further, emphasising justice concerns.

### ***2.3. Environmental justice***

The environmental justice framework addresses the broad range of distributions, procedures, vulnerabilities and capabilities of the ecological and environmental change that differ for social groups (Clayton, 2000). The costs and damages of climate change are not affecting everyone similarly and most of the time, the vulnerable groups are disproportionately impacted. Thus, environmental justice is at the heart of understanding social movements, personal attitudes and behaviours towards environmental issues (Walker, 2007).

The concept is understood mainly under three categories: distributive, procedural and recognition (Rawls, 1997; Schlosberg, 2007, 2013). Although some research has focused on distributive and procedural justice aspects, recognising how these aspects reflect on different individuals or groups are key elements of this concept (Fraser, 1995, 2000; Young, 1990). In other words, equal distribution of environmental costs and benefits and public involvement in decision-making could not attain justice if vulnerable individuals and communities are not recognised. Throughout this dissertation, the term justice will be used to refer to distributive, procedural and recognition aspects.

Several studies thus far have shown that social movements about ecological issues could be explained with this concept and are defined as environmental justice movements (Agyeman et al., 2016; Schlosberg, 2004; Toke, 2011). Grassroots protests and movements concerned about the consequences of these issues have been widely investigated (Acselrad, 2010; Schlosberg, 2004; Walker, 2007). These discussions have mainly focused on the implications and risks of nuclear energy, water power plants and waste (Ottinger, 2013; Walker, 2009). A recent study by Yaka (2020) found that anti-hydropower movements in Turkey claimed socio-ecological justice in which human and non-human life could co-exist according to their historical and cultural context. In the same vein, Shah et al. (2021) note that the large-scale dams affected primarily marginal communities and created further conflicts and concerns such as corruption, preservation of the eco-system, and privatisation. Collectively, these studies outline the struggles of rural, native, and indigenous groups to fight displacement and claim to take part in environmental decision-making.

In the context of renewable energy production, environmental justice creates a framework for exploring conflicts, opposition and support groups (Outka, 2012). Social and geographical unequal distribution of ecological impacts of renewable energy infrastructures could also be contested through environmental justice protests (Avila-Calero, 2018). In their review, Levenda et al. (2021) discuss the environmental burdens of renewable energy technologies (e.g. air and water pollution, visual impacts) for the intersects between social groups such as low-income groups and indigenous and rural communities. In other words, the socio-demographics of the *communities* should be represented and recognized accordingly to their historical and cultural contexts.

There is a strong connection between the claims of environmental justice and public demands for fair and inclusive renewable energy development. Environmental justice has been discussed under the scope of social acceptance (Cowell et al., 2011; Scherhauser et al., 2017). However, acceptance research has predominantly emphasised the two notions of justice, procedural and distributive (Gross, 2007; Langer et al., 2016; Lienhoop, 2018; Ottinger et al., 2014). Far too little attention has been paid to the environmental justice concept's recognition, capabilities, participation, and vulnerabilities. Thus, this study's empirical research critically discusses the analytical strands of justice.

#### **2.4. Social norms**

Social norms play an essential role in understanding people's intentions and behaviours. They have been described as unwritten codes or perceptions of what is expected of others and what

is typically done in certain situations (Cialdini et al., 1990; Goldstein et al., 2008; Young, 2015). Social norms are distinguished from legal, moral, and personal norms, habits and agreements (Farrow et al., 2017). Traditionally, they are defined as descriptive and injunctive norms. Descriptive norms refer to the typical behaviours within a group, while injunctive norms indicate the acceptable ones (Goldstein et al., 2008).

A considerable amount of literature has been published on the influence of social norms on pro-environmental behaviour (Schultz, 1999; White et al., 2009). Allcott (2011) found in their field experiment in the United States that descriptive social norms significantly reduce residents' energy consumption by 2.0%. Moreover, surveys such as that conducted by Nigbur et al. (2010) have shown that social norm interventions could be effective for behaviour change (e.g., recycling). Thus, understanding the normative indicators for behaviours carries a strong potential to investigate the dynamics of communities. Despite this, very few studies have researched the impact of social norms on the acceptance of renewable energy development.

Hübner et al. (2020) have attempted to explain social norms as one of five acceptance factors of wind, solar and biogas energy in their nationwide study in Germany. Similarly, Kalkbrenner and Rossen (2016) demonstrated the impact of norms on residents' willingness to participate in community energy projects in Germany. So far, however, there has been little discussion about how community norms may influence justice perceptions towards energy projects. Fairness judgements are not disconnected from the expectations and behaviours of others. Therefore, this study investigates the interlinkages between social norms and justice.

### ***2.5. Intersectional approaches***

Many feminist discourses failed to consider the intersections of social and cultural identities, particularly of women of colour (Crenshaw, 1991). Intersectionality emerged from Black feminist theory with the claims to recognise discrimination and injustices on multiple grounds of identity (Lykke, 2010). Since then, intersectionality has been employed as a framework in multiple research areas such as natural disasters (Ryder, 2017), urban ecology (Di Chiro, 2006), and sustainability (Kaijser & Kronsell, 2014) to understand and ultimately reduce social inequalities.

Principles of environmental justice have been criticised for being used as an argument only on policy reforms and not on changing power structures that produce injustices (Menton et al., 2020). Critical environmental justice perspectives suggest that intersectionality can recognise these inequalities, vulnerabilities and oppressions in all intersects (Pellow, 2018). Therefore,

intersectional approaches in environmental and energy research have great potential for acknowledging underlying dynamics.

Johnson et al. (2020) reviewed the literature and found that decision-making around the transition to low-carbon energy does not adequately include or recognise the needs of marginalised communities (e.g., indigenous, rural). By applying an intersectional framework, Kojola (2019) found that decision-making concerning the mines in Northern Minnesota, United States overlooks the health risks for the indigenous communities due to economic benefits for white male workers. Moreover, renewable energy development does not guarantee the claims of all social groups. Frondel et al. (2015) analysed the electricity cost burden in Germany due to the promotion of renewable energy technologies between 2006 and 2012. Their results argue that the energy transition has substantial distributional implications for low-income households (Frondel et al., 2015).

This study considers intersectionality as a crucial pillar of environmental justice and discusses it further. Moving towards a more intersectional approach within energy research would highlight the existing gaps, synergies and contradictions of environmental justice claims and concerns. Thus, the mechanisms and dynamics that enforce environmental injustices for marginalised communities could be addressed and transformed into respectful and sustainable solutions.

### ***2.6. Research gap***

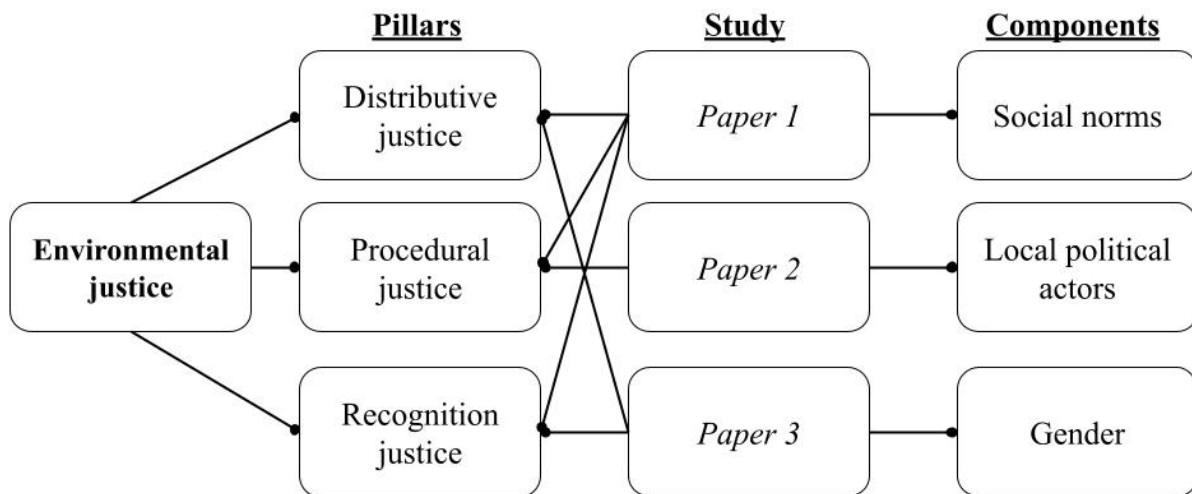
As outlined above, a broad range of research investigates the societal implications and social acceptance of renewable energy technologies. Different factors (e.g., people-place bonds, personal attitudes, and perceived fairness) influencing responses to energy projects call for an in-depth understanding. Justice concerns, including procedures, distributions of cost and benefits, and recognition of local communities and their capabilities have received considerable critical attention. However, research has tended to focus on normative features of justice claims (i.e., financial participation, evaluating the fairness of procedures). Hence, there is a need for research that approaches the factors that impact renewable energy development holistically.

Understanding the underlying reasons and the social context in which local responses are formed could significantly contribute to creating better approaches for the energy transition. This research elaborates on intersectional environmental justice aspects regarding renewable energy projects through examining social norms, local actors and gender implications.



### 3. Research Questions and Design

This study aims to explore the research gaps and investigate the dimensions of environmental justice regarding renewable energy projects through three empirical studies. *Figure 2* outlines the environmental justice framework pillars and components investigated in these studies.



**Figure 2:** Overarching framework of the research papers

*Paper 1* (Karakislak et al., 2021) proposes a conceptual framework for the relationship between social norms and justice perceptions regarding wind energy projects (WEP). Social norms are shaped by the standards or expectations of what is typical (descriptive norms) or acceptable (injunctive norms) in a group (Sherif, 1936). Additionally, social norms have been identified as a factor in the local responses to renewable energy projects (Hübner et al., 2020; Huijts et al., 2012). While some research has been carried out on normative approaches to justice concerns, a socio-psychological attempt has not been established. This paper seeks to remedy this problem by expanding the environmental justice perceptions of WEP with social norms theory.

Through a systematic literature review and semi-structured expert interviews, *Paper 1* provides two analytical frameworks on social norms and justice under three categories: *definitions*, *influencing factors* and *impacts*. The first framework discusses the contextual and functional definitions of social norms, actors, agents and institutions that impact these norms and their impacts on perceptions and behaviours. The second framework defines the three pillars of environmental justice, the framework and discourses for fair WEP and their relationship to social norms based on the literature.

Overall, *Paper 1* found that social norms concerning wind energy depend on their local communities' cultural dynamics. Mainly, community spokesperson with strong ties with the

locals, political actors (e.g., mayors, council members) and opposition groups of WEP are influencing these dynamics. Furthermore, social norms impact how people evaluate the fairness of WEP in conflicted circumstances, such as unequal distribution of costs or lack of public impact in decision-making. This paper was published online in the *Journal of Environmental Policy and Planning*. Additionally, it was presented at the 12th International Sustainability Transitions Conference, held online in 2021.

According to the analytical framework from *Paper 1, Paper 2* (Karakislak & Schneider, 2023) focuses on the influence of local political actors on local responses to WEP. *Paper 2* applies social norms theory to understand procedural aspects of environmental justice regarding WEP in Germany. It investigates the role of mayors, their impact on local responses and other factors that have a role in the planning and decision-making of WEP.

This study has a comparative case study approach and provides results from four WEP in Bavaria, Germany. *Paper 2* shows that the projects with the mayor's support and advocacy might result successfully (e.g., Case Study 1 and 2), but their support does not guarantee local acceptance (e.g., Case Study 4). When the mayor and local council have conflicts and a hesitant stand on the project, it creates more issues and opposition (e.g., Case Study 3). Moreover, other factors such as whether the project developer is regional or external, transparency, early information and external events over time affect local responses. In conclusion, *Paper 2* provides results for the significance of local actors and their role in the procedural aspects of WEP. *Paper 2* is published online in *Energy Policy* journal. This study was presented at the ECPR General Conference at Innsbruck in August 2022.

*Paper 3* (Karakislak et al., 2023) investigates environmental justice's recognition and distributive aspects in decentralised energy production in Germany. It explores the gender implications in German renewable energy cooperatives with an intersectional approach. Intersectionality proposes recognising the inequalities and vulnerabilities within social groups that consider dimensions of gender, social class, racial ethnicity and other identities (Winker & Degele, 2011). Therefore, *Paper 3* aims to reveal gender inequalities in the distribution of benefits through renewable energy cooperatives.

By applying a mixed-methodological approach with a survey and semi-structured interviews, this paper reports that women are underrepresented in German energy cooperatives as members, leaders and managers. *Paper 3* argues that factors like lack of financial resources, time and awareness of opportunities cause this imbalance. However, socio-cultural barriers such as

stereotyping women as *uninspired* or *unwilling* prevent them from taking active leadership roles. In conclusion, *Paper 3* takes gender as a component to examine distributive and recognition aspects of justice. This paper is published in Energy Research and Social Science. An earlier version of this study was presented at the 3rd International Conference on Energy Research & Social Science, held in Manchester in June 2022.

This cumulative research aims to answer the following questions:

1. What components and factors are linked with the three pillars of environmental justice (i.e. distributive, procedural and recognition) regarding the public responses to renewable energy projects?
2. What role do social norms, local political actors, and gender play in Germany's renewable energy development?

## 4. Methodology and Data

### 4.1. Mixed-methodological approach

All methods have limitations and biases that need the careful attention of the researcher. Quantitative research design aims to develop knowledge by focusing on the cause-effect relations, building and testing hypotheses of predefined variables with surveys and experiments (Treiman, 2009). On the other hand, qualitative research investigates narratives, case studies or other phenomena with a constructivist perspective, searching for patterns with open-ended data from interviews, observation and focus groups (Ezzy, 2002). Collecting various data types could capture the advantages of quantitative and qualitative approaches to answer the research questions.

Mixed-methods research has been increasingly implemented in sociology as a paradigm that found its place alongside quantitative and qualitative methods (Creswell, 2003). Mixed-methods research can be defined as:

*“The type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration.” (Johnson et al., 2007).*

A mixed-methods approach recognises the value of qualitative and quantitative research and proposes combining the methodologies to achieve more comprehensive and balanced results (Kuckartz, 2010). Mixed-methods approaches use triangulation to understand better the research object (Johnson et al., 2007). Triangulating different data types seeks to intersect qualitative and quantitative methods (Creswell, 2003). In doing so, describing the research problem, discovering multiple aspects of the research object and understanding the rationale more in depth can be achieved (Johnson et al., 2007). This study employs a mixed-methods approach with three papers that collect various data types (e.g., interview, survey).

### 4.2. Research methodology and analysis of three papers

*Paper 1* and *Paper 2* report on studies that mainly employed qualitative research methods with in-depth interviews and document analysis. *Paper 3* has a mixed-methodological research design, including an online survey, sex ratio analysis and semi-structured interviews to test hypotheses based on the literature.

*Paper 1* presents a conceptual framework based on a systematic literature review and semi-structured interviews. First, the goal was to overview the empirical and theoretical studies in the literature that used social norms theory with the concepts of justice and renewable energy research. A set of keywords, including “social norms; environmental justice; wind energy” in various combinations, were searched in the Scopus database. After scanning the abstracts of 243 articles that resulted in this search, 30 relevant studies related to the research questions were selected. These studies were analysed, coded and categorised according to their thematic focuses, data collection methods, country of study and results.

Additionally, semi-structured online interviews with eight experts from Europe, the United Kingdom, North America and Asia were conducted. These experts were researchers or professors from the scientific field closely related to social acceptance research. There were three criteria for choosing these experts:

1. They have the scientific, theoretical and practical knowledge of the current issues on wind energy development around the world.
2. Their role as scientific experts is crucial for understanding conflicts in this area, and their recommendations have the potential to influence decision-makers.
3. Interviewing experts from different research backgrounds in various countries aimed to have a comprehensive and interdisciplinary conceptual framework.

The questionnaire for *Paper 1* included open-ended questions such as the following: “What could be some examples of implicit assumptions of a wind energy project?”, “Which actors or agents, such as public institutions, friends, family, neighbours, would be influencing these assumptions?”, “Did you observe any behaviour patterns in response to wind energy projects that could be the conjectures of a social norm?”.

Thematic analysis was used for *Paper 1*. This analysis approach requires coding the data descriptively and interpretatively while identifying and organising the topics and themes (Braun & Clarke, 2012). The process started by open coding the transcribed text and generating initial topics and themes on MAXQDA analysis software. Afterwards, the text was reviewed for potential overarching themes and categorised the codes accordingly. Results from the systematic literature review and interviews created the three-category conceptual framework of social norms and justice.

*Paper 2* employed a comparative case study design with semi-structured interviews and document analysis. Four case studies were chosen from the federal state of Bavaria in Germany.

Bavaria has a set-back condition for WEP called the 10H rule that defines the minimum distance between the projects and residential areas to be at least ten times the height of the wind turbine (Langer et al., 2016). Additionally, Bavaria is the third German state to implement renewable energy technologies with strong ambitions for the energy transition (AEE, 2019). However, 37% of the landscape is forest areas, creating conflicts in landscape protection and impacts on biodiversity (Dai et al., 2015; FA Wind, 2021a).

The case studies of *Paper 2* were chosen based on four selection criteria: institutional conditions (e.g., land-ownership, developer), project features (e.g., number of turbines, location), opinion of the mayor (i.e., support and hesitant) and local responses to projects. Case Study 1 and 2 successfully implemented WEP with the support of the town mayors. Case study 3 was in the planning stage with high public opposition, and the mayor was indecisive about the project. Case Study 4 had a project proposal advocated by the mayor, which was initially cancelled, but throughout time, was voted in favour by the town council.

For *Paper 2*, twenty-three interviews were conducted with the town mayors, local council members, project developers and local community representatives. The following questions were asked in the interviews: “Who do you think influenced the outcome of the project?”, “What were the challenges and potential of the project?”, “What objections, concerns, and causes have citizens raised concerning the project?”. Moreover, information on four towns and the projects was acquired from the documents in the statistical portal of Bavaria<sup>3</sup> and project websites if available.

Thematic analysis was used to manage and analyse the data (Ritchie & Lewis, 2003). Both authors of *Paper 2* coded all associations independently via MAXQDA software. Afterwards, the emerging themes, topics and patterns related to the research questions were identified. The role of critical actors in the project development and the outcome was explained by exploring the technical, process and interpretative knowledge in the interview (Bogner et al., 2009).

Decentralized energy production is a key pathway for the German energy transition. Private individuals own 30.2% of the renewable energy produced in 2019<sup>4</sup>. The Federal Office of Energy Cooperatives (DGRV) shows that there are approximately 850 energy cooperatives in Germany (DGVR, 2020). However, there were no available data such as a list or a map of all

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<sup>3</sup> Source: <https://www.statistik.bayern.de/>

<sup>4</sup> Source: Renewable Energies Agency - Ownership distribution of installed RE capacity for power production in Germany in 2019 <https://www.unendlich-viel-energie.de/studie-buergerenergie-bleibt-zentrale-saeule-der-energiewende>

those cooperatives. *Paper 3* investigates the participation and representation of various social groups in German energy cooperatives.

A database for the renewable energy cooperatives by searching the German federal states' common registration portal was created, which resulted in 248 entries. Furthermore, umbrella organisations of different federal states (e.g., Energiewende Baden-Württemberg) were scanned, and results were added to the main list. Overall, this resulted in a list of 388 registered renewable energy cooperatives with publicly available information such as names of the board members, location of their projects and number of members.

Renewable energy cooperatives has two boards responsible for the management: Executive and Supervisory. The ratio of females to males in the sample group of the Executive Board (N=1012) and Supervisory Board (N=1367) members from the database was statistically analysed. This analysis was based on the sex ratio of board members, and due to limitations, it does not consider the personal gender identifications of individuals.

For *Paper 3*, an online survey with the following three sections was prepared:

1. Section: Asks the respondents their role, motivations and investments with the cooperative by single or multiple selection questions (e.g., "What was your biggest motivation to invest in this cooperative?")
2. Section: Asks the respondents to rate gender equality in renewable energy cooperatives regarding membership, opportunities and diversity with a 5-point Likert rating scale (e.g., "How do you rate the participation of women among the cooperative members?")
3. Section: Collects the socio-demographic information of the respondents (e.g., age, gender, education level).

This online survey was distributed to over 300 German energy cooperatives by email. The sample (N=161) was analysed on the statistical software SPSS. The descriptive statistics (i.e., means and standard deviations) and correlation table for all the measurement items and variables were carried out.

Moreover, semi-structured interviews with nine stakeholders (two women and seven men) from renewable energy cooperatives in Germany were conducted. During the interviews, their experiences and perceptions about the socio-cultural barriers women may face, and some programs and actions to support diversity were discussed. Some questions included: "What is the approximate percentage of women members at your cooperative? What could be some barriers for women to be involved in renewable energy cooperatives?". Finally, the interviews

were transcribed, and descriptive and interpretative codes were created according to thematic analysis via MAXQDA.

In order to test the hypotheses of *Paper 3*, the quantitative and qualitative research material was triangulated (Kuckartz, 2010). Survey variables were categorised into groups that relate to each hypothesis and combined with the reflections from the interviews. A detailed explanation of the variables in the survey and how they relate to the hypotheses and research questions are further explained in *Paper 3*.

#### ***4.3. Ethical considerations***

In all three research papers, ethical principles of scientific practice were considered while collecting data through *socially distant* methods (Lobe et al., 2020). Due to the COVID-19 pandemic, all the interviews were conducted online (e.g., Zoom, WebEx). All the interview participants were provided with an information sheet explaining the project goals before the interviews. The interviews were recorded after asking for the oral consent of the participants while assuring confidentiality and anonymity to individuals and organisations. Participation in the interviews was voluntary. Furthermore, participants had the right to withdraw from the study at any time without any consequences.

In the online survey, personal information such as the name or address of the individuals was not collected. Furthermore, the title page of the survey included information on the project, the researcher and their contact details. Participation in the survey was voluntary and not compensated. Participants were informed about their rights to withdraw from the survey at any time and to ask questions and obtain a copy of the research results.



## 5. Discussion and conclusions

This chapter starts by discussing the results of three research papers and their contributions to the literature and practice. Second, study limitations are discussed with suggestions for future research. Lastly, this chapter summarises the main conclusions of this study.

### 5.1. *Discussing the contributions*

This study includes three research papers that contribute theoretically, methodologically and practically to the research field. These papers provides new and important insights into social acceptance research.

*Paper 1* proposes an analytical framework of the relationship between social norms and justice concerning WEP. Even though few acceptance models integrate social norms as a significant factor for responses to energy projects (Hübner et al., 2020; Huijts et al., 2012), contributions mainly focused on measuring intentions and behaviours. After a systematic literature review, *Paper 1* establishes a theoretical gap for understanding local responses through social norms and justice perspectives. Furthermore, this paper introduced a framework that defines social norms (i.e., contextually and functionally), their influencing factors (i.e., actors, agents and institutions) and their impacts (i.e., perception and behaviour) in explaining local responses to energy projects. Similarly, it explores environmental justice under these three categories. While generating these frameworks, this study indicated results for understanding how and in which conditions social norms shape responses to WEP.

Findings from *Paper 1* may be applicable in different country settings where public responses to projects could not be explained through *fully conscious* decision-making and behaviours. Moreover, practitioners and policy-makers still insist on oversimplifying opposition groups and their claims as NIMBYs who are *irrational* (Cousse et al., 2020; Perlaviciute et al., 2018). The cultural context and dynamics of the community determine the expectations of how others respond to the projects, emerging in conflicted situations with feelings of injustice (Karakislak et al., 2021). Thus, planning authorities should recognise the importance of social norms – expectations and standards of how other group members respond – in decision-making and identify the conditions for possible conflicts. As such, aiming to accelerate positive narratives, stories and emotions towards energy projects while acknowledging their potential negative impacts could help to navigate the community norms.

In the effort to employ one of the factors from the framework presented in *Paper 1*, *Paper 2* investigates the role of local political actors in shaping social norms. Studies focusing on local politicians (i.e., mayors and council members) have demonstrated their role to be essential

successfully implementing renewable energy projects in Germany (Busch & McCormick, 2014; Schwarz, 2020). Nonetheless, mayors' role in guiding community norms and their reciprocal relation to political power have been under-researched. *Paper 2* builds upon the existing research and extends the discussion by comparing four case studies from Germany. Results highlight the mayors' mediating role as a key factor in addressing the community's concerns, encouraging them to participate in the projects and acting as intermediaries between stakeholders (Karakislak & Schneider, 2023). However, mayors in German municipalities are directly affected by renewable energy proposals in conflicted cases, being elected representatives of the community and depending on their votes. *Paper 2* also shows that the project developer, whether from regional or external big companies, how interacts with the local community matters considerably.

Supporting the findings from other studies (Dwyer & Bidwell, 2019; Sütterlin & Siegrist, 2017), *Paper 2* argues the importance of approaching communication as a process. Informing and communicating the project to the public should start at the *right* time in that social context with having enough knowledge to share, and continuously and transparently develop over time. *Paper 2* provides suggestions for practitioners and project developers to prioritize contacting and encouraging local politicians with beneficial offers for the municipality and the community. Nonetheless, cooperation with local municipalities may not be enough to get local support. Remaining well aware of the contextual factors in the community (e.g., rural and dense forest areas) and having an approachable and available project developer is essential. Further, setting up information events that allow a constructive dialogue between stakeholders and a trustworthy and approachable representative from the developer company may lead to positive attitudes towards a project. Lastly, recent external events, such as the energy crisis, have also changed the course of energy debates. As a result, the timing and subsequent events could impact the project processes differently, as local responses to WEP are dynamic. For example, the community of CS4 has re-evaluated the proposal, and conflicts have become more heated in CS3 due to pressure from national regulations.

*Paper 3* focuses on the gender-energy research stream that increasingly investigates the implications of energy-related issues and developments on underrepresented social groups (Feenstra & Özerol, 2021; Fraune, 2015). Specifically, this study examines the recognition of women in German renewable energy cooperatives and explores the different implications for genders. Even though there are some reports and grey literature on this topic (Clancy & Feenstra, 2019; IRENA, 2019), only a small number of scientific research partially analysed the

inequalities in energy cooperatives (Łapniewska, 2019; Yildiz et al., 2015). *Paper 3* offers essential insights into the unequal distribution of representation, redistribution and recognition in German renewable energy cooperatives. Methodologically, it contributes to the literature by creating a database of energy cooperatives and the female to male ratio in their management boards.

Results from *Paper 3* show that the stereotyping of women as uninterested and non-technical enforces the male-dominant environment of cooperatives, preventing the benefits of the energy transition from being distributed more equally. These findings may lead to creating a network for women engaged in energy cooperatives or interested in sharing experiences and competencies. Such efforts could encourage other women to take leadership roles and overcome gender stereotypes. Moreover, *Paper 3* argues that other vulnerable groups (e.g., low-income groups and younger generations) could be recognised to fully achieve renewable energy cooperatives' goals. Therefore, a key policy priority should be to plan support mechanisms for energy cooperatives to provide training, resources, and knowledge exchange to women and other underrepresented groups.

Overall, three papers from this study make an important contribution to the field of energy social science by creating a framework to understand the impact of social norms on justice concerns and claims. Furthermore, these papers indicate valuable reflections and avenues for the practitioners to develop better strategies for approaching the local communities.

### ***5.2. Limitations and future research trajectories***

Even though this study design has multiple research interests and goals, there are limitations to disclose. First, the implementation of justice and social norms theory in the papers stands on an epistemological ground rather than precise measurements. While obtaining an embedded view of these theories is essential and leads to valuable insights, the overall results are not showing the direct linkages between social norms and behaviours. Particularly justice perspectives were not tested or measured through surveys or experiments. The study design attempted to mitigate these limitations by employing theoretical foundations of justice and social norms in all three papers. Future research could perform a representative sample of Germany measuring the impacts of social norms on energy-related attitudes and behaviours.

Second, in-depth interviews with observation and participation were impossible due to the COVID-19 pandemic. Data collection methods were altered to virtual forms, which brought some limitations for the empirical research. Furthermore, snowball sampling was used in the interviews, creating the risk of over-representing individuals with similar perspectives or

tendencies. The interviews showed results from a snapshot in time and place, subject to change with time and different conditions. *Paper 2* employed a longitudinal approach in which we conducted interviews in three different periods, even though it was not the initial goal. This provided a deeper understanding of local conflicts affected by external world events and regulatory changes. Thus, a longitudinal approach could be employed by future researchers to investigate changing processes, behaviours and dynamics.

Third, results from this study could only be replicated and generalised to a certain extent. Germany is the research site for two empirical studies, offering a rich environment for energy social science. Germany is also a developed European country with ambitious goals for the energy transition. The country's social, political, cultural and geographical context is diverse by having 16 federal states with multiple frameworks and aims for renewable energy development. Thus, applying the conceptual framework of *Paper 1* or comparing the results from *Paper 2* and *3* to different regional and country contexts could provide valuable insights.

### **5.3. Conclusions**

This study aimed to illustrate (1) the components and factors linked to the three pillars of environmental justice (i.e., distributive, procedural and recognition) concerning renewable energy technologies and (2) the role of social norms, local political actors and gender related to them. It examined the role of these factors in renewable energy development in Germany.

By implementing the three pillars of justice, this study unrevealed not only the importance of citizen participation but that local dynamics, actors and recognition of all community members are determinants of social acceptance. The results and implications of this study have shown that how the local population respond to energy projects is subject to the expectations and narratives formed in their community. Further, it has discovered the potential conditions, influencing factors and impacts of social norms under the scope of environmental justice claims. Thus, communities should be approached by considering the following:

1. Social norms are linked with feelings of injustice, and they may come in place, especially if conflicts arise;
2. The local actors with political power (i.e., mayors and council members) may have a positive impact on the process as leaders and mediators;
3. The unequal representation of social groups benefitting from decentralised energy production can be solved by supporting the involvement of a wider group.

These insights propose project developers multiple ways to better communicate with the local population and policy-makers to develop their legal frameworks for supporting and giving voice and power to the local population for a more fair and decentralised energy transition. Besides, energy communities, cooperatives or other assemblies may find the reflections from these studies as learnings to improve and grow their organisations, demanding government resources and support. By ensuring that society, decision-makers and industry stakeholders are well aware of the implications, obstacles and opportunities of renewable energy development, working together may lead to adapting and mitigating the climate crisis.

No	Title	Authors	Aim and objective	Research methodology	Publication status
1	Exploring the interaction between social norms and perceived justice of wind energy projects: a qualitative analysis	Irmak Karakislak, Jan Hildebrand & Petra Schweizer-Ries	To conceptualize the definitions, influencing factors and impacts of social norms in response to wind energy projects and explore their connection with perceived justice.	Systematic literature review, semi-structures interviews	Published in <b>Journal of Environmental Policy &amp; Planning</b> (2021)
2	The mayor said so? The impact of local political figures and social norms on local responses to wind energy projects	Irmak Karakislak & Nina Schneider	To explore the relationship between local political figures and social norms and their effect on local responses to wind energy projects.	Semi-structures interviews, document analysis	Published in <b>Energy Policy</b> (2023)
3	A cooperative of their own: Gender implications on renewable energy cooperatives in Germany	Irmak Karakislak, Pantea Sadat-Razavi & Petra Schweizer-Ries	To question and further explain whether renewable energy cooperatives in Germany are concerned with inclusive representation, participation and decision-making practices.	Mixed-methodological research with online survey, sex ratio analysis and semi-structured interviews	Published in <b>Energy Research and Social Science</b> (2023)

## Appendix

**Table 1:** Overview of the research papers in the study**References**

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## 6. Empirical Studies

### 6.1. Paper 1

#### Exploring the interaction between social norms and perceived justice of wind energy projects: A qualitative analysis<sup>1</sup>

Irmak Karakislak<sup>23</sup>, Jan Hildebrand<sup>3</sup> & Petra Schweizer-Ries<sup>34</sup>

##### Abstract

The deployment of wind energy projects (WEP) within the process of energy transition changes energy landscapes and daily living environments. With regard to social acceptance as one social response towards WEP, the role of different aspects of justice (i.e. procedural, distributive, recognition) has been discussed. This study highlights the importance of social norms and their influence on perceived justice regarding WEP, which has been neglected in the literature so far. The relationship between social norms and perceived justice is explored as a conceptual framework through a systematic literature review and expert interviews. This framework aims to explain how social norms and their relationship with justice are defined, interlinked and how they affect perceptions of WEP. The results argue that social norms surface in situations where all the key elements of a project are decided without public impact. Thus, norms of fairness emerge under uncertain situations with the influence of similar emotions within groups. Moreover, social norms and perceived justice would explain several responses, such as local conflicts, or the motivation to further develop WEP. This study concludes by discussing the applicability of the framework which needs further analysis as an analytical tool and deeper empirical investigation.

**Keywords:** Justice; Social Norms; Systematic Review; Wind Energy; Social Acceptance

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<sup>2</sup> Saarland University, Department of Sociology, Saarbrücken Campus 66123, Saarbrücken Germany

<sup>3</sup>Institute for Future Energy and Material Flow Systems gGmbH, Department Environmental Psychology, Altenkesseler Str. 17, Geb. A1, 66115 Saarbrücken, Germany

<sup>4</sup> Bochum University for Applied Sciences, Integrated Institute for Sustainable Development, Campus Bochum, Am Hochschulcampus 1, 44801 Bochum, Germany

## 1. Introduction

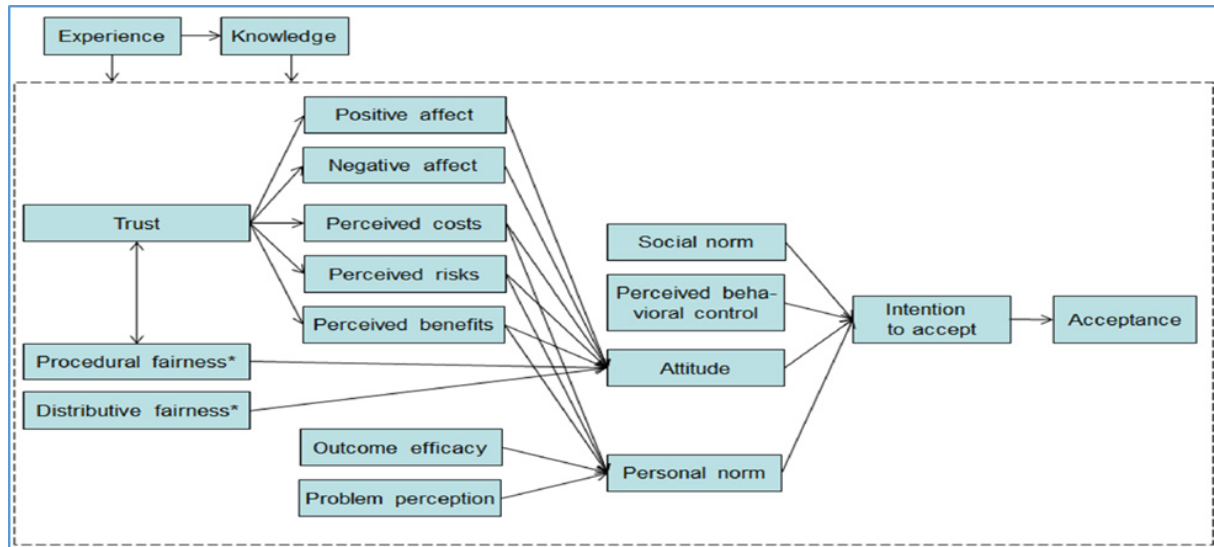
As wind energy projects (WEP) are developed and the new technologies spread across landscapes, they change the natural and social environments in which they are situated. Even though wind energy in the general sense is perceived positively as a clean source of energy generation, a variety of responses from the public can be observed (Wolsink, 2012). Research on public responses to WEP have typically examined acceptance dimensions like support and opposition (Ellis et al., 2007) or attitudes (positive, negative) (Devine-Wright, 2007) mainly on the local level of the affected communities. Additionally, public responses are not limited to active behaviours towards a project, they can be incorporated in beliefs, practices or attitudes (Batel & Devine-Wright, 2015b).

Social norms are argued to have an impact on behaviour under situational, cultural and individual level (Cialdini et al., 1990). They can be portrayed as expectations, standards or perceptions of behaviour. Due to its context-sensitive nature, micro-explanations of why some norms survive or emerge could be formed within a culture (Bicchieri, 1999). Thus, the concept of social norms and their impact on how people react to unfamiliar change in their environment provides a promising layer to understanding public responses.

Whereas the role of social norms is well addressed in research on pro-environmental behaviour (e.g. Steg et al., 2015), it is not prominent in the field of social acceptance of renewable energies like WEP. Distributive justice and procedural justice dimensions have mainly been the focus of research especially during the last decade (e.g. Langer et al., 2016; Sonnberger & Ruddat, 2017). However, social norms were not mentioned as an impact on cultural aspects of social acceptance in studies reviewing the research over the past decades (Rand & Hoen, 2017).

The importance of justice is highlighted in the existing acceptance models for renewable energy technologies (RET). The energy technology acceptance model including psychological factors constructed by Huijts and colleagues (2012), which can be seen in Figure 1, carries a great importance. Still, the role of norms for justice perceptions is not linked yet (ibid.). Justice perception of groups is connected to shared expectations which is parallels to norms and the collective perceptions of groups. Furthermore, it can be assumed that justice expectations and perceptions are influenced by existing group norms as they are context-related. Even though there are studies including social norms as a significant acceptance factor in their models (Hübner et al., 2020; Huijts et al., 2012), a comprehensive overview into what are the norms of community acceptance are and how they shape justice perceptions remains under-explored.

Therefore, this study aims to conceptualize the definitions, influencing factors and impacts of social norms in response to WEP and explore their connection with perceived justice.



**Figure 1:** Psychological factors influencing sustainable energy technology acceptance (Huijts et al., 2012, p. 530).

The main questions that this study aims to address are the following: 1) What are the indicators of social norms in response to WEP? 2) How do the social norms of the communities shape justice perceptions?

In order to address the presented research questions, firstly research on the social acceptance of wind energy is reviewed with a focus on the factors justice and norms in section 2. With a qualitative approach, a systematic literature review was conducted which was supported by expert interviews with researchers working on social acceptance issues. Section 3 presents the methodology of this study including the interview guideline and analytical framework. The main findings from this research is presented in section 4. Finally, section 5 offers a discussion of the results and concludes with some reflections for future research.

## 2. Theoretical background

### 2.1. Social acceptance of wind energy projects

The complex, multifaceted and dynamic structure of social acceptance has been developed with many socio-technical theories from the fields of economics, sociology, psychology, and geography (Ellis & Ferraro, 2016). Likewise, a broad range of different relevant influencing factors has been identified, covering individual attitudes, relationships, contextual issues, perceived impacts, and process-related issues (ibid.). Looking at the concept from the

community level, it should be underlined that acceptance is not simply a function of community attitudes; but a pattern of social change, collective action, and responses to the shift of people's living environments (Improta et al., 2017). Thus, acceptance itself includes a multiplicity of public responses. Research on social acceptance conceptualizes many behaviour patterns towards RET such as support or opposition with different behavioural intensities ranging from passive to active (Batel & Devine-Wright, 2015a; Rau et al., 2012).

Local responses to the landscape and social changes that WEP brings have been investigated to further understand the attitudes, behaviours and expectations of the public. Already some years ago Social Representation Theory (SRT) (Moscovici, 1988) was implemented as a link between psychology and social development in everyday life, and has been implemented to understand public responses to RET (Batel & Devine-Wright, 2015b). Building up from the SRT and social psychology, Devine-Wright (2009) argues that place attachment and place identity shape the acceptance of WEP by attributing meaning to a place. Numerous studies argue that strong place attachment may well lead to either opposition or support in different cases (e.g. Devine-Wright, 2011, Batel & Devine-Wright, 2015a). As social norms can be seen as one aspect of the social dimension in people place-relationships, e.g. place protective actions as normative behaviour, the importance of place and context-relatedness of social responses should be stressed.

These divergent patterns across the research on public responses to RET provide many contrasts. It seems that there has been a lack of focus in examining local responses with a social norm lens. This study draws on the theory of justice and aims to provide a social normative approach to understand public responses to wind energy.

## **2.2. *Justice as a social phenomenon***

The conception of justice, according to sociological approaches, is a social phenomenon that is constructed in social institutions, settings, and discourses (Liebig & Sauer, 2016). When justice definitions, preferences and perceptions are discussed, the social conditions of the groups who express them should be considered. Individuals as members of groups, communities and societies share certain values, belief, concerns, norms that may structure what is perceived as fair or unfair. Tajfel and Turner (1979) articulated social identity theory with their work on outgroup-intergroup interactions and how people enhance similarities within their group and would motive the other members to act accordingly. Similarly, the group-value model by Lind and Tyler (1988) has contributed to the progression of procedural justice research through basing its argument to the social identity theory. Procedural justice, in particular, is argued to be highly affected by group identities, rather than distribution of resources.

Young (1990) emphasizes the importance of generalized social processes rather than the distributional aspects of justice claims. Her definition of a social group as “collective persons differentiated from at least one other group by cultural forms, practices, or way of life” was well recognized and includes the individuality of the group members (Young, 1990). With this work the traditional understanding of justice from its distributional claims was criticised and the concept by tackling social and institutional relations was stressed. Recognition, as a justice claim, is not to be distributed but it is argued to be a social norm embedded in social practices of a smaller group or even society (ibid.). Social structures including practices, rules, norms, languages, and symbols that mediate such relations are argued to be determining the recognition aspect of justice, which is crucial to consider (Schlosberg, 2007). In other words, the discussion on how injustices are produced, reproduced, and sustained are seen through social processes and group identities. Fraser’s (2000) work on a cultural perspective to examine struggles regarding distribution and recognition asserts the importance of social settings and institutions. Roots of which group, community or society a person is affiliated and to what extent they are recognized when justice questions are raised are essential for justice research.

Attitudes and behaviours regarding WEP are argued to be strongly shaped by justice perception together with distributive and procedural effects (Aitken, 2010). Distributional justice, here, refers to all the outcomes of the project and procedural justice refers to all the processes of the project from decision-making to participation. Furthermore, participation is argued to be the “silver bullet” for fair wind projects by some studies, also referring to the perception of fairness in transparent and participative processes (Rau et al. 2012). Several principles of distributive and procedural justice have been argued to play a role in the perceptions of the people and therefore impact the acceptance. It has been underlined that procedural and distributive justice must be combined as they create an overall framework for community fairness together (Gross, 2007). Thus, the multiplicity of environmental justice concerns include distributive and procedural claims, alongside with recognition and participation factors (Schlosberg, 2007). Furthermore, environmental justice research has expanded with diversifying from the claims as justice is a normative evaluation of socio-environmental conditions, to a more essentially involved field that examines further layers of the relationship between people and environmental issues (Walker, 2009).

Taken as a whole, these empirical studies suggest the importance of the public perceptions of justice, however leave an unanswered question of how these perceptions could be shaped within



groups and communities. Thus, this study builds upon social norms theory to form a socio-psychological approach to justice.

### 2.3. *Social norms*

People are social beings that are affected by their surroundings. What we see and observe in our daily lives incorporates our understanding of how we perceive the world. Through socialization practices, there are different normative understandings of justice. As discussed above, relevant groups or communities and their identities affect the determination of justice aspects such as procedures, distributions, rights, and responsibilities (Clayton, 2000). Another approach to examine normative views of justice is through the lens of social norms of the public. Social norms, which are incorporated in people within their social surroundings, are significant factors in explaining the patterns of human behaviour as Sherif demonstrated in 1936 with this famous field-experiment (Sherif, 1936). Social norms are not simply a set of rules but they are also conditional perceptions of what is typically done (descriptive norms) or what ought to be done (injunctive norms). Moreover, there are provincial norms (Goldstein et al., 2008) that consider spatial closeness as a motivational driver for pro-environmental behaviour. In other words, people tend to be more influenced by their close surroundings such as neighbours. On the other hand, Ajzen (1991), argued that the influence of family members or friends to build subjective norms is much higher than that of spatial closeness. Therefore, people are not only influenced by their close surroundings but also through their norms formed in cultural patterns.

In pro-environmental behaviour research, normative influences have been discussed and tested within numerous studies. For instance, Ajzen in 1991 argues with the theory of planned behaviour (TPB) that the intention of a person, which is based on outcome evaluations (*attitudes and subjective norms*) and *perceived behavioural control*, essentially captures the motivation that shapes and influences behaviour (Ajzen, 1991). As an example; this theory and the approach alongside social identity through the group-specific norms have been tested by White and colleagues (2009), which presented strong evidence for recycling being a pro-environmental behaviour.

Another approach using social norms is was introduced by Cialdini and colleagues (1990) and they argues that norms are salient only during the decision-making process. Their work concluded to argue that normative influences can highly impact human actions, nonetheless cultural, situational or personal norms are also indicators to consider (Cialdini et al., 1990). The very classical norm-activation theory developed by Schwartz's (1977), on the other hand, argues that pro-environmental actions occur in response to personal norms which can be

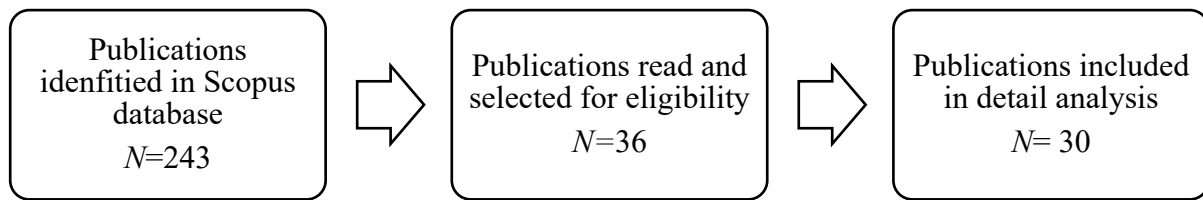
activated in people who believe that environmental conditions pose threats. This provides a strong argument to the cross sectional approach of this study, as it aims not to overlook personal norms. Social norms have been distinguished from moral and personal norms, as well as habits, conventions, and legal rules, due to their conditionality and how they pertain to public action usually without deliberate planning (Bicchieri, 2005). Furthermore, social norms deliver the standards of what behaviour social group views as appropriate.

Looking at the conceptions of justice regarding wind energy projects, which are argued to be emerging through socialization within a community, there should be related norms that are shared. Fairness judgments, therefore, are not completely subjective of what the community or society considers fair given the circumstances (Bicchieri, 2005). This research further questions what the social norms or the shared scripts of these communities are that strengthen these justice concerns. This does not conclude to argue that there are or will be a consensus of what is perceived as fair or not. On the contrary, it aims to question to what degree are the assumptions of social norms and to what degree the variety of justice perceptions are shaped by them.

### **3. Research methodology**

#### **3.1. *Systematic literature review***

A systematic literature review related to the concepts of justice and social norms in the social acceptance of renewable energy research was carried out. Our goal was to emphasize how this body of literature approaches and understands the interaction between social norms and perceived justice. On the Scopus database, we searched the word “wind energy” together with one of the following set of words or combinations: “social” or “public” and “acceptance”, “public” or “local” and “response”, “social” or “local” and “norms”, and “environmental” or “energy” and “justice”. Articles that focused on technical issues were excluded from the analysis which resulted in a total of 243 relevant articles which were screened based on their abstracts. As we were searching for the connection between social norms and public perceptions of justice, articles that identified, conceptualized or applied these terms in the social acceptance literature were analysed. This resulted in 30 articles that reported to our research questions. These articles were recorded and accompanied by bibliographic details including the location of the study, year, author(s) and journal as well as the scale of renewable energy development involved.



**Figure 2:** Procedural stages for the systematic review

With this literature review, we covered empirical studies and research articles related to the social viewpoints of renewable energy development. Procedural steps of identifying and analysing the research articles are presented in Figure 2.

### 3.2. *Expert interviews*

In order to further develop the concept of social norms within acceptance research and develop a framework including the interaction between norms and justice regarding WEP, expert interviews conducted. These data were collected in eight semi-structured interviews with open-ended and exploratory questions between October 2020 and March 2021, using an online tool. The guideline was designed as exploratory expert interviews with a focus on sounding out the subject under investigation, which differentiates from other forms of expert interviews to acquire data (Bogner & Menz, 2009). The researcher introduced their project, explained the aim of their research and answered the questions of the participant before each online interview. The expert list includes researchers from Europe, UK, North America and Asia and can be found in Appendix A. Each participant was provided with an information sheet about the study and gave either oral or written consent to participate in the research with guaranteed anonymity. Each interview took approximately an hour to complete.

In this study, experts were selected from the scientific research field as they are argued to have the forms of knowledge which are distinguished from every day or common-sense knowledge (Meuser & Nagel, 2009). The first reason for choosing expert interviews is those researchers' up-to-date knowledge of the current issues on the development of wind energy. Second, they may be in the position to influence the policymakers and other institutions as their recommendations are closely related to decision-making bodies. Third, as each expert is from a relatively different discipline or field, this paper aims to develop the most comprehensive, interdisciplinary conceptualization within the limits of the study structure. Building upon the

systematic literature review and condensing the experts' point of view, the aim is to define what could normative principles of fair wind development are.

### 3.3. *Analysing procedures*

A qualitative thematic analysis has been used to systematically identify and organize the patterns of themes for the data set (Braun & Clarke, 2012). While coding the interviews in thematic analysis, this research includes the existing conceptual frameworks of social norm theories to explore the similarities and differences within the data set. Therefore, coding procedure combined both the descriptive and interpretative approach to identify the data. Thematic analysis approach contains six main steps; getting familiar with the data, generating initial codes, searching for themes, reviewing potential themes, defining and naming themes and finally producing the report (Braun & Clarke, 2012). Analysis software MAXQDA was used for the systematic literature review, transcribing the interviews, coding the data and identifying the frequencies. The interview guideline also provides the bases for the analytical framework of interpreting the accumulated data.

The analytical framework draws on the theories of social norms and environmental justice. Moreover, reflections from the literature review and in-depth interviews shaped the further development of analysis structure. The first element of the framework recognises that investigating social norms requires three categories; *definitions of norms*, *influencing factors of norms* and *impacts of norms*, which can be seen in Table 1.

<b>1. Definitions</b>	<b>1.1. Contextual</b>	1.1.1. Cultural context
		1.1.2. Comparison
	<b>1.2. Functions</b>	1.2.1. Descriptive
		1.2.2. Injunctive
<b>2. Influencing factors</b>	<b>2.1. Actors and agents</b>	2.1.1. Individuals, groups and organizations
		2.1.2. Media tools and communication channels
	<b>2.2. Institutions</b>	2.2.1. Communities as institutions
		2.2.2. Gender norms

<b>3. Impacts</b>	<b>3.1. Perception</b>	3.1.1. Assumptions and misassumptions
	<b>3.2. Behaviour</b>	3.2.1. Norm salience 3.2.2. Contradictions with behaviour

**Table 1:** Analytical framework of social norms

<b>1. Definitions</b>	<b>1.1. Procedural</b>	1.1.1. Public engagement 1.1.2. Trust
	<b>1.2. Distributive</b>	1.2.1. Costs and benefits
	<b>1.3. Recognition</b>	1.3.1. Representation
<b>2. Influencing factors</b>	<b>2.1. Framework for fair wind energy</b>	2.1.1. National level 2.1.2. Local level
	<b>2.2. Discourses</b>	2.2.1. Moralistic 2.2.2. Communal
	<b>3. Impacts</b>	3.1.1. Influence of social norms

**Table 2:** Analytical framework of justice

The second element of the framework, drawing on Schlosberg (2007), distinguishes between distributive justice, procedural justice and recognition justice. This study explores justice into three categories; *definitions of justice*, *influencing factors of justice* and *impacts of justice*, demonstrated in Table 2.

#### 4. Results

Based on our Scopus search results, more than two-thirds of papers on the link between social norms and renewable energy technologies were published after 2015, which clearly shows rising interest in this topic. Studies were conducted in 21 countries, most in Europe while the others were conducted in America, Asia and Africa. All but three of the articles conducted a single study, which covered three domains of thematic areas. Regarding data collection methods, the vast majority of studies used quantitative modelling tools as survey and questionnaires. Moreover, more than half of the studies investigate different dimensions of social acceptance of RET, while other articles measure individual or collective intention and behaviour (see Table 3).

Countries <sup>1</sup>		Topic	Data collection methods		
Frequency			Frequency	Frequency	
DE	6	Social acceptance	19	Survey	19
US	2	Intention to use RET <sup>2</sup>	5	Case study	8
BE	2	Behaviour towards RET	4	Review	3
IR	2	Intention to pay for RET	2		
NL	2				
GB	2				
BD	1				
CN	1				
ID	1				
IN	1				
ZA	1				
PT	1				
IL	1				
LT	1				
DK	1				
ES	1				
SE	1				
SI	1				
PL	1				
AT	1				

**Table 3:** Frequencies of countries, context of the study and methodology

Findings from the expert interviews address the variances in understandings of norms and justice between experts from different disciplines and countries. The results from the literature review complement very well the results from the expert interviews as can be seen in the text. The results from the analysis are presented next.

#### *4.1. Definitions, influencing factors and impacts of social norms*

As a social phenomenon, social norms can be defined under two categories, according to the context and the functions. How to conceptualize the social norms of the communities differentiates between places, social systems and the dynamics of that culture. Some authors do

not explicitly refer to social norms (e.g. Masukujjaman et al., 2021) however, use other terms such as subjective norms, social influence or normality. For example, Haque et al. (2021) explain normality as a “broader context of social functioning which is influenced by collective assumptions and aspirations about social norms”. Therefore, the significance of a place-based and cultural approach to identify normative influences in public responses to WEP is also critical. In addition, the way that community members are reacting have an impact on the expectations and perception of an individual, which can be perceived comparatively. For example, Sokoloski et al. (2018) highlight the gap between true normative opinion in a group and what individuals perceive the norm to be. It is important to separate social norms from moral, legal and personal norms, which is argued to often overlap. Hojnik et al. (Hojnik et al., 2021) examine consumers` social norms and moral obligations separately and found that both have a significant impact on willingness to pay for green energy. Even though personal attributes to contribute to a clean energy future in some cultural settings are increasing, this commitment is not always shared commonly across the groups.

Some researchers have explained and measured social norms through their functionality (e.g. Irfan et al., 2021). Descriptive norms are explained as exerted pressure or expectations towards people to behave in a certain way to go along with what most people do. In the context of RET, what your neighbours think of a project may impact your or others` opinion. Similarly, Upham and Johansen (2020) mention descriptive norms as alternative representations which are how individuals believe other social groups perceive renewable energy technologies. Furthermore, the expectations of community members to react similarly with their peers to a project highlights the influence of injunctive norms. In the cases that these expectations are not met could create emotions such as anger or frustration, then leading to opposing to a WEP.

Among many examples, Ghorbani et al. (2020) show the importance of community leadership in the emergence of local energy initiatives by analysing behavioural drivers including social norms. Similarly, in their research Schwarz (2020) argue that citizens with social status, affluence and political position in the communities can actively shape the discourses around energy projects. We argue that there are three different groups of influencing actors regarding community norms: 1) community spokesperson; 2) political figures; 3) opposition groups. These individuals, groups or organisations carry certain political power, social resources, necessary agencies and have strong ties with the communities to impact public opinion. Opposition groups are described as vocal and influential, although sometimes being a minority and are recognised actors that influence public opinion by taking action towards WEPs. For

example, Sokoloski et al. (2018) show that levels of support for WEPs are underestimated and incorrect estimation of a norm may influence behaviours among supporters and opponents.

Local political actors such as mayors or municipal council members have outsized roles as advocates of guiding the view of an energy project (Schwarz, 2020). Political impact and leadership on the national level also impact the opinions which can differ from country to country according to the distinct national energy policies. Moreover, community spokespersons that have resources and networks to create influence, are considered to have the ability to convince others.

In the indisputable role of media tools in shaping perceptions and expectations about renewable energy development, social media offers a platform for the public to diffuse norms, views or beliefs (e.g. Borch et al., 2020). For example, Lai et al. (2021) show that informal processes like protesting through social media can influence norms formation and transfer. The open setting of social media may lead to less fact-checking therefore can produce misassumptions about WEP, which can be perceived as a tool for negative impact. Nevertheless, social media also initiates younger generations to engage in energy-related topics, which sets up new norms in virtual communities.

Communities have their norms, beliefs and practices about how they function, how they will change through a WEP and how that will impact the characteristics of that group. For example, Mäkivierikko et al. (2019) explore the viability of a local social network as a context for providing energy feedback and suggested the significance of strengthening the sense of local group identity. The power of community mechanisms within themselves can create the need for a decentralized approach to developing energy projects in localities. Moreover, socio-demographic differences in how the community members participate in local energy developments, especially the gender aspect can influence the normative practices.

The impact of social norms on perceptions, intentions and behaviours towards renewable energy projects have been analysed. For example, Bozorgparvar et al. (2018) examine the psychological factors that influence the use of renewable energy in Iran and subjective norms showed no significant effect on intention. On the other hand, Kalkbrenner and Roosen (2016) highlight social norms and trust as the strongest determinants for willingness to participate in community energy projects. In the case of wind energy, implicit assumptions and misassumptions such as noise, health and biodiversity issues, affect the shared view of the public (e.g. Fischhendler et al., 2021). Siting and consequently the changes in the landscape are



considered to one of the main challenges due to the public misassumptions. The impacts and consequences of WEPs are argued to create a structural perception that could directly lead to behaviour. But in some cases, there might be ostensible argumentations, and other aspects such as economic benefit distribution might be behind.

Social norms tend to be salient under uncertain situations. Even though assumptions such as “wind turbines will disturb your drinking water” have not been scientifically proven, it can create an unclear setting for communities without prior experience near a WEP. In cases where a negative norm is apparent, it is a key factor to consider the cultural setting and how important it is to fit into that group to the individuals. For example in their analysis of behaviour related to care for the neighbourhood, Hidalgo et al. (2021) show that people tend to observe and follow the norms of those who are similar to them. In situations where the individuals start having strong emotions, in most cases anger, this might become a predictor for salient social norms. Moreover, feeling discontent and powerless towards the planning process may lead to people opposing to WEP (Schwarz, 2020). Another example from Upham and Johansen (2020) argue that objecting to a WEP is more or less directly socially conditioned by others’ opinions. On the other hand, social norms can contradict behaviour. This contradiction can be explained as reframing the situation in order not to violate the social norm and be excluded from the group. As Morrison and Ramsey (2019) found that individuals with social capital who are embedded in their communities, can exert over peer groups about contributing to community energy initiatives. On the other hand, individuals with strong personal norms could correspondingly conflict with their communities.

In the systematic literature review, studies from different countries and disciplines were taken into consideration to have an overview of how social norms are outlined in different research settings. The social context in different cultures plays an important role in whether social norms in the groups influence the intention, perception or behaviour of the individuals. For example, some studies from China (Irfan et al., 2021) and Lithuania (Liobikienė et al., 2021) that investigated the factors that impact the willingness to use renewable energy sources found no significance effect on social norms. In another study in Slovenia (Hojnik et al., 2021) that explores the drivers for willingness to pay for green energy showed the critical role of social norms. The context-dependency of social norms, therefore, is connected to the cultural structure of the countries, regions and communities. During the expert interviews, the importance of cultural setting to understand the role of norms was highlighted. In individualistic cultures, for example, depending on others to shape your opinions may be considered undesirable, whereas in collectivist cultures individuals tend to define themselves in relation to others. Furthermore,

whether individuals follow social norms or stick to their values and beliefs, depend highly on the structure of that culture.

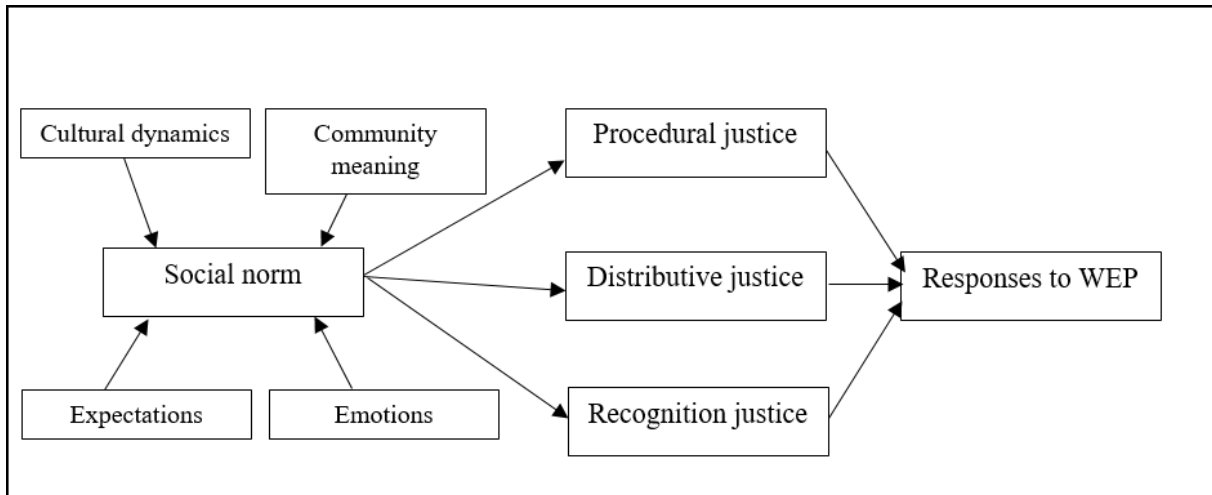
#### **4.2. Definitions, influencing factors and impacts of justice**

Justice perception in regards to WEPs can be defined under procedural, distributive and recognition aspects. Procedural justice includes the topics of public engagement, participation and trust. Liebe et al., (2017) highlight the importance of providing citizens with the opportunity to participate in the decision-making process of a WEP may positively impact acceptance. Even though participatory schemes for the communities are essential, when the public cannot impact or change key decisions on siting or other project features, it tends to create further frustration. Agterbosch et al. (2009) argue how the ability of citizen voices to be heard by stakeholders plays as a forecast for community acceptance. Another example from Fischhendler et al. (2021) argue that when the community division is weaker, fairness becomes important in determining the level of acceptance and if the project processes are perceived as unfair, locals tend to actively oppose. In cases where public engagement is illusory, in other words, if the community is excluded from decision-making or planning but are only symbolically informed, there seems to be more conflict. Schwarz (2020) explains that when citizens feel powerless in the WEP planning, this leads to dissatisfaction and may cause distrust in stakeholders which is a conjecture for negative responses to projects.

Expectations about the distribution of costs and benefits regarding a WEP is an underlying predictor of acceptance (e.g. Liebe & Dobers, 2020). There tends to be more of a symbolic dimension of distributive justice, which can be described as individuals feeling injustice because of comparing themselves to their groups or communities. In addition, some communities have further concerns and expectations as they may be taking on more risks living nearby a WEP. For example, Perlaviciute et al. (2018) argue that unfair distribution of costs, risks and benefits may threaten all individual values which trigger negative emotions towards energy projects. Although, asking for benefits might be considered socially undesirable in certain cultural contexts, which might shift the general discourse of concerns to something else.

Representation of the localities, their culture and their attachment to their environment are important indicators to recognize and involve the communities in the deployment of these projects. Lai et al. (2021) and Chezeli and Ndaï (2019) highlight the objectives of recognition justice which are most of the time neglected. As one possible solution to this recognition issue, frameworks for fair projects can be implemented both on local and national levels. For example,

Raymond and Delshad (2016) argue that normative framing of the energy policies may influence public attitudes towards biofuels more than economic frames. Standardizing fair projects by national regulations that also adapt to local settings might be one pathway for influencing factors for justice perceptions. Because what is considered equitable varies in different cultural groups.



**Figure 3:** Summarizing the interaction between social norms and perceived justice

According to Lai et al. (2021), the ideological differences in environmental justice in the case of environmental impact assessment and the perceptions of the intermediaries, social norms are underpinning factors. In other words, social conditions and influences are key considerations that affect justice perceptions. Chezel and Nadaï (2019) argue that fairness is relational and embedded in energy assemblages. The empirical evidence suggests that there are already existing normative understandings of fairness in the communities. Which social norms related to justice are coming to the forefront changes depending on how the project process carries on. Because once the project is announced, in most of the cases, key elements are already decided, this phase tends to be where social norms emerge. However, both negative and positive indicators of norms are subject to change as the project correspondingly evolves. There are a variety of discourses for public interpretation of a WEP, such as communal discourses focusing on local sustainable development of moralistic ones that find connections of the overall advantages of deploying a renewable energy source. These discourses can be examples of deploying positive norms around WEPs. These results attempt to explore the connections between social norms and perceived justice with the Figure 3.

## 5. Discussion

This study addressed the role of social norms as a relevant factor within the field of social acceptance research on renewable energies. In particular, it explored the interaction between social norms and perceived justice to deepen our understanding of various public responses to WEP. With this study we aimed to illustrate 1) how social norms are framed in the context of wind energy; 2) what is the role of social norms in the perceived fairness of WEPs; 3) what are the implications of this relationship on social acceptance. We conducted a systematic literature review which was supported by expert interviews and then proposed a two-dimensional conceptual framework for the definitions, influencing factors and impacts of social norms and justice. This framework was based on findings from social psychological theories, social acceptance models and normative approaches to justice. Several conclusions arise from our analysis of the interaction between social norms and justice.

First, the results indicate social norms that shape responses to WEP, are, most of the time, not merely about the project itself, but circle around the cultural dynamics of the community. What these communities mean to their members and what are the expectations of other members to behave concerning planning and decision-making processes, are the key elements that constitute norms (Haque et al., 2021). Particularly environmentally-oriented norms could be increasingly bonding to positive emotions and enhancing communities' understandings of the opinions of their social group (Irfan et al., 2021). Furthermore, the results address the differences in approaching social norms as their impact on perceptions, intentions and behaviours changes between technologies.

Second, social norms are linked with and further influence the expectations or standards of how community members should perceive the projects to be fair or not (Lai et al., 2021; Sokoloski et al., 2018). These expectations are argued to include the demand for community-driven projects and well-formed participation schemes where participation is foreseen before the first decisions are made, e.g. on siting (Walker & Baxter, 2017). Studies underlined the frustration of communities over inefficient public engagement in energy projects, especially when their voices are not heard by the stakeholders (Schwarz, 2020). Moreover, trust in stakeholders, community identity and the decision-making processes of the projects construct the evaluation of fairness (Morrison & Ramsey, 2019). In our study, we concluded that existing social norms of the communities tend to emerge in cases where the phases of the project evolve problematically: whether there is mistrust in stakeholders or unequal distribution or an illusion of participation without any public impact, people would follow social norms as a result of strong emotions (Cousse et al., 2020; Kalkbrenner & Roosen, 2016).

While our study is based on a dense sample of data and has been carefully analysed, we realize some limitations. Although we used broad terms for our research, our goal was to define and understand social norm dimensions and their association with justice. However, the large majority of the papers in our review are empirical which reflect culture-specific differences. We aimed to illustrate the nature of diverse approaches, not to claim that they are disconnected. Moreover, our study was limited to wind energy technologies, however, we included studies that investigated other renewable energy sources in our analysis. Each technology is perceived uniquely, therefore, there may be situational factors that impact opinions of different RETs. Lastly, choosing these methodological tools makes this study stay on a rather epistemological ground, therefore, we recognize the need for future research.

Future research could aim to take a comparative approach to explore the social norms of communities in different cultural settings. All the factors and variables included in this study can be used in comprehensive studies focusing on the analysis of influencing actors of social norms on the local energy projects or testing whether a negative norm in the community would impact how locals evaluate the fairness of a project. We expect significant results from empirical investigations of media tools, individuals, groups and organizations as influencing actors and agents of social norms. There is a lot of room for further elaboration and testing of this conceptual framework which provides future research trajectories. The interactions explored in this study hopefully offer the initial steps in that direction. With such research efforts and implications for stakeholders, conflicts and perceived injustices around WEP might be minimized.

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### **Appendix**

	<b>Field</b>	<b>Country</b>	<b>Gender</b>	<b>Date</b>
<b>1<sup>st</sup> interview</b>	Management	Switzerland	Male	29.10.2020
<b>2<sup>nd</sup> interview</b>	Social psychology	Portugal	Female	05.11.2020
<b>3<sup>rd</sup> interview</b>	Policy	USA	Male	10.11.2020
<b>4<sup>th</sup> interview</b>	Sociology	Japan	Male	11.11.2020
<b>5<sup>th</sup> interview</b>	Policy	USA	Female	13.11.2020
<b>6<sup>th</sup> interview</b>	Geography	The Netherlands	Male	16.11.2020
<b>7<sup>th</sup> interview</b>	Social psychology	Germany	Female	26.11.2020
<b>8<sup>th</sup> interview</b>	Social psychology	Portugal	Female	30.04.2021

**Table 4:** List of experts

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## 6.2. Paper 2

### The mayor said so? The impact of local political figures and social norms on local responses to wind energy projects<sup>1</sup>

Irmak Karakislak<sup>23</sup> & Nina Schneider<sup>4</sup>

#### Abstract

Wind energy plays an important role in the energy transition. However, many wind energy projects result in conflicts at the local level. Mayors and local council members are key actors who can play a supportive, moderating, escalating, or mediating role in siting decisions about wind energy. Further, communities' social norms encapsulate their beliefs about what a wind energy project should be like. Alongside public expectations, these norms indicate the layers of cultural dynamics and standards of communities. Hence, this study investigates the dynamics of local responses to wind energy projects and their outcomes. This is achieved through an empirical-qualitative approach in which the experiences of four Bavarian case studies in Germany are illustrated using document analysis and in-depth interviews. The results of this study indicate that mayors play a crucial role in local responses to wind energy projects in Bavaria. Their support is necessary but not sufficient for local acceptance. Other stakeholders, next to project characteristics and communication, as well as external events, also have an impact on local responses over time. The paper concludes with lessons learned about communication and information strategies, as the study has implications for policymakers and practitioners in relation to designing and planning wind energy projects.

**Keywords:** Wind Energy; Social Acceptance; Social Norms; Incumbents; Energy transition

#### 1. Introduction

The German energy transition (*Energiewende*) has long been a role model for other countries (Strunz, 2014). In 2021, Germany led 11% of the newly installed onshore and offshore wind

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<sup>2</sup> Saarland University, Department of Sociology, Saarbrücken Campus 66123, Saarbrücken Germany

<sup>3</sup>Institute for Future Energy and Material Flow Systems gGmbH, Department Environmental Psychology, Altenkesseler Str. 17, Geb. A1, 66115 Saarbrücken, Germany

<sup>4</sup> Institute for Economy and the Environment, University of St. Gallen, Müller-Friedberg-Strasse 6/8, 9000 St.Gallen, Switzerland

installations in Europe, ranking as the third country after the United Kingdom and Sweden (WindEurope, 2022). Germany is expected to install the most wind capacity in Europe by 2026. Nonetheless, in 2020, the lowest installations and investments were seen since 2010. The COVID-19 pandemic can partly explain this, but also by complex and lengthy permitting processes and the challenges connected to the switch to an auction scheme in 2017 (Lundberg, 2019). Recent changes to this legislation will allow civic wind energy projects to be exempt from the auction system in 2023<sup>5</sup>. However, the German wind industry is currently facing not only challenges related to permitting, legislation, and auctions but also social barriers (Kimm, 2017). Many wind energy projects encounter local opposition and resistance, resulting in project delays or failures (Langer et al., 2017; Reusswig et al., 2016; Zoellner et al., 2008).

The transition to renewable energy sources is affected by dynamics that go beyond technical issues, being part of a political, social, cultural, and spatial transformation. To facilitate a successful transition from fossil fuels to renewables next to the strategic site planning of federal, state and/or local governments, it is important to obtain the acceptance of local communities (Huijts et al., 2012; Warren et al., 2005). To enable a socially just energy transition, a better understanding of the concerns and motivations of local communities is inevitable. These could generate valuable insights into how projects should be sited, designed, communicated, and implemented (Olson-Hazboun et al., 2016). Understanding why some projects face resistance while others are supported is necessary (Christidis et al., 2017; Wolsink, 2007). Various studies have investigated different factors that influence local responses to wind energy projects; however, the role of local political figures has received little attention so far and is thus a promising area of research. This paper aims to investigate the dynamics of local responses to four wind energy projects in Bavaria, Germany, focusing on the role of local politicians and social norms.

German federal states define guidelines that regulate wind energy siting. Therefore, we chose only one federal state (Bavaria) to ensure that the regulatory framework was the same. One common regulatory path for addressing acceptance-related problems is determining requirements for their proximity to residential areas (Masurowski et al., 2016; Watson et al., 2012). Bavaria has introduced a state regulation, the 10H rule, which defines the minimum distance between the wind turbine and residential areas as at least ten times the total height of the wind turbine (Baugesetzbuch, 2014). With wind turbines reaching overall heights of 250

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<sup>5</sup> April 2022: 10H rule remains - with exceptions, Source: [https://kommunalwiki.boell.de/index.php/10H-Regelung#April\\_2022:\\_10H-Regelung\\_bleibt\\_-\\_mit\\_Ausnahmen](https://kommunalwiki.boell.de/index.php/10H-Regelung#April_2022:_10H-Regelung_bleibt_-_mit_Ausnahmen) (accessed 29.09.2022)

metres, the 10H rule increases the challenge for municipalities to find appropriate project sites. Even though proximity has some effect on the perceptions of wind farms, the intensity of this effect is shaped by the norms and values of the affected communities (van der Horst, 2007). Political power can produce and promote certain norms in social systems (Fraser, 2014), and institutional norms have the potential to regulate market dynamics (Nyborg et al., 2016).

Further, this paper focuses on wind energy projects in forest areas because some of the main concerns of those who oppose wind energy projects are related to landscape protection and impacts on biodiversity, especially in forest areas (Dai et al., 2015). While deploying wind parks in forest areas is complex in terms of local acceptance in Germany, developing wind energy in such zones is necessary for achieving climate and renewable energy goals (FA Wind, 2021a). Wind turbines in forested areas are situated almost exclusively in the southern federal states, namely, Rhineland-Palatinate, Hessen, Bavaria, Baden-Württemberg, and North Rhine-Westphalia (Bunzel et al., 2019). In Bavaria, forests account for around 37% of the land area, making it the state with the greatest forest coverage among all 16 German states (FA Wind, 2021a). Analysing local actors that influence community norms can increase understanding of conflicts and dynamics related to wind energy projects (Karakislak et al., 2021). This paper aims to fill the gaps in the literature by exploring the relationship between local political figures and social norms and examining their effect on local responses to wind energy projects. It does so by addressing the following research questions:

1) What is the role of elected mayors in wind energy projects? 2) What influence do their opinions have on local responses? and 3) What actors and processes influence local responses over time?

The remainder of this article is structured as follows: Section 2 introduces the theoretical foundation of the paper by discussing the role of social norms, local political figures, and the local population. Section 3 introduces the methodological approach, the case study selection, the methods, and the analytical approach. Section 4 gives a detailed overview of the case studies. Section 5 illustrates the results of the four case studies. The paper concludes in section 6 by reviewing the main findings and suggesting implications for policymakers and practitioners.

## **2. Social norms, political agency and local responses**

This paper applies the conceptual framework described by Karakislak et al. (2021). This two-dimensional framework specifies factors and variables for analysing the definitions, influencing



factors, and impacts of social norms as well as perceived justice within communities. The first element of the framework proposes that three groups of individuals are influential in terms of the norms that impact local responses: community spokespersons, political figures, and opposition groups. These actor groups come to power to influence public opinion in situations where there is uncertainty or conflicts, such as unequal distribution of benefits. Community spokespersons have social influence and strong ties within their groups, individuals with resources and networks capable of impacting others (Karakislak et al., 2021). Their opinion (e.g., support, oppose) on energy projects does not define their role, but their impact on the community and processes matters, whereas opposition groups foster a negative norm. Mayors and local council members are actors with political power, social resources, and strong ties to the community. Therefore, they have a key influence on local responses to wind energy projects (Karakislak et al., 2021). The theoretical foundations on which the conceptual framework is based are elaborated in this section by reflecting on the interdependencies between social norms, local political figures, and local responses.

## **2.1. Social norms**

How members of the public respond to the social and environmental changes around them is widely linked to the expected reactions of others. These conditional expectations about how people will react, or how they should react, are conditional behavioural regularities - or social norms (Bicchieri & Mercier, 2014).

Overcoming conflicts associated with energy projects requires a deeper understanding of the embedded influences and values related to the social context (Upham & Johansen, 2020). There tends to be a gap between what others typically do (descriptive norms) and what ought to be done (injunctive norms) (White et al., 2009). The distinction between intention and behaviour is also relevant when estimating responses to wind energy projects (Sokoloski et al., 2018). Social influence<sup>6</sup> within groups tends to increase the effects of normative beliefs about renewable energy technologies in general (Hübner et al., 2023; Reyes-Mercado & Rajagopal, 2017). Moreover, social norms or pressure from family, friends, and neighbours, alongside political actors, have the potential to influence local responses in both directions (Huijts et al., 2012).

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<sup>6</sup> Intentional or unintentional demands to change the behaviours of others.

This study addresses local responses to projects as implicit normative indicators of communities. Descriptive norms about climate change mitigation are also factors that are considered.

## 2.2. The role of local political figures

Local politicians are directly affected by public opinion, while in turn their engagement in wind energy projects affects local responses (Friedl & Reichl, 2016). Consequently, local politicians may have a significant impact by shaping the dynamics of community acceptance of wind energy projects. Active local support for community-led projects<sup>7</sup> strongly shapes the distribution of power and the relationships between local actors (Bell et al., 2013).

As key agents of societal inclusion and local policies, the needs and views of the mayors should be better understood (Gürtler & Herberg, 2021). Young and Brans (2017) and Beermann (Beermann, 2009) found from their case studies that the role of the mayor as a policy entrepreneur in implementing 100% renewable energy systems is crucial. In other cultural contexts, for example, a case study comparison in Japan underlined the role of shared social norms about community initiatives for renewable energy as part of policy learning by mayoral leadership and other stakeholders (Takao, 2020). Mayors may become advocates or leaders of renewable energy projects that influence local citizens (Honvári & Kukorelli, 2018). Local politicians have the social and political power to influence public opinion (Busch & McCormick, 2014; Friedl & Reichl, 2016; Karakislak et al., 2021). The power of the local politicians may be applied in different ways. Partzsch (2016) explains this using three concepts in environmental politics: “power with”, which includes learning and cooperation; “power to”, which involves resistance and empowerment; and “power over”, which refers to manipulation. These understandings of power are embedded in actors, agents, and structures that influence decisions (Partzsch, 2016). Thus, support from the mayor and the local council has the potential to increase cooperation among municipality actors and the community (Schwarz, 2020; Wüste & Schmuck, 2013).

Public trust in local decision-makers also impacts the acceptance of wind energy projects (Fast & Mabee, 2015; Titov et al., 2021). Developing trust could be understood as a chain whereby

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<sup>7</sup>Renewable energy projects that a community of place or interest owns shares in, participates in, or distributes energy services through (see e.g., community energy Hoffman and High-Pippert (2005), energy citizenship Ryghaug et al. (2018), prosumers Ford et al. (2016), community liaisons Fast (2017)).

leaders first build trust in themselves, then in a process, and then an outcome (Dwyer & Bidwell, 2019). Moreover, trust between the local community and project stakeholders tends to increase when local people are involved in the project development (Walker et al., 2010). The transparency and openness of local actors could also potentially influence project outcomes (Firestone et al., 2018).

Christidis et al. (2017) found that the perceptions of community members and local politicians tend to differ regarding wind energy projects, which could become a barrier to their implementation. In cases when communities have a direct democratic impact on projects, such as through referendums (Bell et al., 2005), political actors have the advantage of being able to create open dialogue that overcomes such potential barriers. There is a potential for conflicts between the local politicians' influence on the public and how this might affect their re-election (Friedl & Reichl, 2016). For example, Walker et al. (2018) showed that a divisive political context in a province could spur the rise of opposition and even create an electoral backlash. Hence, in relation to projects, mayors may avoid taking sides until they are ensured of having enough public support or exert *power over* the community. This paper explores how the positioning of mayors can impact local responses and whether having supportive local politicians is key to successful project implementation.

### **2.3. Local responses to wind energy projects**

Local responses influence the outcome of wind energy projects directly (e.g., through referendums) but also indirectly through their influence on local politicians (Jolivet & Heiskanen, 2010). However, it is important to understand local responses not as an obstacle to the energy transition but rather as an aspiration to increase their understanding (Devine-Wright, 2007a).

Local responses are multi-layered and dynamic and can range from support to opposition and indifference, resistance, tolerance, or acceptance (Batel & Devine-Wright, 2015b; Walker et al., 2018). Energy-related social science research has been developing a more nuanced understanding of local responses (Walker et al., 2018) and moved away from the NIMBY (not-in-my-backyard concept), which has been criticised for labelling opposition groups as self-interested or irrational (Kempton et al., 2005; Wolsink, 2006). Discussions about individuals' attitudes, behaviours, and responses are adapted to different concepts and theoretical frameworks (Fast & Mabee, 2015; Huijts et al., 2012).

Estimating and understanding local responses also requires that local actors acknowledge and cope with the emotions associated with wind energy (Perlaviciute et al., 2018). How people feel about wind energy in general, and their environmental beliefs might not reflect how they respond to projects. Positive associations about wind power tend to be more abstract than negative ones, resulting in the opponents' responses being more clearly elaborated (Cousse et al., 2020). Being directly affected by a project tends to be a strong driver of people's attitudes; thus, this requires better anticipation (Russell & Firestone, 2021). Van der Horst (2007) found that only people with strong feelings against wind energy generally engage in local resistance. Warren et al. (2005) claim that local opposition involves a minority of people but that they receive more attention from the press. On the other hand, in locally rooted projects, some actors have the potential to foster positive emotions and opinions about wind energy (van der Schoor & Scholtens, 2015). In the past, most referendums about wind energy projects resulted in project abandonment. However, more recently, decisions have tended to be pro-wind energy (Langer et al., 2016). A similar trend can be perceived in Bavaria. One explanation may be that people with personal experience with wind energy tend to be more positive about it (Langer et al., 2018). Another possible explanation is that the "silent majority" either passively supports (Schweizer-Ries, 2008) wind energy or has no strong opinions about it (Gross, 2007).

### **3. Research Methodology**

The aim of this study is to investigate how local politicians and social norms influence local responses to wind energy projects. In order to do that, the paper analyses four case studies in Bavaria and examines the processes around these wind energy projects. In this section, we will explain our case study selection, present our methods, and conclude with the analysis.

#### **3.1. Case Studies**

Germany is a relevant context for examining the local dynamics of wind energy development for three reasons. First, Germany's phase-out of nuclear and coal energy requires a substantial expansion of renewable energy. Second, Germany has great potential for wind energy expansion, and third, the deployment faces various challenges.

The Bavarian state government introduced the Bavarian Energy Action Program in 2019 to spur the deployment of 300 new wind turbines with a 1 GW newly installed capacity (StMWi, 2019). However, this significant goal of expanding wind energy and informational instruments has met regulatory setbacks. Since there is no national regulation about wind turbines in forest areas, each state employs restrictions on planning that steer wind energy's expansion (Bunzel et al.,

2019). Particularly in Bavaria, forest areas carry a large potential for wind power, but – as Ludwig and Bosch (2014) suggest – this requires alternative socio-ecological integration models. In November 2014, Bavaria introduced the 10H rule, which defines the minimum distance from the residential areas to the closest wind turbine as ten times the turbine's total height (Baugesetzbuch, 2014). There are recent changes to 10H that allow dropping the distance rules in priority and reserved areas for wind energy (e.g., motorways and forest areas). However, local municipalities can define exceptions to the 10H rule in their local setting through urban land use plans that allow wind energy projects within the 10H limits. Municipal actors also have to balance the local and national interests in situations when hierarchical interventions such as the 10H rule exist (Verhoeven et al., 2022). Despite the intention to avoid conflicts, local projects still face strong opposition in Bavaria (Langer et al., 2016). In practice, the 10H rule can put additional pressure on local municipalities. First, the 10H rule can take power away from municipalities, and second, the exception to the rule puts pressure on them since they have to justify why a distance lower than 10H is allowed (Watson et al., 2012). This often results in considerable resistance from the local population but also from neighbouring municipalities (Langer et al., 2016).

Bavaria is a particularly interesting area for wind energy due to its significant role in the German energy transition. Bavaria ranks third on the list of German federal states in terms of its ambitions and implementation targets of renewable energy to create socio-technical change (AEE, 2019). Thus, it is one of the states that prioritised the energy transition. However, the 10H rule has affected the expansion of wind energy and created further conflict.

Most federal states in Germany have two types of mayors, working voluntarily or full-time, depending on the municipalities' size. There could be multiple mayors in Bavarian municipalities with more than 5000 inhabitants, the first mayor being the civil servant that the citizens directly elect. The first mayor is the chairperson of the council and head of administration. The local council elects the second or third mayor from their members. Their role is to represent their community similarly to other council members (GO, 1988).

In order to identify relevant case studies, we screened news articles, the Bavarian Energy Atlas and the State Ministry for Economic Affairs, Regional Development and Energy to create a list of wind energy projects that fit our criteria. We used the following factors to examine the wind energy projects, such as the institutional conditions (e.g., land ownership, developer/operator, and planning authority), project features (e.g., number of turbines, distance, and location), opinion of the mayor, and intensity of active opposition or support groups. We ended up with

sixteen case studies defined as successful and completed projects by the Bavarian ministry and four conflicted potential projects covered in the news. We chose the case studies based on the following five selection criteria: project size, ownership, implementation status, project site, and opinion of the mayor (see Table 1).

First, we ensured that all projects were similar in size, thus within a certain range of installed or planned MW capacity (< 30 MW). We eliminated seven completed examples because they were either single-turbine or larger-scale (>8 turbines) projects. Second, we excluded three projects owned entirely by the municipality or the local community (e.g., energy cooperative). Third, to allow a comparison between successful project implementation and disapproved projects, we included two projects that were already in operation and two projects in the planning phase. Fourth, for the project location, we only selected projects that were planned or implemented in a forest area since 37% of the landscape in Bavaria consists of forest areas, and one of the main concerns about wind energy is landscape protection. Fifth, we distinguished the projects by the mayor's response. We wanted to include projects where the mayor either supports, opposes or is indifferent towards them. However, we could not identify project proposals or implemented projects that a mayor openly opposed. Through our interviews with project developers, we learned that bilateral discussions occur before a project gets started between interested project developers and mayors. If mayors oppose the project, they seem to not even get initiated. Therefore, we could not include a project with an opposing mayor. We present the four case studies as examples of various project outcomes in similar social contexts and illustrate the different processes rather than compare the project actors or results. Thus, this study presents the case studies descriptively and discusses their processes, outcomes, and implications interpretatively.

Case study	Number of turbines	Year	MW (each turbine)	Total height	Distance from residential areas	Inhabitants of the municipality	Financial participation	Ownership	Project developer	Opinion of the mayor
1	4	2015*	2.5 MW	197m	800m	2400	Yes	Bürgerwind (Citizen wind)	Regional	Advocate & initiator
2	3	2019*	3.6 MW	199.5m	900m	5600	No	Private	Regional	Advocate
3	4	2019**	6 MW	250m	>1000m	12000	Planned	Private	National	Hesitant support
4	5	2022**	N/A	230-250m	N/A	6400	Planned	Bürgerwind (Citizen wind)	N/A	Advocate & initiator

**Table 1:** Information on the case studies (Source: Interviews and document analysis)

\*Implementation; \*\*In planning

### 3.2. Data collection

For the data collection, we conducted interviews at three different points in time. In total, we conducted 23 semi-structured interviews. The first 13 interviews were conducted in December 2021 and January 2022, followed by 5 in May/June 2022 and 5 in November/December 2022 and January 2023 (see Table 2). We conducted semi-structured interviews as they allowed comparability between the cases while providing us with enough flexibility to react to context-specific questions. Through a web search, we identified relevant stakeholders and contacted them via email. All the interviews were conducted in German using online tools and took between 20 and 60 minutes. At the end of each interview, we asked respondents to identify further relevant stakeholders of the project, and we stopped interviewing when we reached data saturation for each case study.<sup>8</sup> We want to highlight that, especially for the ongoing projects, there will be changes and new information until the projects are implemented or cancelled. Thus, data saturation was reached for the time period of January 2022. In order to ensure data saturation for a longitudinal study, we referred to the following principles: initial analysis sample, stopping criterion and independent coders (Francis et al., 2010). Initially, we aimed to have four interviews for each case study. For Case Study 4 (CS4), we interviewed local political actors who are also community members because wind energy was discussed during a local council meeting and then stopped before a project could evolve. Thus, no project developer was involved yet, and the interviewees portrayed the two local council meetings and the open opposition before the vote. Since we conducted interviews in a one-year span, there were recent developments in the potential projects. However, there was still no concrete proposal nor a potential developer. Hence, we had additional interviews with other local council representatives and stopped when no new information or insights appeared. Two co-authors coded and analysed the interviews independently, supporting the study's replicability (Francis et al., 2010; Fusch, Patricia, I & Ness, Lawrence, R., 2015).

Three types of knowledge can be gathered through interviews: technical, process, and interpretative. First, facts and figures were explored which do not depend on individuals, i.e. *technical knowledge* (Bogner & Menz, 2009). Here, we were interested in the project specifics such as location, number of turbines, turbine height, MW capacity, ownership structures, and proximity to residential buildings. *Process knowledge* provides insight into processes and activities obtained through experience and direct involvement (Bogner & Menz, 2009). Here,

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<sup>8</sup> When no new information was forthcoming.



we were especially interested in participation structures, the actors involved, communication strategies used, and the local responses to the projects. *Interpretative knowledge* refers to interviewees' subjective perspectives, interpretations, and constructions (Bogner & Menz, 2009). The interviewees provided us with their assessment of the projects and the role of key actors, their perceptions about local responses, and their explanations for the success or failure of the projects.

Case study	Interviews	1st Mayor	Local council members	Project developer	Local community
1	6	1	3	1	1
2	5	1	1	2	1
3	7	1	2	1	3
4	5	1	4	N/A	-

**Table 2:** Interview participants

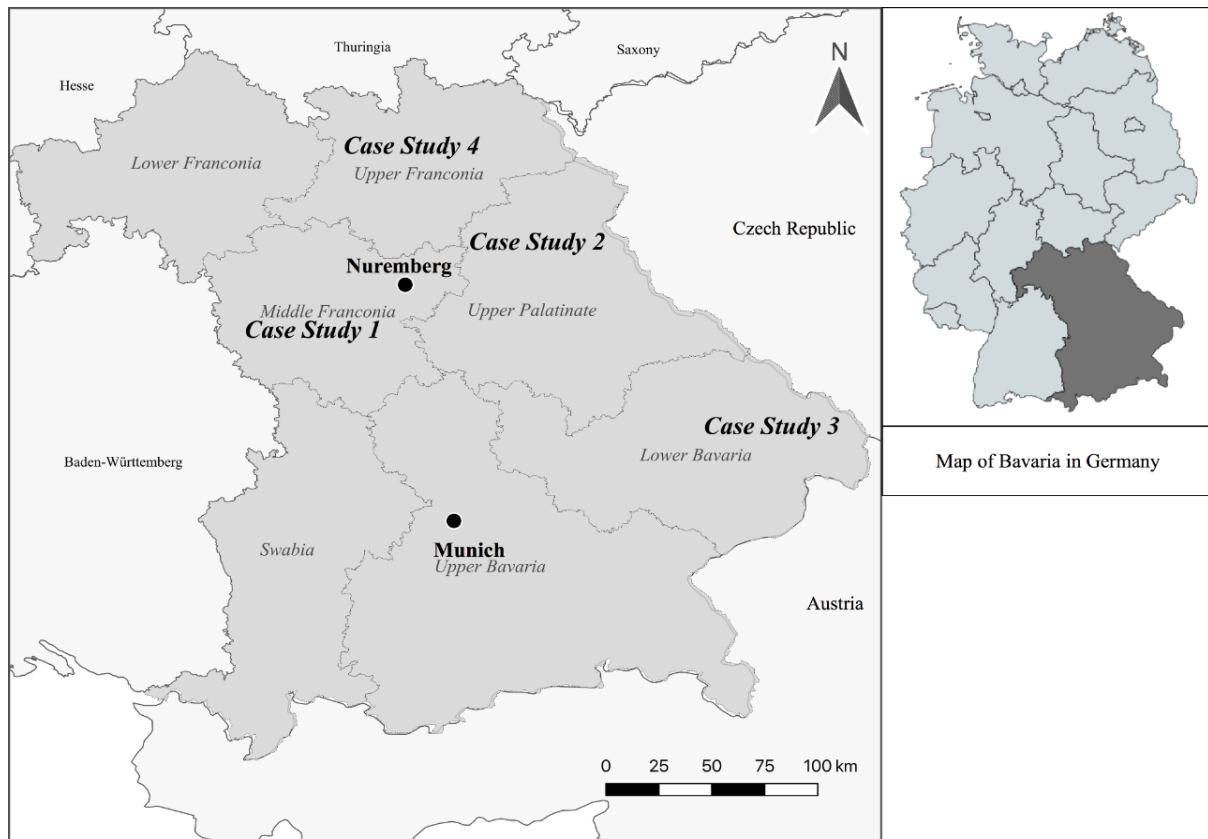
### 3.3. Analysis

After transcribing and translating the interviews, we used a framework method to analyse the data, which involves qualitative data management and analysis and is affiliated with the broader context of thematic or qualitative content analysis (Gale et al., 2013; Ritchie et al., 2003). It consists of organising the data to enable interpretation within and between cases to identify similarities and differences (Gale et al., 2013). This analysis was complemented by examining relevant documents and reports to understand the Bavarian context better.

In the first step, both authors reviewed all interview transcripts independently and inductively coded them by identifying themes. As a result, an index was created that identified the main and sub-themes. The software "MAXQDA" was used for data management and analysis. This software facilitates the application of the framework method and offers several visual tools and mapping options for the analysis (Kuckartz, 2010).

Initially, the concepts that addressed our research questions were identified. These include local actors in decision-making and the dynamic process of local responses. Next, we studied emerging patterns within the results from the case studies (Yin, 2014). Finally, we searched for explanatory patterns and factors. For example, the leadership styles of the mayors, citizen participation, impact on the outcomes and trust are some that emerged. We connected these patterns, insights, and concepts that relate to the outcomes of the projects as the findings of our research questions.

## 4. Case study descriptions



**Figure 1:** Case study areas in Bavaria, Germany (Created with QGIS software)

This section describes the social and cultural context of the case studies and summarises the process of wind energy projects. The information presented here is collected from documents and interviews.

Most of the landscape (80-90%) for all four locations was rural, divided between agriculture and forest areas (See **Fig. 1**). Their respective local economies depend on manufacturing, trading, transportation, and hospitality industries. According to the last federal and state elections, the towns supported political parties similarly. Germany's Christian-democrat and conservative political party (CSU) received the most votes in all four towns. There are three male mayors (CS1, CS2 and CS4) and one female first mayor (CS3) in these municipalities. The gross annual household income of the residents in the towns was also similar (Bavarian State Office for Statistics, 2021). We, therefore, argue that the towns have a relatively similar socio-economic and cultural context.

### 4.1. Case Study 1

Case Study 1 (CS1) is in a town in the northwest of Bavaria, close to the borders with Baden-Württemberg. The town has one mayor and a 14-seat town council. Most of the council members are independent candidates, including the mayor.

The project was initiated by the mayor, who has been in office since 2008. When project planners showed interest in implementing a wind energy project, the mayor initiated a community-owned project through an alliance with four neighbouring municipalities to ensure the benefits stay in the region. He saw an opportunity to generate income and create regional value since the municipality did not have many other sources of income. The mayor's motivation and advocacy were seen as the decisive factor in terms of the project outcome. Local council member 2 described the mayor as *“far-sighted and driven”*. Another local council member described his impact in the following:

*“And above all the mayor, who is pushing this quite massively, and then of course there is also the effect, uh, that people trust the mayor and therefore perhaps don't speak out as loudly against it...”* (Local council member 1, Biologist)

The project developer was chosen from eight applicants and was described by our interviewees as *“from the grassroots”*, trustworthy, experienced, and caring about the region. He mostly develops community-owned projects with his company to ensure that benefits stay in the region. The project developer also recognised the public's concerns, addressed people personally, and described members of the small opposition group as *“simply afraid”*. He was described by our interviewees as one of the reasons for the high level of acceptance. Compared to having an external company involved, council member 3 perceived that the developer *“had not gotten rich from the project”* but instead made sure that the profits stayed within the municipality.

The citizen project involves the investment of five municipalities and 215 citizens. Next to financial participation, there was no possibility for the local population to get involved in the planning process, but the local population was informed early and regularly. The option to buy shares was communicated in all municipalities through citizens' meetings and local media channels. The project has been very successful and profitable for the stakeholders. Recently, the developer proposed to extend the wind farm with a turbine, but one of the neighbouring communities rejected it.

Some individuals were against the project, but the opposition was never very strong, and the local population mainly supported it. The mayor would not have proceeded with the project without the local population's support, noting *“the danger of being voted out of office”* in this

respect. One of the community members expressed their concern about Bavaria not being an optimal region for wind energy due to the presence of dense forest areas, waterfalls, and water reservoirs. The project was planned around existing infrastructure to avoid as much deforestation and impact on the local environment as possible. Further, the municipality invested between 180,000 and 200,000 euros into nature conservation measures and reforestation in compensation for the wind energy project. According to the local council member 1, these mandatory compensation measures raise awareness and highlight that compensation measures are not required for other quite invasive infrastructure projects.

Acceptance of the project was not an issue. A community member explained that the people of Franconia<sup>9</sup> were "*very patient*" and "*tolerant*". However, the project encountered other obstacles. Delays were caused by the implementation of the 10H rule, the presence of a nearby American helicopter airport, and the connection to the grid. The biggest challenge, however, was that the project was planned in a state forest, and a minister in Bavaria disallowed the state forest authority to sign the respective contract. However, through political pressure, the project was approved in the end.

#### 4.2. Case Study 2

The media and our interviewees described the second case study (CS2) as a showcase example in Bavaria. The town is located in north-eastern Bavaria, close to the border with the Czech Republic. The town has a council with 20 members and three mayors. The current mayor is a democratic and conservative party representative, similar to most council members. The previous mayor who initiated the project in 2015 is from the same party. In addition, the municipal council members were unanimously in favour of the project, which increased the coherence between local representatives of all parties.

The Bavarian minister from the Ministry of Economic Affairs visited the wind park with six delegates to learn more about the project and obtain insights into its successful implementation. This was the first project to be implemented with a distance to residential buildings less than specified by the 10H rule. Local acceptance was high, and it was also the only project that was not legally challenged at the time. Additionally, this municipality's average CO<sub>2</sub> consumption per capita is higher than the Bavarian average, which a local council member interpreted as a reason for the greater awareness of the need for the energy transition.

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<sup>9</sup> Franconia is defined as the cultural region in Bavaria with its own Franconian dialect.

The previous mayor was the key facilitator of the project and was identified as one of the reasons for the project's successful implementation. According to our interviewees, the public supported the project strongly due to their belief in the necessity of renewable energy development and the mayor's advocacy. The project planner stated that:

*“I think what had a very positive effect here was a courageous mayor who communicated to the population from the outset that this procedure, which was necessary, would be started in a results-oriented manner and that if insurmountable problems became apparent, then it would be possible to discontinue it again.”* (Project and landscape planner)

After some initial concerns that the use of wind energy could cause “trouble”, the local council voted unanimously for the project, and all related resolutions were approved. The local council also included a member of the German Federal Parliament (Bundestag) who is a strong advocate of wind energy, which may be one of the reasons for the strong support for the project. Initially, the municipality was approached by an external energy corporation that planned to build six wind turbines. This corporation's approach was described as “brisk”. The responses of the local population were not only positive. The local council wanted to promote wind energy but remain in control over the locations and consequently, decided through zoning about potential sites. In the end, the project was planned by a regional company together with a regional planner, while an employee of the local municipality carried out the urban planning. The previous energy corporation had an approach that mainly focused on maximising profits, whereas the new project developer considered the municipality's needs. The latter chose a pooling approach, meaning that not only the landowner where the turbines stand profits from the lease but also anyone affected through access roads or the grid connection. Further, the turbines were installed close to existing infrastructure to avoid unnecessary environmental and forest impacts. Moreover, a local described the siting of the wind turbines to be favourable without any shadow cast.

The local population was informed about the project through an information event. There was a presentation at the beginning, followed by an opportunity for residents to visit different information tables and obtain the information they were interested in. The information event was described as constructively critical by our interviewees. The set-up was identified by a local council member, community member and project developer as one of the reasons for the high level of local acceptance as it did not allow mobilisation against the project. The project manager shared this assessment:

*“This led to the fact that the citizens' initiatives from outside were actually there, but as they saw that they were not given the platform for their protest, they left again.”* (Project manager for administrative procedures)

The planning process took three years, and there was no possibility for financial participation offered. During the planning phase, they faced two main obstacles: the 10H rule and a military helicopter training area located close to the project site. After completion, the current mayor stated that they had realised that the dismantling of wind turbines would be classified as special waste (*Sondermüll*), which was not accounted for in the original budget.

### 4.3. Case Study 3

In central-eastern Bavaria, Case Study 3 (CS3) is located at the border with Austria. It is a more densely populated town than the other three cases, with 24 members on the local council and three mayors. The town's first mayor is an independent candidate, while most of the council members represent conservative parties.

The project is still in the planning phase and was the most controversial of the four case studies. After an external energy corporation indicated its interest in implementing wind turbines in this municipality, resistance formed quickly and strongly. One of the targets was the mayor, who was elected ten years ago. While the second and third mayors, other council members, and the project developer were not directly exposed to the aggressive activities of the opposition, the first mayor was held accountable for the project. She received threats, although she was neither a vocal advocate of the project nor had she pushed strongly for it. The mayor supports the project but has not clearly voiced her opinion since, as she reported, she did not want to influence the local council or the local population. She stated:

*“I've always said that we have to deal with the question of where our energy should come from in the future, and we can't always say that others have to fix it for us. [...] We can't always just be against it without saying what we're for.”* (First mayor)

The backlash she has faced for her political stance was exceptionally intense. She had received a dead rat by post, which she interpreted as being a gendered threat. When asked whether a male mayor or the other town mayors would have faced the same reactions, she replied, "No". However, the sample size is too small to conclude gender-related issues.

Other political actors in the municipality argued that the hesitant position of the first mayor had created further conflicts. Local council member 1, who is against the project, also stated that

politicians should rely on being elected by a large percentage of the population and take a stand. Moreover, he is part of a political party in the local council that emerged from the opposition group against the wind energy project. The third mayor explained the lack of leadership as "decisive" and added:

*"The principle in a Bavarian municipality is quite simple, in my opinion: the [first] mayor is the leader. The mayor defines the direction in which a municipality can develop. They have everything in their hands, they have the staff that works for them and the other members of the city council... Simply, it is the first mayor, who says, "Dear administration, we now have the application here, how do we deal with it, or what could we do with it?" - and the rest is all incidental." (Third mayor, local council member 2)*

The project developer wanted to install turbines of the maximum height. One of the local council members criticised this goal and suggested having smaller turbines instead. Local council member 1 stated that the planned project will only be profitable for investors and will "fill their wallets" but ignore the community's concerns. A financial participation model is planned for this project, but the details have not been decided yet. The project developer further elaborated on early information the following:

*"The difficult thing about early information is that it is always very vague. If we provide information at an early stage, we don't have a bird survey or a noise survey yet. So we don't have all these things yet, because we inform early and sometimes there is a conflict with the expectations. [...] Then we are asked a lot of questions that, of course, can only be answered in a general way at the beginning of a project and not in a project-specific way. And then again, I would say that the disappointment is sometimes very great because people expect to learn a lot of details that it is not possible to give at that point." (Project developer)*

This project is associated with the most vigorous opponents of the four cases. Concerns included environmental destruction, impacts on fauna and flora, risks for the water sources, effects on the landscape, a drop in tourism, visual impacts, the impact of infrasound, and health risks. The strong response to the interest of the energy company in building a wind energy project in the municipality was surprising to the mayor since, in 2010 and 2011, the same municipality had stated its intention to become a role model regarding wind energy in Bavaria. At the beginning of her term, the land-use plan was adapted, and concentration zones for wind energy were defined. That did not result in a response from the local population, which may be due to a lack of awareness in the community. However, she described the energy company as being too

confident and unwilling to make any concessions and “*gambling away*” the local population’s trust as their communication methods or rather the lack of communication had failed to address people's concerns. The local population was informed through an event that was held in response to the local opposition. Additionally, the third mayor described the 10H rule as a further burden at the municipal level, as local politicians would prefer not to undermine the 10H distance.

The case exhibits a striking difference between the perceptions of the local council and the local population in contrast to the perceptions of the project developer. The developer sees the project as being on a good track with opposition within the normal range, while the mayor and the local council perceived this quite differently. According to the project developer, the sole difference was that there was a greater media presence. Recently, following a petition by the local population, the local council decided to vote on the project proposal and has set a prospective date. However, the developer company withdrew their proposal from the local municipality before the voting, considering proposing the project to the county instead. The interviewees from the local council and the local population highlighted the lack of transparency on the part of the project developer. Next to the initial information event at the beginning, which was also only a response to the request to get some information, the project developer did not share any information with the local population or the local council. This caused a strong resentment and the local population did not get any responses to their questions and also their concerns were not addressed. They have been unable to reach the developing company or the project developer. According to our interviewees, there is a huge gap between what the developer promised and should do and what they were doing. Three of our interviewees from the local population were against the project and stated that the frustration mainly evolved from the lack of information and that they did not get any responses to their questions.

#### **4.4. Case Study 4**

CS4 is a town in the north of Bavaria, close to the state of Thuringia. The local council consists of mostly independent candidates, local party members, and their mayor. The town council has 21 members and one mayor. Over the one year in data collection, CS4 evolved and had the most dynamic responses and the most dynamic development. The mayor initiated the project in 2021 and was an advocate, but the project was cancelled as a reaction to the strong local opposition through a municipal council vote before a project was planned. However, after the



implementation of the “Wind an Land” law<sup>10</sup>, the local council re-opened the discussion about wind energy in the municipality in August 2022.

According to the mayor, a project was already initiated ten years earlier, and the population was receptive. Back then, the contracts with landowners had already been signed, but after the introduction of the 10H rule, the project could not proceed. However, since municipalities can circumvent the 10H rule through a land-use plan, the mayor put the topic back on the agenda 2021. In February 2021, during a meeting without public attendance, the local council decided in proportions of 19:1 in favour of investigating the possibility of developing wind energy projects in their municipality. This was a decision that indicated an interest in the topic, but no concrete project was initiated at that time.

At this time, a lockdown due to the COVID-19 pandemic was ongoing, and the local population was informed via the local newspaper. Inviting the public to an information event was also not possible, so the event took place online. According to local council member 2, this made it more difficult to interact and to get a feeling about the assessment of the local population. He also mentioned that questions remained unanswered since many details were not known or undecided at that point. In the next local council meeting, the local council voted unanimously to investigate the use of wind energy in the municipality. After the local population was informed, opposition emerged rapidly and intensely. Concerns included shadow, noise, flashing lights, and bird strikes. The mayor was surprised by the intensity of the reactions.

As a reaction to the intense local opposition, the local council voted in May 2021 against the project 13:7. Just weeks earlier, the same local council had voted in favour of the project with 19:1. According to the local council member 1, opponents put a lot of pressure on local council members, stating that they would divide the local population. The local council meeting had to take place under police protection. The mayor described the situation the following way:

*“It was a real storm that was hard to beat in terms of clarity, with whistles and a tractor outside the municipal council meeting and 100 people chanting and shouting, so it was very violent.”* (Mayor)

For the mayor, the rejection was a significant setback since members of his own party voted against the project. Local council member 2 suggested it might have been better to postpone the decision rather than make it in such a heated environment. A referendum would have been

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<sup>10</sup> Germany introduced the Wind an Land (Wind on land) law in July 2022 that aims to designate two percent of each federal state area for wind energy by 2030 (Bundesgesetzblatt (BGBl. I S. 1353), Article 4, 2022).

another option, which a neighbouring municipality chose (with 70% of the local population supporting the project). According to the local council member 3, concerns were also raised by the local population that this decision has been taken too quickly and that the municipality has to consider wind energy. In November 2022, the local council defined preferential areas for wind energy, and brought the topic once more back to the agenda. According to our interviewees in fall 2022, the receptions were quite different than 1.5 years before. The context changed and the local population seemed to be more concerned about climate change and energy independence topics. Local council member 3 explained, “*Last year energy was irrelevant, but now everyone is thinking about it*”. Therefore, there was a push from the local council, but also from the local population for locally produced energy.

## 5. Findings

The following section presents our findings from the four case studies. From the analysis of the case studies, we were able to identify four main factors that influence the dynamics of local responses: the assessment of the mayor and the local council; other relevant stakeholders, such as project developers and oppositional groups; project communication, transparency and the processes; and changes caused by external events.

### 5.1. The assessment of the mayor and local council

Many of our interviewees mentioned the importance of the mayor and the local council’s support for implementing wind energy projects and local acceptance. Our case studies confirm the findings in the literature that the approval of the mayor and the local council for a project seems to be pivotal to success (Busch & McCormick, 2014; Gürtler & Herberg, 2021). Approval of a project by the mayor is no guarantee of successful implementation, but disapproval of a project proposal seems to hinder project development in the first place. Local political actors (e.g., local council member 1 of CS1) and project developers (e.g., project planner of CS2) from our case studies indicated that the mayor's openness to potential projects is essential for wind energy development. Furthermore, during scanning potential case studies, we could not identify any wind energy projects opposed by a mayor. Our inability to find such projects suggests that approval might be a prerequisite in Bavaria for initiating a project, which our interviewees also confirmed.

As local political figures, mayors are representatives of their communities but also their political parties or groups. We found that the local leadership of the mayors tends to be independent of the national standpoint of the affiliated political parties regarding the energy transition, similar

to Adesanya et al. (2020). Even though some participants argued that the political parties of the mayors and council members could steer responses to projects, we found no correlation between these factors in the case studies.

The influence of mayors on the project outcome is twofold. Firstly, they can stop projects directly since they have to adapt the land use plan. The project developer of CS3 stated that they do not start projects without the approval of the local council and the mayor since they need to change the land use plan. The project developer explained that many projects fail because the mayor says “no” thinking “why should they get themselves into trouble?”. Secondly, mayors can also have an influence on local responses. They can play a mediating role between project developers, planners, and the local population, providing them with a strategic position through encouraging and inviting the public to participate in projects, addressing concerns, or acting as intermediaries. Their vision of their town and their leadership could significantly impact the project’s development. Nonetheless, mayoral support does not guarantee local support. Thus, the mayor’s support is essential but not sufficient for local acceptance.

Our findings also indicate that mayors need the support of the local council. Especially in municipalities where the projects need to be approved locally, council members directly impact outcomes. In turn, mayors and local council members are also directly affected by the reactions to projects of the local population. They can face pressure from the public, which may affect their attitudes towards project development. Thus, the mayors’ responses can change over time, but their influence on the local population can also change and is highly influenced by social norms and trust.

In our case studies, mayors were elected representatives by the local communities, which portrays them as trusted leaders. Trust in mayors as stakeholders played an important role in the distinctive outcomes of these three projects, confirming other studies (Dwyer & Bidwell, 2019; Fast & Mabee, 2015; Titov et al., 2021). However, trust is not the sole explanatory factor for acceptance; other factors impact the relationship between the community and mayors, such as providing a clear vision, project communication, and project characteristics. The current mayor of CS1 and the previous mayor of CS2 have been in office for over ten years and have had long-lasting relationships with their local communities. Here, the mayors were supporting and initiating the projects, and the local population supported them as well, which resulted in the project implementation in the end. Whereas, in CS4, the mayor has been in office for over 20 years and would be arguably perceived as a trusted local leader. However, his initial attempt to launch a project was not successful.

Moreover, mayors have administrative boundaries in wind energy planning as most projects are spread across multiple municipalities. In CS1, neighbouring communities shared different percentages in financial participation in the project, and the town that received lower benefits objected to the extension proposal. Thus, a mayor's leadership in their community may not be sufficient to impact the project's outcome.

## 5.2. Process of communication

Almost all interviewees agreed that project communication is an essential part. It is not only important what is communicated, but also how, when, and by whom. It is essential to inform the public early about projects to prevent trust-related problems and to avoid the impression that everything is being managed and decided behind closed doors.

This conclusion confirms the findings of many studies (Dai et al., 2015; Dermont et al., 2017; Wolsink, 2007). However, our case studies suggest that the early provision of information is not enough. The "*right timing*" is critical for avoiding raising more questions than it settles. Many of our interviewees agreed that there needs to be a balance between informing early and having enough information to share. When informing early, many factors will be unknown, not assessed, or undecided. This implies that residents will not receive answers to every question they have, which may result in the feeling that local decision makers or project developers are not being entirely open and transparent. The mayor in CS4 saw the timing as one of the reasons for the initial failure of the project. He considered that they had informed the public too early, leaving many questions unanswered. Similarly, the project developer of CS1 described the balance between providing early information and having enough information as a "*tightrope walk*".

Project communication is a process, and alongside the importance of timing, our interviewees agreed on the relevance of how information is provided and how the events are set up. In CS4, one of the reasons for the strong opposition was believed to be the online context of the public information meeting. A positive example is the information event of CS2. Here, our interviewees agreed on the positive influence of the set-up on the constructive dialogue that was enabled. Panel discussions do not seem appropriate to inform the local population about a planned project. Moreover, personal discussions and raising awareness within the community regarding alternatives to wind energy were described as helpful.

Therefore, how and when the public is informed strongly influences the local responses and, in turn, the project outcome. In other words, information should be communicated when there is

considerable room to elaborate, not too early when there are no proposals for siting or project features. Moreover, the context of information sessions tends to impact how meetings proceed. Further, it is crucial that the whole process of the project is explained and that the local population is informed about when they can expect which decision and the respective information. Therefore, the information flow needs to be consistent and the whole planning process needs to be transparent.

### **5.3. Other stakeholders**

Next to the timing, also the people behind the project are highly relevant to local responses. Our interviewees identified project developers and oppositional groups as having an influence on local responses and project outcomes. We identified that it is essential whether the community trusts the project developer, similarly to the findings of previous studies (Dwyer & Bidwell, 2019; Kalkbrenner & Roosen, 2016). Confirming findings from the literature (Goedkoop & Devine-Wright, 2016; Walter, 2014), regional project developers were trusted more than external project developers. Alongside their project role, we analysed how they perceive local responses. Project developers tend to make assumptions about emotional responses toward energy projects. Whether they frame the latter as NIMBY responses and try to solve conflicts through compensation (Perlaviciute et al., 2018) or take the raised concerns seriously affects local responses. Therefore, it is not only relevant *who* the project developer is but also *how* they interpret their role, how they interact with the local population and *how* they set up the project.

Regional project developers were favoured in the four case studies over external corporations. The former were perceived as caring about the region and its inhabitants and trying to ensure that added value stayed in the region. They were perceived as attempting to minimise negative impacts on the local population and the environment. In contrast, the latter is perceived as only interested in maximising profit and output without caring too much about environmental and social consequences.

In CS2 and CS3, concerns were raised by the public. However, they were addressed differently by the project developers. The project planner of CS3 argued that the public was prejudiced against the project from the beginning. In contrast, in CS2, an external developer was associated with a failed project, which the current developer had taken over. Moreover, the external developer of CS3 explained the advantages of the project for the town in terms of siting and distance from the residential areas, whereas the regional developer of CS2 emphasised first the social, environmental, and economic advantages for the community and only afterwards the profits for their company. The communication between the local population, municipality and

the developer of CS3 was also found to be problematic due to the absence of the provision of information and leadership. Particularly in CS3, the project developer failed to be transparent and informative about the process, leaving unanswered questions and eventually avoiding contact with the local community. This difference in the project presentation narrative might also have led to the different local responses in these two case studies.

Moreover, when a project developer is perceived as caring about the people and the region, this correlates positively with the local responses and in turn, the project outcome. This is also strongly linked to the set-up of the project. Regional project developers were associated with project set-ups to benefit the municipality or community either financially or in other ways.

The local population plays a vital role in wind energy projects since they influence outcomes in two ways. First, through democratic and participatory processes - for instance, lawsuits, objections, and referendums. Second, their influence on local political figures (Jolivet & Heiskanen, 2010). As political actors, a mayor's position relies merely on the community's support. However, one challenge our interviewees mentioned is to assess the community's opinion as a whole and ensure that not only the people are heard to voice their opinions. Because opposition groups tend to be more audible and visible, taking into account the responses of the whole community becomes difficult. A local community member of CS3 stated that when people feel threatened or endangered, they tend to respond emotionally. On the other hand, the relevance of considering members of the silent majority who either do not have strong emotions or do not express their opinions about wind energy projects (Stephenson & Lawson, 2013) was also highlighted in our case studies. In both cases, it was argued that the two sides of the spectrum stayed in their own bubble, creating problems in changing attitudes and behaviour.

In our case studies, we explained these polarised public views through social norms, similarly to Huijts et al. (2012). Responses to energy projects tend to create a *domino effect*, which might enforce strong opposition, like in CS3 and CS4. In CS3, proponents did not want to voice their opinion since the opposition was very intense. Similarly, in CS4, the opposition group directly influenced the local council's voting behaviour. In other examples like CS1 and CS2, where the public raised similar concerns, norms are argued to cultivate the responses in the other direction. Consequently, mayors have a significant role in shaping local community social norms, but their impact alone is not always the deciding factor.

#### **5.4. Temporality and impact of external events**

Research on social acceptance reflected on the dynamic process of project development mainly in temporality (Batel, 2018; Küpers & Batel, 2023; Labussière & Nadař, 2018). Earlier studies proposed a U-shaped curve, suggesting that responses to the project become more favourable over time (Devine-Wright, 2005; Wolsink, 2007). Even though the U-shaped curve considers the temporality aspect and changes within project planning and development, it is argued to simplify acceptance to adaptation and familiarisation (Rudolph & Clausen, 2021). Our findings show a similar curve in which temporality is fundamental in dynamic responses to project outcomes.

Despite local actors and factors, recent developments in the world play a determinative role in changing attitudes towards energy technologies. After the 2011 Fukushima disaster, Germany rigorously shifted its energy policies towards renewable energy sources, impacting public perspectives (Betzer et al., 2011). Thus, countries create new regulations and national narratives concerning the energy technology transition following such catastrophic events (Malone et al., 2017). Our results show that recent events incline to change responses to renewable energy projects.

In 2022, the Russian war against Ukraine impacted all of Europe, bringing the topic of energy independence to urgency. Moreover, Germany's new "Wind an Land" regulation puts pressure on each federal state to deliver rapid changes in their localities. In the one-year time between interviews, CS4 decided to re-evaluate the topic of wind energy in their municipality. The energy crisis transformed the attitudes towards wind energy from opposition to tolerance and even project support. The local community preferred to put the cancelled project back on the table since the local council and the local population assessed the situation differently now and they agreed that the expansion of renewables is necessary. According to our interviewees in fall 2022, awareness grew not only regarding energy security and energy independence but also increased climate awareness. Further, the municipality wanted to plan the project rather than encountering a potential top-down proposal. The council's initiation allowed the community to be involved in the process and potentially benefit from it.

Contrary to CS4, local conflicts in CS3 escalated in a year. The project developer company faded away in their role of informing the community and failed to be transparent. Instead, the concerns over the proximity to residential areas, the negative impacts of wind turbines on fauna and flora and the lack of trust in stakeholders became more prominent. Moreover, the developer company's recent decision to withdraw the proposal from the municipality highlights how top-down regulations can impact democratic local decision-making. Thus, the energy crisis and the

top-down measures resulted in two distinct outcomes, accelerating the development of one project and the tension between the stakeholders of the other.

## 6. Conclusions and policy implications

The energy transition is an important means of addressing climate change. In Germany, decentralised energy production through “Bürgerwind” (citizen wind) projects and energy cooperatives is the backbone of the energy transition. We have presented four case studies from Bavaria, illustrating the importance of the structural frameworks, key stakeholders, and information. Our study adds a unique contribution to the research on social acceptance and has implications for practitioners due to the following conclusions.

This paper has shown that the outcome of wind energy projects depends on multiple interlinked relationships between different stakeholders. Regarding the first research question “What is the role of elected mayors in wind energy projects?”, this study shows that the approval of the mayor and the local council for wind energy projects seems important. However, support from the mayors is not always enough to guarantee local support. Our findings also indicate that mayors need the support of the local council members, as shown in CS4, in which case the lack of support of the local council resulted in an initial project cancellation. Additionally, they need to present a clear vision, ensure that the community or the municipality benefits from the project, and clearly communicate why it should be implemented.

The second research question was on the mayor’s influence on local responses. A decisive factor in the local responses was how the mayors addressed the concerns. Mayors can play a mediating role between developers, planners, and the local population throughout the project proposal and planning process. Furthermore, mayors could also initiate the projects, defining a strategic position. Thus, their role in the municipality administration and project development sets the tone of the local environment.

Concerning our third research question (“What actors and processes influence local responses over time?”), we identified three main factors: communication as a process, the role of stakeholders, and impact of external events. First, our study shows that early communication with communities and transparency during the decision-making process of wind energy project developments are important factors influencing local responses. Beyond this, our results also highlight the importance of timing and context in communicating with the public. Second, our results suggest that regional project developers may be favoured over external corporations. While regional developers are foreseen as benefiting communities more, external corporations



are often perceived as prioritising their own interests over those of local communities. This is strongly interlinked to the project, which needs to enable positive effects for the community or the municipality. Building trust within the local community, local political actors and project developers play an essential role in the outcome of the projects as well. Third, this study confirms that opposition groups play an important role when it comes to wind energy developments. Local responses to wind energy are dynamic and directly and indirectly influence project outcomes. Opposition groups, in particular, impact the social norms in the community. Fourth, the dynamics of project development are subject to change in different times, places, and circumstances. During the one-year time span of data collection, local responses to and processes of our two case studies (CS3 and CS4) changed with the increasing concerns over the energy crisis and independence and recent national regulations. Finally, the whole planning and permitting process is complex and lengthy, creating a challenge for municipalities, especially small ones. The 10H rule is a burden for municipalities, not only because of the complicated process that needs to be followed if a project fails to satisfy the 10H rule but also because it may put municipalities in a difficult position by giving the impression that they are harming the local population.

Based on these insights, five implications for policymakers and practitioners are derived. First, the role of mayors is not limited to political leadership, as the representative of their community and decision-maker in administration. Their roles can extend to other functions, such as project initiator, mediator, and facilitator in public participation processes. Creating educational and endorsement programs to enhance their mediating skills and competencies could help support them in these activities. Surrounding counties and federal states could establish learning and experience networks and encourage the joint planning of municipalities so that mayors are not left alone. Second, mayors are interested in creating benefits for their municipalities. Thus, implementing policies that offer financial benefits to the municipality (for example, in the form of tax revenues or by pooling systems for distribution of profits) could incentivise interest in projects. Third, early information is essential. However, there needs to be a balance between informing early and having enough information to share. Additionally, the setting of the information event also plays a role. Aside from informing early, it is crucial to keep the information flow open throughout the whole planning process and beyond and to respond to the concerns of the local population. Fourth, the 10H rule was mentioned in all case studies as a burden. Consequently, the 10H rule should be adapted. Finally, to promote fair and inclusive decision-making processes, decisions could be taken by the public through referendums.

While this study is based on a qualitative sample involving four case studies, we note some limitations that can spur further research here. Firstly, our focus was on the impact of the mayors, while social norms that shape local responses are implicit determinants of relevance to the study. Based on conceptual frameworks that argue that social norms are a significant factor in acceptance, our approach identifies local responses as norms that are connected to the attitudes of the mayors instead of approaching those using standardised measurements. Moreover, all the mayors in our case studies were elected by the locals. In cases when mayors are selected as representatives from the local council, the results might differ. A second limitation was our difficulty in reaching local community representatives for interviews. Through snowball sampling, we identified key spokespersons in each case study who had either raised their concerns or supported the project, but we managed to speak to only a few. Even though this is a common challenge in social acceptance research, the COVID-19 pandemic affected our data collection. Field research with participant observation could create further insights into the norms of the opposition groups. Third, our case studies indicate that local opposition seems to react differently to male and female local leaders in similar circumstances. Compared to three male mayors that supported their local projects, only the female mayor with a hesitant opinion received personal threats concerning the proposed project. However, the sample size is too small to draw conclusions about this factor. Future research could identify whether there are differences between the tactics of political figures and how oppositional groups respond to them, which may be gender-related (i.e., if the latter targets them more aggressively than male leaders). Research into these issues would benefit more attention and help achieve a more just and inclusive energy transition.

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## Appendix

Interview No.	Role or Title	Date of Interview	Format	Duration
<b>Case Study 1</b>				
1	First Mayor of CS1	10.12.2021	Video Call	36 Min.
2	Local Council Member 1 of CS1	14.12.2021	Video Call	33 Min.
3	Local Council Member 2 of CS1	08.12.2021	Video Call	31 Min.
4	Local Council Member 3 of CS1	09.12.2021	Video Call	26 Min.
5	Project Developer of CS1	17.01.2022	Video Call	34 Min.
6	Community Member of CS1	11.05.2022	Phone Call	20 Min
<b>Case Study 2</b>				
7	First Mayor of CS2	09.12.2021	Video Call	32 Min.
8	Second Mayor and Local Council Member of CS2	09.06.2022	Video Call	20 Min.
9	Project Planner of CS2	22.12.2021	Video Call	35 Min.
10	Project Manager of CS2	13.12.2021	Video Call	28 Min.
11	Community Member of CS2	01.06.2022	Video Call	25 Min.
<b>Case Study 3</b>				
12	First Mayor of CS3	09.12.2021	Video Call	42 Min.
13	Local Council Member 1 of CS3	10.06.2022	Video Call	60 Min.
14	Third Mayor and Local Council Member 2 of CS3	26.05.2022	Video Call	60 Min
15	Project Developer of CS3	21.12.2021	Video Call	31 Min.
16	Community Member 1 of CS3	12.01.2023	Video Call	26 Min
17	Community Member 2 of CS3	17.01.2023	Video Call	43 Min
18	Community Member 3 of CS3	17.01.2023	Video Call	43 Min
<b>Case Study 4</b>				
19	Mayor of CS4	07.12.2021	Video Call	38 Min.
20	Local Council Member 1 of CS4	20.01.2022	Video call	18 Min.

21	Local Council Member 2 of CS4	23.12.2021	Video Call	39 Min.
22	Local Council Member 3 of CS4	30.11.2022	Video Call	23 Min
23	Local Council Member 4 of CS4	30.11.2022	Phone Call	19 Min

**Table 3:** Interview participants list

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### 6.3. *Paper 3*

## **A cooperative of their own: Gender implications on renewable energy cooperatives in Germany<sup>1</sup>**

Irmak Karakislak<sup>23</sup>; Pantea Sadat-Razavi<sup>2</sup> & Petra Schweizer-Ries<sup>24</sup>

### **Abstract**

Renewable energy cooperatives are crucial for local communities to initiate energy transition. With a mixed-methodological approach, this paper analyses the participation of women in renewable energy cooperatives in Germany and reveals the socio-cultural barriers. This study presents an intersectional analysis that integrates gender with other socio-cultural categories and identities within the social context of cooperatives. This study presents the results from a sex ratio analysis of energy cooperatives (N=388), online interviews (N=161), and semi-structured interviews (N=9). Results show that a lack of awareness of opportunities, financial resources, and time for volunteer-based workload and the lack of recognition of social inequalities in the cooperatives hinder women from actively taking part in leadership roles. This study concludes by discussing how contribution to localised renewable energy production reflects differently on genders. It also provides suggestions such as mentorship and diversity programs that would allow more women to take management roles and encourage a more inclusive and fair transition for all.

**Keywords:** Gender; Renewable Energy Cooperatives; Germany; Recognition Justice; Intersectional Analysis

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<sup>2</sup> Saarland University, Department of Sociology, Saarbrücken Campus 66123, Saarbrücken, Germany

<sup>3</sup>Institute for Future Energy and Material Flow Systems gGmbH, Department Environmental Psychology, Altenkesseler Str. 17, Geb. A1, 66115 Saarbrücken, Germany

<sup>4</sup> Bochum University for Applied Sciences, Integrated Institute for Sustainable Development, Campus Bochum, Am Hochschulcampus 1, 44801 Bochum, Germany

## 1. Introduction

The world must find solutions to better mitigate and adapt to climate change. The energy transition is a central pillar of climate action that supports a sustainable shift in the energy systems (IPCC, 2019). The socio-technical change aims to diffuse low-carbon energy technologies. This challenge should be reinforced by policies, industry, and changing the behaviour of society (Grubler, 2012; Sovacool, 2016). Shifting from fossil fuels to renewable energy technologies has social, political, and cultural effects on societies. Changes to the energy sources and uses of the technologies create differences in societal practices and behaviours, such as using LED light for energy efficiency and travelling by train instead of flying (Sovacool & Griffiths, 2020). Moreover, the geographical division of these changes in the energy systems tends to create uneven development in different states or regions, which impacts energy politics (Bridge & Gailing, 2020). This transformation of energy production needs to be achieved on different scales (van der Schoor & Scholtens, 2015). Local and decentralised energy development is one of the pathways for sustainable energy transition (Brisbois, 2019; Mundaca et al., 2018).

Communities have several different meanings in the energy transition, from actors that have agency to take actions for the local governance of localities that carry out environmental applications (Walker, 2011). Participation of local communities in the energy transition contributes to the shift in the energy systems and increases the acceptance of renewable energy technologies (Gross, 2007; Wirth et al., 2018; Wüstenhagen et al., 2007). Addressing the barriers and local factors, such as norms and working with the communities to implement energy technologies can avoid opposition and build bottom-up solutions (Seyfang & Smith, 2007). Renewable energy communities are groups of citizens and other stakeholders that actively and financially participate in local energy production and distribution (Azarova et al., 2019; Ghorbani et al., 2020). These local groups could be formed and defined as energy communities (Bauwens & Devine-Wright, 2018), energy citizens (Campos & Marín-González, 2020) or energy cooperatives (co-ops) (Wagemans et al., 2019). Overall, the goals of these forms are to consolidate local governance of renewable energy production and contribute to energy democracy and more justice (Baxter et al., 2020; Brummer, 2018; Rommel et al., 2018).

A transition toward low-carbon energy requires a mix of large-scale and centralised energy systems with decentralised and bottom-up approaches for technology implementation (Devine-

Wright & Wiersma, 2013). German energy transition (*Energiewende*) is one example that integrates community-level energy production deployment into their energy system (Strunz, 2014). Consequently, political, technological, economic, and social changes affect the country's energy landscape. Germany's energy co-op form of community-led initiatives has a unique structure that allows allocating power shares through public participation (Yildiz et al., 2015). However, local energy governance and public participation do not always guarantee fairness or equality for all (Goedkoop & Devine-Wright, 2016; Jenkins et al., 2016). How people evaluate the fairness of an energy project depends on various factors (Karakislak et al., 2021). Notably, gender justice issues are related to many other inequalities in energy systems, such as poverty and lack of recognition or representation in decision-making processes (Cannon & Chu, 2021; Feenstra & Özerol, 2021).

Energy research addresses a critical gap that investigates the practices and involvement of genders in the energy transition, such as the distribution of power inequalities (Fathallah & Pyakurel, 2020; Ryan, 2014). Thus, more qualitative and quantitative data on the gender-energy connection could uncover the differences and relations between sexual categories. These different gendered groups hold a variety of responsibilities regarding environmental decisions; therefore, the issues dealing with energy transition need to tackle gender with greater attention (Sorman et al., 2020). Moreover, recognising a gender-aware perspective can contribute to a more sustainable, inclusive and diverse energy transition (Clancy & Feenstra, 2006). Thus, engendering energy policies that consider reoccurring inequalities, capabilities, and vulnerabilities would recognise and address the needs, as well as different energy practices, of socio-cultural identities (Feenstra & Özerol, 2021).

Several researchers have conceptualised gender with its diverse aspects. More commonly, Butler (1999) argues that gender is *culturally constructed* and does not only result from the sex given at birth. In the gender-energy nexus research, the definition of gender emphasises a social construct that may vary across social, cultural, economic, and political contexts (Feenstra & Özerol, 2021). Furthermore, some studies differentiate the gender dimensions as only men and women merely based on sex, which is enforced by heterosexuality (Young, 1994). However, we approach the intersections of gender and sexual identities by considering the socio-cultural context of the research site and existing power differences within genders.

Intersectionality, as the socially defined dimensions of gender, class, racial ethnicity, or sexuality, is an approach to grasping and recognizing the inequalities and vulnerabilities within social systems that emerged from Black feminist theory (Kajiser & Kronsell, 2014; Winker &



Degele, 2011). Environmental research also aims to understand energy systems and climate adaptation by engaging with intersectionality theory (Malin & Ryder, 2018; Ryder, 2018), which explores these interlinked dimensions. Therefore, critically disintegrating the gender category to have *seriality*<sup>1</sup> would consider the common attributes of women, but it does not identify them as a homogeneous group (Young, 1994). In other words, the seriality of gender here does not exclude the individual identities of women (Young, 1994). Therefore, the social group of women should not be overgeneralised.

Studies show that women leaders in company boards tend to be more effective at pursuing environmentally friendly strategies (Glass et al., 2016). Similarly, in the renewable energy industry, women are more concerned with the care for the environment, awareness of gender structures and the need for improvement (Emmons Allison et al., 2019). Nevertheless, renewable energy planning and deployment institutions often follow patriarchal organisational patterns with hierarchical, male-dominated power structures and privileges (Bell et al., 2020; Fraune, 2015). Whether the technology development is centralised or locally rooted, social implications differ in geographies. Their decentralised and less hierarchical structure makes local German energy projects interesting (Kalkbrenner & Roosen, 2016). However, renewable energy co-ops contain socio-cultural barriers preventing inclusive participation for women (Łapniewska, 2019). Similarly to *Windfang FrauenEnergieGemeinschaft*, an all-women-led wind energy co-op in Germany (Clancy & Roehr, 2003; Łapniewska, 2019), there could be more *cooperatives of their own*<sup>2</sup>. Thus, this paper mainly targets the underrepresented social groups of women in local energy governance. With this, we propose to get further insights into local energy development and new potentials for its acceleration.

A growing body of research has delved into decentralised energy production and its socio-economic implications for the communities, like increasing technology acceptance or creating added value in the region (Bauwens et al., 2016; Punt et al., 2021; Viardot, 2013). However, there is still a research gap focusing on gender, intersectionality, and renewable energy governance (Johnson et al., 2020; Lazoroska et al., 2021). By exploring the gender-energy nexus, this paper makes an intersectional analysis of renewable energy co-ops in Germany to fill this gap. This paper aims to question and further explain whether renewable energy co-ops

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<sup>1</sup> Young defines *seriality* as a way of thinking about women as a social collective without assuming all women to have common or similar social attributes Young (1994).

<sup>2</sup> Inspired by the essay of Virginia Woolf “A Room of One’s Own” (1929) that argues a woman needs to have financial and social independence to gain intellectual freedom.

in Germany are concerned with inclusive representation, participation, and decision-making practices.

In this study, we aim to answer the following questions: i) How is the recognition of genders in renewable energy co-ops addressed, and what are the social implications of this (mis)recognition? ii) What role do women play in the distribution of participation, involvement and leadership in renewable energy co-ops?

## 2. Theoretical background

### 2.1. Gender justice and energy transition

The notion of *no climate justice without gender justice* emerged in social protests for protecting the environment (Kennedy & Dzialo, 2015; Terry, 2009). In contrast, social research has studied gendered experiences of environmental issues for decades. Research on attitudes and behaviours towards socio-technical change has become an essential subject of analysis, predominantly in quantitative studies (Mort, 2019). The relationship between gender and environmental concerns (McCright & Xiao, 2014), risk perceptions on health (Bell, 2016; Flynn et al., 1994), and women's place in environmental justice movements (Yaka, 2019) are some of the prominent research topics. However, eco-feminism captures the broader patriarchal power structures of gender attribution and different socio-cultural identities in environmental issues (Pellow & Brehm, 2013). In this sense, an alternative feminist approach to gender justice requires the recognition of the social and cultural status of women in social interactions (Fraser, 2007).

Feminist political theory reconstruct issues of gender justice with three dimensions; *redistribution*, *recognition* and *representation* (Fraser, 2005). Recognition for pushing for feminist claims in gender disparities, redistributing, and reframing disputes about justice should integrate into this reconfiguration of gender justice (Fraser, 2005). Moreover, Fraser's definition of *participatory parity* aims to provide a normative approach for evaluating justice for all social arrangements creating a base for the notion of justice (Fraser, 2005). This term identifies and evaluates justice with the recognition and distribution dimensions that also allow multiple axes of social differentiation. Therefore, this approach intends to create a non-identitarian model (Fraser, 2007). Thus, these three clusters of justice should be carefully examined in order not to reproduce gender exclusions in the same way.

Representation, especially in a political context, aims to extend visibility and legitimacy for women. However, in feminist theory, this term should also function as a language that fully or

adequately represents *women* (Butler, 1999). Butler explains that gender “intersects with racial, class, ethnic, sexual, and regional modalities of discursively constituted identities,” making it impossible to detach from political and cultural conditions (Butler, 1999). Sex (as assigned at birth) and gender (social and cultural identification) concepts have “multiplicity, fluidity and context-dependence”, as Lykke argues (Lykke, 2010, i). Additionally, women are not a homogeneous group and can be affected by inequalities differently (Clancy & Feenstra, 2019; Ndabeni & Mashigo, 2019). Therefore, there are diverse approaches to gender. Taking women as a homogeneous group with an essentialist position would fail to capture these differences, which we aim to be careful of while analysing the data. We acknowledge that this paper has a Western perspective. Moreover, we include the gender and sex construct both as assigned at birth (female) and as a socio-cultural category of individuals (woman) in our analysis.

Women are exposed to the negative implications of energy sources as much as men, yet still are mostly excluded from the decision-making practices on national and local levels (Ryan, 2014). Thus, another recognition layer is different income levels, which are crucial for assessing energy-related issues such as energy poverty and access (Clancy et al., 2003; Mort, 2019). Some studies have explained women’s primary motivation to participate in environmental movements to protect the family and future generations (Kennedy & Dzialo, 2015; McCright & Xiao, 2014). However, overgeneralising this goal could distract from institutional power relations that need to be uncovered (Allen et al., 2019).

Technocratic policymakers tend to assume energy topics to be gender-neutral, which creates a disconnection between energy and gender policies (Clancy & Feenstra, 2019). However, analysing gender relations in energy policy documents is a crucial consideration for gender equality (Mort, 2019). Thus, not considering the relevance of gender in energy technologies to meet equality and empowerment goals hinder gender blindness in energy policies (Mang-Benza, 2021). By addressing unequal social, cultural and institutional structures, gender mainstreaming seeks strategies for change (Daly, 2005). Gender mainstreaming as an economic policy goal in the energy field aims to accelerate women’s economic empowerment. Furthermore, it provides an analytical approach to recognising the presence of gender biases (Ndabeni & Mashigo, 2019).

The current social inclusion policy in the United Nations (UN) Sustainable Development Goals<sup>3</sup>, alongside gender mainstreaming, has influenced international policy commitments. Since the 1970s, gender discourses have been discussed in the UN Conferences as women

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<sup>3</sup> <https://sdgs.un.org/>

empowerment, followed by gender mainstreaming and finally led to social inclusion claims in the 2010s (Feenstra & Özerol, 2021). In their study, Clancy and Mohlakoana (Clancy & Mohlakoana, 2020) show the direct and indirect effects of audits that put gender on the policy agenda and mainstreaming in the energy sector with data from Kenya, Senegal, and Nepal. However, operationalising inclusive practices according to the gender-aware policies in the energy field is seemed to have a slower transition. This study takes a gender justice approach to address the organisational patterns and norms that have been argued to redistribute power and create misrecognition (Fraser, 2007).

## ***2.2. Renewable energy co-ops as social systems***

The role of energy co-ops in the energy transition is to provide innovative social structures and adopt low-carbon energy technologies to local conditions (Wierling et al., 2018; Yildiz et al., 2015). The most common legal forms of community-led renewable energy projects in Germany are limited partnerships with a limited liability company as a general partner (GmbH & Co. KG) and co-ops (eG) (Bauwens et al., 2016; Rommel et al., 2018). Renewable energy sources in Germany shared 45.4% of the total electricity production in 2020 (Umweltbundesamt, 2021). In 2019, private individuals owned 30.2% of Germany's total renewable energy production<sup>4</sup>. Currently, 835 co-ops hold a total share of 3.5% of renewable energy production<sup>5</sup>. Co-ops aim to promote energy production and consumption through local citizens buying and investing in renewable energy technologies. (Sadat-Razavi, 2021). A group of community members initiate these co-ops and actively participate in the decentralised energy transition. Energy co-ops in Germany mainly rely on solar energy and much less on citizen-owned wind parks (*Bürgerwindparks*) (Yildiz et al., 2015). Besides, many bioenergy villages and regions in Germany intend to cover the energy demand with biomass by operationalising decentralised bioenergy infrastructures (Jenssen et al., 2014).

Citizens of a municipality co-finance energy co-ops, and their power plant's equity is distributed individually (BWE, 2013). Renewable energy co-ops have a democratic governance structure with the motto of “one-member-one-vote”, regardless of the size of the shareholding (Yildiz et al., 2015). This structure allows the division of the net earnings pro-rata among the members

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<sup>4</sup> Source: Renewable Energies Agency - Ownership distribution of installed RE capacity for power production in Germany in 2019 <https://www.unendlich-viel-energie.de/studie-buergerenergie-bleibt-zentrale-saeule-der-energiewende>

<sup>5</sup> Source: The German Cooperative and Raiffeisen Confederation - Annual survey of energy cooperatives <https://www.dgrv.de/news/dgrv-jahresumfrage-energiegenossenschaften/>

instead of according to their shareholding, which makes it convenient for new members to participate (Bauwens et al., 2016).

Feed-in tariffs (FiT), one of the leading investment models, are market-independent mechanisms exempt from volatile electricity prices (Rommel et al., 2018). This tariff provides strong investment security for small actors like co-ops. With the recent changes in the German Renewable Energy Act (EEA), the yearly number of newly founded energy co-ops in Germany is dropping (Wierling et al., 2018). However, localised energy production opportunities are threatened by the decrease of FiT and the introduction of new auction models in the EEA, (Kimm, 2017). The co-ops struggle to attain land tenure by competing with the investor companies (Bauwens et al., 2016). Lack of knowledge, conflicts in the community, insufficient financial resources and institutional structures, and high competition in local energy markets are some barriers to developing renewable energy co-ops (Wierling et al., 2018).

Participation in community energy projects primarily has two types: active participation by volunteering and financial investment (Kalkbrenner & Roosen, 2016). Local community members can actively participate by buying shares from the co-ops or volunteering. In energy co-ops, board members organise and manage the projects as unpaid volunteers while still having financial investments (Fraune, 2015; Kalkbrenner & Roosen, 2016). Becoming a member of an energy co-op does not require any special skills or technical knowledge (Łapniewska, 2019). Renewable energy co-ops are mainly homogeneous regarding their members' demographic characteristics. Despite the gender-related differences (e.g., pay gap, occupational segregation between women and men (Fraune, 2015)), there is homogeneity in the age and socio-economic status of the co-op members (Bauwens & Eyre, 2017). Most of the members in Germany are well-educated men with medium- to above-average incomes with normative motivations such as environmental concerns (Holstenkamp & Kahla, 2016; Rommel et al., 2018; Yildiz et al., 2015). Nonetheless, women have limited involvement in energy governance as managers due to the patriarchal structures of men-dominated culture (Mang-Benza, 2021). Therefore, questions of justice and homogeneity of the co-ops carry an essential role in integrating the interests of different social groups (Rommel et al., 2018).

It is crucial to ensure the participation of diverse social groups by keeping the minimum financial engagement low enough to support the social acceptance of the technologies (Wierling et al., 2018). For example, *Windfang* in Germany aims to increase women's work experience in energy projects (Clancy & Roehr, 2003; Łapniewska, 2019). Their board members have

financial compensation for their work, despite the co-op's unpaid voluntary work tradition in Germany (IRENA, 2020).

Identifying the differences in participation between women and men can affect decision-making and policy outcomes (Mort, 2019). Standal et al. found that prosumers<sup>6</sup> were often described as men interested in technology, whereas women have environmental motivations to become prosumers (Standal et al., 2020). Additionally, companies with more women board members tend to prioritise and invest in renewable energy and commit to lowering their carbon emissions (Pearl-Martinez & Stephens, 2016). Classification of energy technology as technical and *masculine* creates further barriers for women to engage in these fields or address their needs (Mort, 2019). Some studies argue that women who enter male-dominated power and privilege structures tend to act according to traditional *masculine* norms (Magnusdottir & Kronsell, 2015). This contradiction creates the danger of not being able to fully represent women's interests in the decision-making spheres. Policies on changing energy behaviour may affect genders disproportionately due to unequal circumstances (e.g., household workload) (Carlsson-Kanyama & Lindén, 2007). Therefore, women's engagement in designing policies is one aspect of building gender into the energy transition.

### ***2.3. Intersectionality in environmental research***

Intersectionality has emerged as a critical framework and paradigm, especially in post-structural feminist, Black feminism and queer theory (Hankivsky et al., 2014). The feminist movement has evolved using this concept, especially with anti-racist and post-colonial commentary on mainstream feminism (Lykke, 2010). Intersectionality offers an analytical tool for the interactions between gender, racial ethnicity, social status, and other social and cultural categories of individuals that reflect on the social practices, institutional contexts, and the outcomes of these power dynamics (Kaijser & Kronsell, 2014). Power relations within social categories set the ground for injustices in various ways. Therefore, understanding these structures, norms, and dynamics between interactions of social identities proposes reframing these injustices (Cho et al., 2013).

Intersectionality in energy systems has the potential to identify the challenges and barriers that distribute power and injustices (Ryder, 2018). The climate justice movement in North Dakota, US, started as an indigenous movement and moved beyond to a collective resistance and liberation across social groups (as LeQuesne calls the "matrix of resistance") (LeQuesne, 2019).

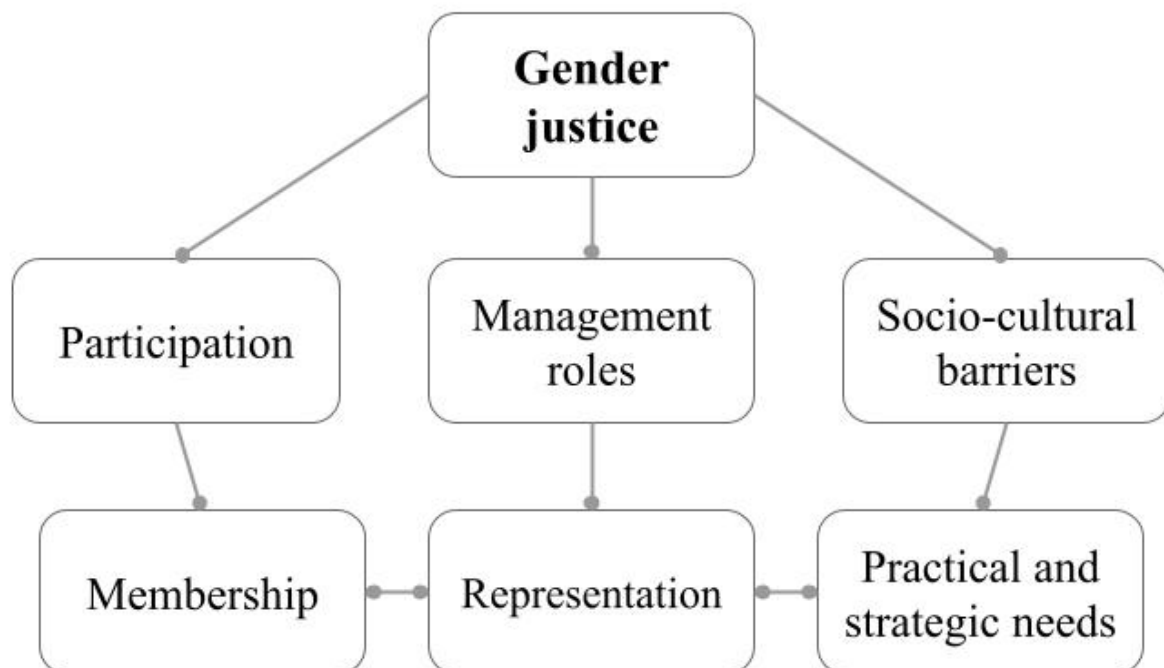
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<sup>6</sup> Prosumers are actors that consume and produce renewable energy (see Brown et al. (2020))

One study by Nygren and Wayessa (Nygren & Wayessa, 2018) examined the displacement of marginalised communities in cities in Mexico and Ethiopia. Their study showed that an intersectional approach provides nuanced dimensions of environmental injustices while highlighting how institutions reproduce this displacement (Nygren & Wayessa, 2018). Thus, better accounting for intersectional nuances in environmental research can lead to more critical solutions and responses to injustices (Malin & Ryder, 2018).

#### 2.4. Conceptual framework

The environmental justice framework by Schlosberg argues that social and individual recognition are key elements of attaining justice alongside distributive and procedural dimensions (Schlosberg, 2007). This framework recognises inequality, participation, and capabilities of individuals and communities instead of arguing for an all-inclusive theory of justice (Schlosberg, 2007). This study proposes an interlinked workable conceptual framework with a similar goal (see **Figure 1**). This study investigates the German renewable energy co-ops by adapting Fraser's three clusters of gender justice (i.e., redistribution, representation, recognition) and integrating them into: *participation, management roles and socio-cultural barriers*.



**Figure 1:** Conceptual framework of the study

In this study, we investigate women's active and meaningful participation. Rau et al. (Rau et al., 2012) describe four levels of participation in renewable energy technologies: information, consultation, cooperation, and citizen control. Even though participation is not a guarantee of

acceptance, active engagement opportunities for planning and decision-making motivate the public (Rau et al., 2012). The degrees of citizen power that enable decision-making, partnership, delegated power, and citizen control are aspects within energy communities and co-ops (Arnstein, 1969; Wagemans et al., 2019).

We are examining the representation of genders in these leadership roles. In Germany, renewable energy co-ops (*Energiegenossenschaften*) have an Executive Board (*Vorstand*) and Supervisory Board (*Aufsichtsrat*) that are responsible for management. Both board memberships are mostly voluntary (Viardot, 2013). Supervisory Board (SB) members usually elect the Executive Board (EB) members. EB members are responsible for managing and representing the co-op in project development, finance, membership, and administration. SB members supervise, monitor and advise the EB in the members' interests. The General Assembly of the co-op includes every legal member and elects the SB members.

Studies show socio-cultural barriers for women in renewable energy, including involvement in energy communities or co-ops (Fraune, 2015; IRENA, 2019). Energy co-ops in Germany serve a relatively homogeneous social group, leaving several other groups underrepresented. The co-ops decision-makers consist of older men who share different responsibilities in their work and personal life compared to women. This study aims to identify these barriers in German energy co-ops to develop and discuss measures to include women's claims as one underrepresented group. In this context, we consider women involved in energy co-ops who would be interested in participating and taking a role in the management and women that would be potential co-op members. Furthermore, we analyse the institutional structures of co-ops and whether it allows flexible opportunities for women and considers their needs. Their needs may differ due to gender pay and care gap.

### **3. Research methodology**

This study has a mixed-methodological approach, taking quantitative and qualitative data to investigate women as an underrepresented group in co-ops. First, the aim has been to show the distribution of women in participation and leadership of renewable energy co-ops and, second, examine the perspectives and experiences of energy co-op members on this topic. The methods used in this study complement each other to answer the research questions.

#### ***3.1 Research hypotheses***



Increasing the representation of women and opportunities for diverse social groups would contribute to a more inclusive and fair energy transition. Thus, we assume the following hypotheses for German energy co-ops:

Co-op members elect the management boards. However, board members have the power to make decisions about project development and other administrative tasks. Therefore, investigating the female-to-male ratio in co-op boards can reveal gender representation and relations. -> **H1:** Women are underrepresented in the Executive and/or Supervisory Boards of renewable energy co-ops.

There are more investments from men than women for financial citizen participation in renewable energy in Germany (Fraune, 2015). We argue that co-op membership is more attainable and attractive for men than women. -> **H2:** People involved in renewable energy co-ops evaluate the participation and involvement of women to be low.

Co-ops are social systems that have members mainly from local communities. They serve as a social phenomenon investigating community identity, collective action and social relationships (Yildiz et al., 2015). Also, decision-making in co-ops is democratic, which requires the board members to distribute their delegated power. This study considers the relationship within the co-ops as an essential indicator for investigating the dynamics of participation. -> **H3:** Co-op members evaluate the relationships in the co-op structure to work well (e.g., communication between the board and the members, distribution of responsibilities).

Justice being a socio-spatial phenomenon, its claims must be understood within the social and political context while considering broader implications (Nygren & Wayessa, 2018). Various topics create inequalities for women (e.g., gender pay gap, division of household work, gender norms), and this study investigates the circumstances in the German energy transition. -> **H4:** Women members of renewable energy co-ops face more participation obstacles than men.

Co-ops in Germany currently have a particular member profile (mostly older men from the middle to upper class) (Fraune, 2015). This study argues that co-ops typically do not recognize and consider inclusion and diversity aspects. -> **H5:** Members rate the renewable energy co-ops' diversity and consideration of women's needs to be low.

### ***3.2. Research design***

To address the research questions and test the hypotheses, we collected qualitative and quantitative data with a female-to-male ratio of energy co-ops (N=388), a standardised online questionnaire (N=161) and semi-structured online interviews (N=9). This mixed-

methodological combination has the strength of gaining a more comprehensive understanding of the concept (Robson & McCartan, 2016). We collected all the data between December 2021 and April 2022.

In energy social science, mixing methodologies play a pragmatic role as alternative research designs that aim to reveal underlying dynamics (Devine-Wright et al., 2021; Walker et al., 2014). Furthermore, using a pluralistic approach in intersectional research significantly affects theoretical discussions and methodologies (Lykke, 2010). The choice of methods can benefit from an open approach to understanding gender as a changing and contextual social characteristic (Lykke, 2010). We explored the scientific and grey literature to overview the female-to-male ratio in energy co-ops in Germany. We realised the gap in this data that relates to our research questions. Later, we wanted to examine this inequality in representation further to discuss its reasons and solutions with individuals already involved in energy co-ops.

### **3.2.1. Sex ratio analysis**

First, we analysed the sex ratio of EB and SB members in German renewable energy co-ops. We searched for co-ops in the common register portal of German federal states with the keyword “energy” (*Energie*), which resulted in 248 entries. Furthermore, we scanned the lists in umbrella organisations of federal states such as BürgerEnergie Thüringen e.V., Energiewende Baden-Württemberg, Energieagentur Brandenburg and others that had similar platforms.

This research resulted in 388 registered renewable energy co-ops in 16 German federal states. We extracted the information from the publicly available data (names of the board members) on the websites of the co-ops or the company registration websites. We have included and analysed the sex ratio of EB (N=1012) and SB (N=1367) members of German energy co-ops. Our analysis included co-ops that produce wind, solar and biogas energy, and develop bio heating systems and ecovillages. We statistically analysed the ratio of females to males in our sample group. We want to highlight that this dataset does not consider the complexity and diversity of sexual identities due to data collection limitations. As there was no available data, such as an online map or list of all the registered co-ops in Germany, these results are based on the names and pictures of the board members from the 388 scanned co-op websites. Therefore, it does not consider the personal gender identification of the included board members.

### **3.2.2. Online survey**

We prepared an online survey for data collection. We distributed the survey to umbrella associations, organisations and over 300 registered German renewable energy co-ops with an email containing the link to the survey and an explanation of our research interests. We could reach out to only the co-ops with publicly available information through their websites (N=388). We collected some socio-demographic information from the participants but did not ask any questions about personal data (e.g., name, address) that could identify individuals or co-ops. Therefore, participation in the survey was ensured to be voluntary and anonymous. Participants could drop out of the survey without any consequences.

The survey has three sections. The first section asks the respondents their role, motivations, and involvement with the co-op by single or multiple selection questions. Furthermore, we asked how much total investments the participants had in their co-op and whether they allocated weekly hours to co-op activities depending on their role.

The second section collects data for verifying the hypotheses on the perceptions of gender equality in their co-ops. With a 5-point Likert rating scale, we measured how respondents rated gender equality in renewable energy co-ops. Scale points were anchored with the words “very good”, “good”, “average”, “poor”, and “very poor” or “always”, “often”, “sometimes”, “rarely”, and “never”. We asked them to rate the participation of women among the co-op members, their experiences of being members, and the co-ops’ openness to potential members. Finally, the last section collects the socio-demographic information of the respondents, such as age, gender, education level, occupation and annual household income (see Supplementary Files).

### ***3.2.3. Semi-structured interviews***

We conducted semi-structured interviews with stakeholders in renewable energy co-ops in Germany. We had interviews with EB and SB members from four co-ops in Germany that accepted our invitation. We interviewed nine stakeholders (two women and seven men) from eight renewable energy co-ops with snowball sampling (see Appendix). We assured interview participants anonymity, asked for their consent and declared this study's ethical considerations and data protection principles with an information sheet. The interviews aimed to identify in detail the differences and similarities between men and women and other demographic variables, attitudes, and behaviours within the co-ops.

Moreover, we interrogated what socio-cultural barriers women face with their external relations with other groups in the renewable energy sector, such as public authorities, permitting and

planning institutions. Finally, we discussed programs, training and actions that some co-ops used to support diversity in their members. Some questions were: “What do you think are the advantages of being on a co-op board? Did you face any challenges while becoming a member? Does your co-op have any measures to increase the number of women members?” All interviews were conducted through online meeting tools, transcribed and analysed using MAXQDA data management software.

### ***3.3. Measurements and data analysis***

The evaluation of the survey data was carried out with the statistical software SPSS. Cronbach’s alpha ( $\alpha$ ) tests were carried out to assess the reliability of the measurements. When  $\alpha$  was higher than 0.6 or 0.7, the questions were combined to indicate one measurement of the variables. The descriptive statistics and correlations for all measurement items and variables used for the scale questions are summarised in **Table 1**.

The variables were asking the participants to rate their participation experience (1), the openness of their co-op to potential members (2), participation of women (3), awareness of personal conditions (4), consideration of women’s needs (5), measurements to support diversity (6), the relationship between the board and the members (7), and the distribution of responsibilities within the co-op (8). Lastly, we asked the respondents to select the extent of similar opportunities for genders (9) and the barriers women face (10).

The means and standard deviations of the responses from women and men participants were not significantly different from each other according to the independent *t*-test. As only one participant identified as another gender (non-binary) in the survey and the sample was too small to include in the statistical interpretation, we will not discuss their responses separately.

We investigated the institutional governance of co-ops with an intersectional approach. We focused on women's participation, representation and recognition in decentralised energy production by underlying the female-to-male ratio statistics. By surveying and interviewing members of co-ops, we analysed the disproportional visibility of genders and how power relations are structured and reproduced. We explored intersecting patterns in multiple categories, such as gender and social class (Christensen & Jensen, 2012).

We triangulated all the data from the mixed-methods research design (Kuckartz, 2010). We analysed the sex ratio of energy co-op board members to test H1. The sample for EB consisted of N=1012 individuals, and for SB members, N= 1367 people, which resulted in the female-to-

Variable	M	SD	1	2	3	4	5	6	7	8	9
<b>1. Experience</b>	1.66	.708									
<b>2. Openness</b>	1.66	.698	.475**								
<b>3. Participation</b>	2.75	.989	.061	.165*							
<b>4. Awareness</b>	2.22	.724	.430**	.360**	.193*						
<b>5. Consideration</b>	2.39	.837	.297**	.362**	.386**	.620**					
<b>6. Measures</b>	2.40	.824	.216**	.367**	.364**	.486**	.715**				
<b>7. Relationship</b>	1.86	.660	.497**	.492**	.241**	.446**	.372**	.371**			
<b>8. Responsibilities</b>	2.19	.875	.416**	.492**	.192*	.319**	.311*	.294**	.588**		
<b>9. Opportunities</b>	1.50	.815	.199*	.053	.150	.245**	.277**	.193*	.168*	.001	
<b>10. Barriers</b>	3.86	1.069	-.194*	-.104	-.089	-.235**	-.269**	-.199*	-.143	-.186*	-.388**
			[.014]	[.191]	[.277]	[.003]	[<.001]	[.011]	[.071]	[.018]	[<.001]

N=161. M and SD are used to represent mean and standard deviation, respectively. 5-Point Likert scale; 1-8 variables range from (1) “very good” to (5) “very bad” and 9, 10 variables range from (1) “always” to (5) “never”. \*indicates  $p < .05$ . \*\*indicates  $p < .01$ .

**Table 1:** Means, standard deviations, and variable correlations

male ratio analysis. To test the H2, we used two variables (Variables 3 and 9) from the online survey and reflected on these results in the interviews. H3 relates to Variables 1, 8 and 7 from the survey, which we further discussed in the interviews. We included three variables (Variables 10, 4 and 5) from the survey and reflections from the interviews to test H4. Similarly, H5 referred to Variables 2 and 6 from the survey and interview data.

Thematic analysis was used for the interviews to “identify, organise and offer insights into themes” within the data by generating a codebook (Braun & Clarke, 2012). Both descriptive and interpretative codes were created, categorised, and altered until all the themes were logical and meaningful to the respective hypothesis. Finally, we integrated a variety of perceptions into topics and themes introduced in our conceptual framework.

While this study was carried out using mixed-methodological tools and data, there are some limitations to disclose. It was challenging to encourage the co-ops to participate in an interview or distribute the online survey to their members about gender equality. As expected, our quantitative survey sample has biases with older, educated and male respondents. Regarding participation, some respondents left notes to the survey stating their relatively passive role as members, only attending annual meetings and voting for board members. Lastly, our methodology had limitations in having a deeper understanding of the management and leadership roles within a co-op, which we argue in the discussion.

## **4. Results**

This section presents the findings from the sex ratio, online survey, and in-depth interviews in three sections corresponding to the conceptual framework. The  $\alpha$  of the 5-point Likert scale variables of the gender equality questions in the survey was measured at 0.691, which estimates the reliability of the used scales.

### ***4.1. Representation of genders in EB and SB***

We included 388 co-ops in Germany in our sex ratio analysis. Table 2 shows the ratio of female to male board members from the energy co-ops in the respective German state.

Management of the renewable energy co-ops consists of two boards, and H1 argues that there are more men than women in these leadership roles. Our analysis included the sex ratio of SB members (N=1367) and EB members (N=1012) to verify H1. There could be a minimum of 1, a maximum of 20, and on average 3.5 members observed in SB; a minimum of 1, a maximum of 8 and on average 2.6 members observed in EB. The share of females in SB seats (14%) is

Federal States	Number of co-ops	Executive Board members		Supervisory Board Members	
		Female ratio	Male ratio	Female ratio	Male ratio
Baden-Württemberg	149	8%	92%	14%	86%
Bavaria	60	9%	91%	11%	89%
Berlin	5	0%	100%	30%	70%
Brandenburg	12	20%	80%	24%	76%
Bremen	2	17%	83%	33%	67%
Hamburg	3	29%	71%	0%	100%
Hesse	22	11%	89%	10%	90%
Mecklenburg-Western Pomerania	8	20%	80%	21%	79%
Lower Saxony	25	11%	89%	13%	87%
North Westphalia	26	9%	91%	28%	72%
Rhineland-Palatinate	28	10%	90%	13%	87%
Saarland	5	0%	100%	0%	100%
Saxony	12	16%	84%	9%	91%
Saxony-Anhalt	10	21%	79%	20%	80%
Schleswig-Holstein	6	25%	75%	22%	78%
Thuringia	15	6%	94%	4%	96%

**Table 2:** Number of co-ops per 16 German States and their sex ratio of Executive and Supervisory Board members

slightly higher than the number of females in EB (10%). Regarding the number of males in management roles, they constitute the majority in both SB (86%) and EB (90%).

The data shows the underrepresentation of female members in the management of German co-ops. In some regions in Germany, the number of females in leadership positions is lower than in others (see **Table 2**). Thus, our findings support H1.

#### ***4.2. Women`s active participation***

Overall, 466 people opened the link to the online survey. The completed and valid cases that constitute the sample (N=161) represent a response rate of 34.5% (see Appendix), which is relatively high. Internet-based surveys tend to have lower response rates, with extended versions having as low as 12% (Deutskens et al., 2004). The number of men (68.9%) was proportionately higher than women (30.4%), along with one non-binary respondent. Most of the sample was over 55 (61.5%), with 26.8% between 35 and 54 years and 11.8% between 25 and 34 years old. 72% of the respondents had a university, college, or higher degree. Most respondents were either full-time employees (N=65) or retired (N=58). Similarly, over 80% of respondents were in relationships (e.g., married, partnership), with only 11.8% being single. Even though the socio-demographics of the respondents are not heterogeneous, the survey sample is representative of the energy co-ops in Germany, as educated, older men are known to be involved in more than other social groups (Fraune, 2015; Łapniewska, 2019).

H2 expected that members would evaluate women`s participation in renewable energy co-ops to be low. We asked the survey respondents to select their role at the co-op with multiple-choice options. The majority of the respondents (N=100) were active members of the co-op, whereas there were fewer SB members (N=15) than EB members (N=43). There were five employees and six respondents with other roles, such as a founding member of a co-op or board assistant. Over 60% of the participants indicated that they had investments in their co-ops in the amount of 2000€ or more. From this, men respondents (42.3%) had investments over 5000€, whereas women members` investments were more than 5000€ (28.6%), 2000€-5000€ (22.4%) and 200€-500€ (22.4%). Additionally, 38.8% of the women respondents declared an annual household income between 20.001€-50.000€ with ages ranging from 24 to 45 (36.8%) and 55 years and older (41.1%). Of these women, 15.7% were single, and 73.6% were married or living with partners. In contrast, the annual income of men was between 20.0001€-50.000€ (31.5%) and 50.001€-80.000€ (31.5%). The gender pay gap can partially explain the difference between the investment amounts (Fraune, 2015). Moreover, married couples in Germany have joint income



taxation, which adds up the spouses' income, which might impact women's negotiation power to invest [40].

Women's participation variable was checked for its correlation with the opportunities variable ( $p = .057$ ). When asked to assess the participation of women in their co-ops, most of the respondents (41%) answered average, some rated good (23.6%) and poor (20.5%). More men respondents evaluated the participation of women slightly more poorly than women respondents. Furthermore, most respondents (67.1%) believed that opportunities to invest in co-ops are always equal for women and men. Within that, more men (72.1%) argued the opportunities to be always the same, whereas responses of women ranged between always (55.1%), often (26.5%) and sometimes (16.3%).

Although the survey results evaluated the participation of women in energy co-ops as somewhat balanced, other variables and interviews discovered further insights. In seven interviews, participants estimated the number of women members in their co-ops to range between 30% - and 40%. Even though the opportunities seem equal for all, other aspects like the gender pay gap and domestic responsibilities, like household workload, came into the discussion as underlying factors in the interviews. One respondent explains the different experiences of genders as follows:

*“We now have women entering these professions as accountants, businesswomen, and engineers. But the whole scene is still very much dominated by men in their 60s. These are mainly the pioneers who started the energy transition 20 or 30 years ago, either working in a company or starting a cooperative...As far as participation is concerned, there is complete equality. Any woman can become a member at any time, can participate just like anyone else, and any woman can run for office just as well. There are also no invisible limits for a board position or a supervisory board. It is, so to speak, a consequence of the overall context that no women were involved up to now.”*  
(Executive Board member, Man)

In terms of participation and investment opportunities, there are no technical burdens, but in practice, the share of women as members and co-op leaders is lower than that of men. Therefore, the results partially support H2.

#### **4.3. Democratic and self-functioning co-ops**

H3 expected the relationship between the boards and members to be working well. There tends to be a group identity within energy co-ops, with members having similar values and

motivations towards the energy transition (Rommel et al., 2018). The most frequently answered option for how survey participants became aware of the involvement opportunity was through personal contact with the project and co-op initiators (30.4%). Other answers were: attending public information events (24.2%) and doing individual research on co-ops (19.9%). For women respondents, personal contact with initiators (24.5%) and recommendations from friends, family or neighbours (22.4%) were selected as the most common options. Men, on the other hand, apart from their contact with initiators (32.4%), found more opportunities at public information events (27%).

Survey respondents selected contribution to the energy transition as the most frequent (85.1%) motivation to be involved in a renewable energy co-op. The following frequent answers were to create dialogue and acceptance of technologies in a place (33.5%) and co-op's democratic and participatory structure (30.4%). Other motivations were the financial advantages of investments, bringing competition to the energy landscape, being independent of fossil fuels and creating regional added value. For men (31.5%), the financial advantages of the co-op were a more critical motivation factor than for women respondents (16.3%).

One interviewee defined *co-ops* as the most simple, democratic, and advantageous form of financial participation. Similarly to the quantitative findings, the qualitative data shows that taking individual and collective actions toward climate change are the main motivations. Other drivers were active involvement in the energy transition, having financial benefits from renewable energy production and contributing to the acceptance of technologies.

Over half of the respondents dedicate weekly hours to co-op activities, including working or volunteering. When asked if the indicated working time affected their domestic responsibilities (e.g. childcare, eldercare, house chores), men respondents mostly disagreed, whereas women respondents agreed with the statement. For the retired participants from the interviews, the workload of being a board member was easy to manage. For other interviewees that were employed and board members, balancing household responsibilities and volunteering tasks could become challenging at times. One interviewee reflected on the volunteer-based workload for women as follows:

*“Of course, our experience is that voluntary participation in a cooperative, in some cases, is more difficult for women. One example of this was the last constitution of our Executive Board, where a woman was approached to join the Board, and she was very keen to do so but then cancelled at short notice because she did not think she could do*

*it with two children and her own business. (She) found out in the preliminary discussions that the meetings were held at inconvenient times. 6 to 7 p.m., when dinner is served, and you go to bed, it is tough to reconcile that.*” (Managing Director at a co-op, Man)

Experience variable showed a significant correlation with responsibilities ( $p = .001$ ) and relationships ( $p < .001$ ) variables. Survey participants were asked to rate their experience of being involved in a co-op, and most of the answers were either very good (47.2%) or good (40.4%). Furthermore, the distribution of responsibilities between the board and its members was evaluated well (47.2%). The responses were mostly good (56.5%) when asked about the relationship and connection between the co-op board and its members. Triangulation of the survey and interview data, therefore, supports H3.

#### **4.4. Obstacles for women**

We hypothesised that women face more obstacles or gender barriers than men members within co-ops (H4) and that the co-ops' consideration and awareness of women's needs and diversity would be evaluated low (H5). The barriers variable was negatively correlated with awareness ( $p = .003$ ) and consideration ( $p < .001$ ) variables. Survey participants estimated to what extent women in search of opportunities or involved within co-ops would face gender barriers. The answers were equally circulated between rarely (33.5%) and never (33.5%), followed by sometimes (21.7%). For women respondents, the possibility of encountering barriers was rare (34.7%), followed by sometimes (28.6%). Whereas for men members, the most frequent answer was never (38.7%), followed by rarely (33.3%).

Participants rated the co-op's awareness of family and personal living conditions to be good in the overall sample (48.4%), whereas women's answers were primarily average (44.9%). When asked to rate the co-op's consideration of women's strategic and practical needs, the answers were mainly average (39.1%). Answers from women respondents were mostly piled up on the co-ops' consideration to be average (49%), whereas more men evaluated it to be good (42.3%).

Concerning H5, we asked the participants to rate the openness of co-ops to potential members and the opportunities. The responses mostly ranged between very good (45.3%) and good (44.1%). Lastly, measurements of co-ops to ensure diversity and inclusion for all groups were rated mostly average (43.5%) by all participants. There were no significant differences between the answers of women and men participants.

Survey respondents selected three barriers for women that would hinder their participation in an energy co-op: lack of awareness of opportunities ( $N=73$ ), lack of financial resources ( $N=70$ ),

and the technicality of the projects being a determinant (N=67). Responses that followed were lack of time, lack of gender targets in co-ops, complex political framework of co-ops, no obstacles, and lack of attractiveness for women.

During the interviews, all the board members highlighted the co-ops to be open and accessible to all. However, they considered that co-ops should be more attractive for women than other participation opportunities within the energy transition. It has a democratic structure, but it does not address the limitations of specific groups as they are trying to survive as companies. A man respondent emphasised that “it is, unfortunately, the case that *women are difficult to find or inspire*”. However, respondents also mentioned that women have fewer financial resources and time to be involved in co-ops. Additionally, stereotyping of women as not fitting to technical areas, lack of women representation in localised energy production and gender equality on the policy level were discussed as hindrances for women.

In line with the findings from the survey and interviews, obstacles for women are more common than for men. However, the analysis allows us only partially to verify H4. Even though co-ops are open for potential members, as H5 argues, diversity or inclusion for all social groups is not mainly addressed.

#### ***4.5. Suggestions and measures to diversify co-ops***

Survey respondents selected 3 of 6 provided measurements to increase the number of women in energy co-ops and the option to write one themselves. The most frequent answers were holding information and discussion events for women, networking, sensibility and awareness campaigns on gender and diversity. For women respondents, it was also essential to have *equal and flexible working/ volunteering tasks* and have *knowledge exchange between women in leadership roles*.

During the interviews, one of the leading suggestions to overcome gender barriers was to have promotional programs. Some of the co-ops we interviewed applied for these programs to address gender issues and encourage a diverse group of people to be involved in their organisation. Workshops for women to introduce the co-op structure, training for all genders to recognise inequalities and support women’s empowerment by training them for leadership roles were suggested as measures.

Improvement of the communication strategies was highlighted in the interviews as well. Developing the technical language and outdated websites of co-ops could appear more attractive to a broader audience. In one of the interviews, this was emphasised:

*“We try to have a gender gap communication to focus on male and female members, to show the diversity of our membership and all the tools. We are very interested in having members of all ages, all backgrounds, all ethnicities, and an intersectional approach. Especially people with a migrant background. But it is not easy. Measures might be tried to address to prepare the material and the information in a language which is understandable for all people. Communication is a big topic.”* (Executive Board Member at a co-op, Woman)

Even though this paper focuses on women, we asked the survey respondents to select other social groups they see as underrepresented. Low-income groups were the most frequent answer (N=89), followed by immigrant background groups (N=75) and younger people (N=72). Similarly, the interviews highlighted younger people and people with limited financial resources as underrepresented groups. However, some respondents argued that this tendency is related to taking over responsibility and becoming a shareholder or a member rather than having the resources to do so.

Setting a low share limit to participate and invest in a co-op and having more national co-ops instead of only local ones could encourage a more diverse group of members. Additionally, grandparents buying shares in a co-op for their grandkids could inspire younger generations to be involved in the energy transition.

## **5. Discussion**

Renewable energy co-ops in Germany play an essential role in contributing to decentralised energy production and the energy transition. Due to their social structure, co-ops have the potential to reflect the dynamics of public participation (Yildiz et al., 2015). This study further investigated the recognition aspect of justice within co-ops and explored the different implications for genders. We will discuss the implications of the findings in this section.

Renewable energy co-ops in Germany seem to be managed and occupied mostly by men, which is also found by other studies (Fraune, 2015; Radtke & Ohlhorst, 2021; Rommel et al., 2018). Survey results indicated a significantly higher number of investments from men, which also relates to the indicated income of men being higher than women. However, gender injustices were not recognised strongly by the management of the co-ops, and there was a strong emphasis on the co-ops being open to any interested person (Lazoroska et al., 2021). The gender pay gap explains one crucial aspect of our findings: involvement within co-ops requires financial resources (Clancy & Roehr, 2003; Fraune, 2015). A lower-threshold offer and sharing the

investments with other individuals for membership would create fewer financial risks. It could also overcome the concerns over the complete layperson of an investment. It would also be helpful to keep the minimum financial investment low enough to diversify the participation, Wierling et al. suggest (Wierling et al., 2018).

We found expectations of the financial profits of co-ops to be important motivations, similar to other studies (Bauwens et al., 2016; Wassermann et al., 2015). Likewise, literature shows that the motivations of men and women in their involvement in local energy initiatives tend to differ (Clancy & Feenstra, 2019; Dóci & Vasileiadou, 2015; Holstenkamp & Kahla, 2016). Our results showed that men selected financial benefits from the co-ops as a significantly more motivating factor than women. For women, contribution to the energy transition was the most significant driver, followed by the co-ops' democratic and participatory structure. Women's cultural and socio-ecological framings about their environment tend to differ from men's macro-political framing of energy issues, as Yaka suggests, which might impact their motivations (Yaka, 2019). These align with the studies that argue climate protection for future generations is affiliated more with women's involvement in environmental movements (Cable, 1992; Radtke & Ohlhorst, 2021).

In contrast, ecofeminism critically examines the women-nature-femininity nexus that constructed gendered, racial and ecological inequalities and exclusion worldwide (Bell et al., 2020). Women's active and meaningful participation in renewable energy production seems limited. Hegemonic masculinity tends to dominate the political discourse under eco-modern goals by favouring existing solutions rather than demanding systematic change (Hultman, 2013). Our results also show that participation and leadership motives are more vital for men than women (Holstenkamp & Kahla, 2016; Radtke & Ohlhorst, 2021).

Previous studies argue that the volunteer-based workload of co-ops could be one barrier for women (Clancy & Feenstra, 2019; Fraune, 2015). However, some studies suggest that women tend to take on volunteering activities more than men (Allen et al., 2019). Our results show that women who allocate weekly hours for their co-op activities agree with its negative impact on their household workload. This impact relates to social norms of the gendered division of domestic labour that might affect women's ability to volunteer (Clancy & Roehr, 2003; Wiese, 2020). Therefore, realising the different needs of genders, allowing flexibility for co-op tasks and planning activities in times that fits a broader group, rather than retired or unemployed people, would potentially support the involvement of women. Additionally, offering women

employment and pay to manage a co-op could be another solution (Clancy & Feenstra, 2019; Łapniewska, 2019).

Our findings highlight that women and men are informed about opportunities differently. Most men respondents suggested that women were not interested in taking on responsibilities in energy co-ops. Energy technologies are scripted as masculine, which could also limit women's engagement enforced by gender norms (e.g. (Mort, 2019)). We further argue that men categorising women as *uninspired* (Executive Board member at a co-op, Man) is a barrier and feeds into the stereotyping of women. Unless the potential members have a direct connection to project initiators, recommendations from their social surroundings are essential drivers for women's involvement in energy co-ops. Members' social networks may also play a role in which genders are invited or encouraged to join the co-op boards.

Studies argue that technical knowledge of energy systems plays a vital role in the management of co-ops (Brummer, 2018). Contrary to this pre-condition, our findings highlight the importance of *learning-by-doing* for leadership rather than special technical training or skill sets. Leadership is key to facilitating the co-op model (Ghorbani et al., 2020). Our findings support the recommendation to create a mentorship program for women to exchange experiences, ideas, and competencies as a subsidiary co-op model. A network for women involved and interested in finding opportunities in energy co-ops around Germany could support that (Clancy & Roehr, 2003).

The needs of women concerning energy issues are reflected differently in Germany than in the Global South, where the practical, productive, and strategic needs of women are changing and need further attention (Feenstra & Özerol, 2021). The needs of women differ within the intersections of their social class, age and racial ethnicity as well. Our findings and literature show that renewable energy co-ops should address the inequalities and create awareness, knowledge and expertise to overcome disparities (Mignon & Rüdinger, 2016). Programs to discuss ways of including women in co-ops propose an opportunity for active learning, brainstorming and encouragement for a more heterogeneous group to be involved. However, most co-op members work on a volunteer basis, and their time, opportunities, and resources are limited as they are dependent merely on their members' equity and investments, similarly to Bauwens et al. suggest (Bauwens et al., 2016). Market-independent support mechanisms through a government program would help overcome these limitations.

Lastly, women are not the only underrepresented group in co-ops. Our analysis focused on women, although we also examined intersections of vulnerable groups. We identified low-

income groups as the most prominent underrepresented group in energy co-ops, which supports previous findings showing that mostly middle-class benefits from co-ops (Rommel et al., 2018; Yildiz et al., 2015). Some social groups experience multiple underrepresentation in energy co-ops simultaneously due to their income, racial ethnicity and gender. Furthermore, focusing on other intersections of marginalised groups, such as Black people and people of colour, may yield further inequalities that we did not investigate in the scope of this study. One aspect that could be improved is the image of the co-ops, as it might be intimidating for some social groups to get involved in a structure that could be called an *old boys club* (see also (Brisbois, 2019)). The co-ops should try lighter language in their advertisements, which would be more understandable for people outside the industry or technical areas.

Our results show the encouragement to have younger generations involved in the energy transition and co-ops. According to our findings, buying co-op shares as membership gifts for younger people is one practical aspect. Communication and advertisement tools like being present in local events (e.g., Fridays for Futures demonstrations, stands in local markets, ads on bike sharing apps), could target a wider interest group for co-ops. Some co-ops have websites to inform their communities, but communication through social media platforms and town websites can increase visibility. However, the financial resources of individuals could still be a limitation to participating. Co-op activities can become a burden for board members that have full-time jobs. Creating employment or internship opportunities through government-supported co-op programs could be an alternative solution to attract the youth and support co-op board members.

Future research could investigate renewable energy co-ops as in-depth case studies and examine what type of leadership the board members have and whether this differentiates between genders. It would be valuable to observe women's leadership in a male-dominated environment and whether they act according to the institutionalised masculine norms like Magnusdottir and Kronsell suggest (Magnusdottir & Kronsell, 2015). One suggestion from the literature (see (Listo, 2020)) could be to organise a focus group discussion at a convenient time for women while allowing them to bring young children to the meeting. It might overcome some recruiting and methodological issues in this study (see (Listo, 2020)).

Another factor that could be further examined is the urban-rural contrast and whether co-ops in bigger cities with more members tend to attract a diverse group. This study indicates overall results for German energy co-ops, but we realise the cultural and socio-economic differences between regions. The generalisability of the study results is conditional on the different



characteristics of the co-ops (e.g., amount of members and type of project investments). Future research could explore gender nuances in co-ops comparatively and examine place-based influences. With such research efforts, the socio-cultural and institutional barriers for women could become visible, and we could take one more step towards a more inclusive energy transition.

## **6. Conclusions**

This study aims to reveal social inequalities in women's participation, involvement and leadership in local German energy initiatives. We use gender and justice as analytical categories to investigate a local engagement structure: cooperatives. Our findings highlight the statistical dominance of male members in energy co-ops. Rather than only reporting on the quantitative gender-related differences, we further deepen the knowledge about the sensibility of power relations and social inequalities with the intersections of socio-cultural identities.

The results of this study show that women are underrepresented in the management and leadership roles in renewable energy co-ops around Germany. Factors like lack of awareness of opportunities, time, and the gender pay gap impact this imbalance. Moreover, the results argue that women are stereotyped as uninspired and unwilling to take on the leading role without considering the existing gendered social context within co-ops. Umbrella co-op organisations (e.g., national and federal state-level associations) could have programs to spotlight woman board members and create visibility for the gender imbalance in co-ops. Women's leadership and participation encourage other women to join through better communication strategies. Language and pictures on the co-op's website and flyers could be improved and diversified. Another solution could be to create support programs through government schemes that would include mentoring for women involved in co-ops and those interested in joining. Moreover, other social groups (e.g., immigrant and low-income groups) could also benefit from recognising these intersections of social class, ethnicity and age. By applying an intersectional approach, the social distribution of benefits from co-ops should be accessible to a broader social group.

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## Appendix

<b>Age</b>	<b>Percentage</b>
18-24	-
25-34	11.8%
35-44	7.5%
45-54	19.3%
55-64	28.0%
65 and older	33.5%
<b>Education</b>	
No formal education	-
Primary/ secondary school degree	3.1%
Middle school degree	4.3%
High school degree	3.1%
Training degree	15.5%
College degree	21.7%
Bachelor degree	33.5%
Master degree	8.1%
Doctoral degree	8.7%
No indication	1.9%
<b>Annual household income</b>	
Under 20,000€	5.0%
20,001€ - 50.000€	33.5%
50.001€ - 80.000€	28.6%
80.001€ - 110.000€	11.8%
110.001€ - 150.000€	8.1%
150.001€ and more	2.5%
No indication	10.6%
<b>Federal state</b>	
Baden-Württemberg	9.3%

Bavaria	6.2%
Berlin	5%
Brandenburg	1.2%
Bremen	1.9%
Hamburg	1.2%
Hesse	5.6%
Mecklenburg-Western Pomerania	1.2%
Lower Saxony	2.5%
North Rhine-Westphalia	3.7%
Rhineland-Palatinate	8.1
Saarland	49.1%
Saxony	0.6
Saxony-Anhalt	-
Schleswig-Holstein	1.2%
Thuringia	3.1%

N=161

**Table 3:** Socio-demographics of the survey sample

	<b>Role at the co-op</b>	<b>Gender</b>	<b>Occupation</b>
<b>1</b>	SB	Male	Retired/ Administration
<b>2</b>	EB	Male	Retired/ Information technology
<b>3</b>	EB	Male	Engineer
<b>4</b>	EB	Male	Retired/ Teaching
<b>5</b>	EB	Male	Retired/ Finance
<b>6</b>	EB	Male	Managing director at co-op
<b>7</b>	SB	Female	Energy project developer
<b>8</b>	EB	Female	Coordinator at NGO
<b>9</b>	Membership in multiple co-ops	Male	Head of renewable energy department

N=9

**Table 4:** Information on the interviewees**References**

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## Appendix

### Paper 1

#### Interview Guideline

1. Can you please describe some examples where in your research area social norms play a role? Please give examples for illustration.
2. Which other factors are important to name connected with social norms?

*Social norms and wind energy*

3. What, in your opinion, could be the some examples of implicit assumptions of a wind energy project? How these assumptions, in your opinion, would be transmitted within groups/communities? Could these assumptions (positive/neutral/negative) turn into a social norm?
  - a. Would this depend on the number of people engaging in behavior/action according to these assumption?
  - b. If so, who (which actors/agents, such as public institutions, friends, family, neighbors) would be more influential in the group? Why?
  - c. To what extent local, national and social media could shape these assumptions?
4. What conditions could there be, in the development of a project, for personal norms to get overridden by communal/social concerns?
  - a. What role, in your experience, culture and its impacts would play a role in this relationship?
5. Would a group member with pro-environmental values and strong group identity, follow a norm indicating negative responses to a wind project? And why?
6. What are some patterns of behavior you have observed in this context that could be the conjectures of a social norm?
7. What could be the pre-existing norms of participation in wind energy projects? Different from legal regulations, are there participation norms? In your view, how inclusive are the types of participation?
  - a. Could national, regional or municipal legal frameworks shape these norms? If so, which level will be more effective?
8. In your own experience, did you observe any gender norms in wind energy development? If so, could you give examples?

- a. In your research area, how would you describe the gender ratio? To what extent acceptance research considers the unwritten rules of cultures and allows visibility, voice and power to all members of the community?

*Norms of justice perceptions*

9. In your experience, which dimensions of justice are highlighted more by the public in response to wind energy projects?
10. What could be some examples of norms that can shape the evaluation of the fairness of wind projects?
  - a. Which criteria of justice would come forward in a group with strong social identity?
  - b. Could a national framework of fair wind energy (such as fair labelling) standardize justice principles? Could this create “just wind energy” norms?
11. In which phase of evaluating a wind project, norms would have stronger influence?
  - a. Which discourses, in your opinion, could be useful for public interpretation of a wind project?
  - b. Could these discourses serve both social norms feedback and individual feedback? Could they have impact on both societal and personal levels?

## **Paper 2**

### **Interview Guideline (Translated from German)**

*General information about the project*

1. Could you let us know what your role in the project was/is?
2. Could you describe the project for us? (size, number of turbines, site, etc.)
3. What are, in your opinion, the advantages/disadvantages of the project?
4. Who initiated the project?
5. What is the status of the project? (In planning/all permits available/ under construction/ completed/ cancelled)
  - a. If cancelled; what are the reasons that the project could not be carried out?
6. Who do you think had an influence on the outcome of the project?

- a. Did the local politicians support/oppose the project?
  - b. Did the local population discuss the opinion of the mayor regarding the project?
  - c. Did the local population share the view of the local politicians?
7. How did you perceive the planning process?
- a. Were you involved in the planning process?
  - b. What are your thoughts about the other actors' involvement?
8. What were the biggest challenges you encountered during the planning process?
9. Where do you see the greatest potential for the project?
10. How would you evaluate the project overall?
- a. What motivated you to support/oppose the project?

*Attitudes towards renewables and climate change*

1. Do you think climate change is a threat?
2. Do you think it is still manageable?
3. Who do you think should act? (government, private sector, citizens, consumer)

*Acceptance, participation and public perceptions*

1. How was the project perceived by the local population? (What mood did you observe in the population about the project proposal?)
2. What were the reactions to the project proposal?
  - a. Were the reactions different depending on the proximity to the planned project/proposed project/implemented project?
3. Were there initiatives or opposition groups that formed against this project?

*If yes: Active opposition*

1. What objections, concerns and causes have citizens raised with respect to this project?
  - a. Were these concerns considered?
  - b. Which persons or groups expressed their objections?



- i. Were these groups organized?
  - c. Were people afraid to voice their opinion against the project?
  - d. Were people afraid to voice their opinion supporting the project?
    - i. What was the main narrative about the power plant in the municipality?  
(E.g. infrasound, wildlife, health issues, visual impacts etc.)
    - ii. Who was affecting/influencing the narrative most?
2. What were the actions taken to overcome these conflicts?
  - a. Were measures taken as e.g. citizen participation, information campaigns to increase the acceptability?
    - i. If yes, was there / will there be the possibility for citizens to participate in the planning and decision-making processes of the project?
      1. If yes, how and at what time during the project?
    - ii. If no, why did no participation of the residents take place?
3. Was there the possibility for citizens to participate financially in the projects?
  - a. What was offered?
  - b. If yes; what is the (approx.) percentage of those who have participated financially in the project?
    - i. What could have been the reasons for not participating financially?
  - c. If no; do you think this could have changed the project outcome?

*If no:* Why do you think there was no active opposition?

#### *Successful implementation*

1. Why do you think the project was successful?
2. What do you think worked well for this project? (E.g., information events, public opinion polls etc.)
  - a. Who were the initiators of these measures? What was your role in them?
  - b. Can you recommend communication strategies and tools that helped you?

*Cancelled project*

1. Why do you think the project was not successful?

*Last questions*

2. Lastly, are there any aspects we have not mentioned yet that are important?
3. Is there anybody that you think we should talk to who played a key role?

**Paper 3****Online Survey (Translated from German)***Questions about membership*

In the following questions, we will ask you about your involvement within the cooperative. We would like to understand the main motivations to invest in a cooperative.

1. Where is your cooperative based? *Single choice*

- |   |   |
|---|---|
| <input type="checkbox"/> Baden-Württemberg                | <input type="checkbox"/> Bavaria                |
| <input type="checkbox"/> Berlin                           | <input type="checkbox"/> Brandenburg            |
| <input type="checkbox"/> Bremen                           | <input type="checkbox"/> Hamburg                |
| <input type="checkbox"/> Hesse                            | <input type="checkbox"/> Lower Saxony           |
| <input type="checkbox"/> Mecklenburg-Western<br>Pomerania | <input type="checkbox"/> North Rhine-Westphalia |
| <input type="checkbox"/> Rheinland-Palatinate             | <input type="checkbox"/> Saarland               |
| <input type="checkbox"/> Saxony                           | <input type="checkbox"/> Saxony-Anhalt          |
| <input type="checkbox"/> Schleswig-Holstein               | <input type="checkbox"/> Thuringia              |

2. What is your role at the cooperative? *Multiple choice*

- |  |  |
|--|--|
| <input type="checkbox"/> Board of directors      | <input type="checkbox"/> Supervisory board |
| <input type="checkbox"/> Employee                | <input type="checkbox"/> Member            |
| <input type="checkbox"/> Other (please specify): |  |
| _____  |  |

3. How did you learn about the investment opportunity at your cooperative? *Multiple choice*

- Prior experience with another cooperative
- Prior personal engagement with the cooperative
- Own research
- Recommendations from friends, family or neighbours
- Personal contact to initiator of the project
- Public information and consultation events
- Other (please specify): \_\_\_\_\_

4. What is the total amount of investments you have at the cooperative? *Single choice*

- Less than 200€
- 200€ - 500€
- 500€ - 1,000€
- 1,000€ - 2,000€
- 2,000€ - 5,000€
- More than 5,000€

5. What was your biggest motivation to invest in this cooperative? *Single choice*

- This cooperative has financial benefits for me
- This cooperative contributes to the energy transition and sustainable development
- This cooperative creates local dialogue and acceptance
- This cooperative is democratic and participative
- Other (please specify): \_\_\_\_\_

6. How would you describe your activities in the cooperative? *Multiple choice*

- Attending meetings
- Organizing meetings
- Contributing ideas
- Voting on decisions
- Other (please specify): \_\_\_\_\_

7. How many hours in a week do you spend for the cooperative related work and activities?  
*Single choice*

- None
- Less than 3 hours
- Between 3 hours and 7 hours
- More than 7 hours

Other (please specify):  
 \_\_\_\_\_

\*If “none”, please skip to question 10.

8. Do you think this time spent on cooperative related work affect your household workload?  
 (E.g. chores, child or elder care) *Single choice*

- Strongly agree                       Agree  
 Neutral                                       Disagree  
 Strongly disagree

9. Do you think this time spent on cooperative related work affect your free time? (E.g. hobbies, social life) *Single choice*

- Strongly agree                       Agree  
 Neutral                                       Disagree  
 Strongly disagree

#### *Questions about gender equality*

In the following questions, we will ask your views on the different experiences women and men have within a renewable energy cooperative. We would like to understand the management and decision-making practices within a cooperative.

10. How do you rate the participation of women among the cooperative shareholders? *Single choice*

- Very good                                       Good  
 Average     Poor  
 Very poor

11. To what extent do women and men have similar opportunities to invest in renewable energy cooperatives? *Single choice*

- Always     Often  
 Sometimes     Rarely  
 Never

12. To what extent do women in renewable energy cooperatives or seeking such opportunities face gender-related barriers? *Single choice*

- |                                    |                                 |
|------------------------------------|---------------------------------|
| <input type="checkbox"/> Always    | <input type="checkbox"/> Often  |
| <input type="checkbox"/> Sometimes | <input type="checkbox"/> Rarely |
| <input type="checkbox"/> Never     |                                 |

13. How do you rate your experience of becoming a member of the cooperative? *Single choice*

- |                                    |                               |
|------------------------------------|-------------------------------|
| <input type="checkbox"/> Very good | <input type="checkbox"/> Good |
| <input type="checkbox"/> Average   | <input type="checkbox"/> Poor |
| <input type="checkbox"/> Very poor |                               |

14. How do you rate your cooperative's openness and participation features to potential shareholders? *Single choice*

- |                                    |                               |
|------------------------------------|-------------------------------|
| <input type="checkbox"/> Very good | <input type="checkbox"/> Good |
| <input type="checkbox"/> Average   | <input type="checkbox"/> Poor |
| <input type="checkbox"/> Very poor |                               |

15. How do you rate the distribution of responsibilities between cooperative management and shareholders? *Single choice*

- |                                    |                               |
|------------------------------------|-------------------------------|
| <input type="checkbox"/> Very good | <input type="checkbox"/> Good |
| <input type="checkbox"/> Average   | <input type="checkbox"/> Poor |
| <input type="checkbox"/> Very poor |                               |

16. How do you rate the relationship between cooperative board members and shareholders? *Single choice*

- |                                    |                               |
|------------------------------------|-------------------------------|
| <input type="checkbox"/> Very good | <input type="checkbox"/> Good |
| <input type="checkbox"/> Average   | <input type="checkbox"/> Poor |
| <input type="checkbox"/> Very poor |                               |

17. How do you rate your cooperative's mindfulness of family or personal living conditions, including different effects and responsibilities for women and men members? *Single choice*

- |                                    |                               |
|------------------------------------|-------------------------------|
| <input type="checkbox"/> Very good | <input type="checkbox"/> Good |
| <input type="checkbox"/> Average   | <input type="checkbox"/> Poor |
| <input type="checkbox"/> Very poor |                               |

18. In your opinion, how considerate and inclusive your cooperative is for women's practical and strategic needs? *Single choice*

- Very good                       Good  
 Average                          Poor  
 Very poor

19. How do you rate the actions your cooperative takes to ensure diversity and inclusiveness? *Single choice*

- Very good                       Good  
 Average                          Poor  
 Very poor

20. In your opinion, what could be the main barriers for women to participate in renewable energy cooperatives? *Three choice*

- Lack of financial resources  
 Lack of time  
 Lack of awareness of opportunities  
 Lack of gender targets at cooperatives  
 Technical projects being deterrent  
 Difficult political framework of cooperatives  
 Other (please specify): \_\_\_\_\_

21. Do you see other social groups that are underrepresented in your cooperative? *Three choice*

- People with low income  
 Young people  
 Migration background  
 LGBT+ community  
 People with disabilities  
 Other (please specify): \_\_\_\_\_

22. In your opinion, what are some measures needed to support women in renewable energy cooperatives? *Three choice*

- Information and discussion events
- Networking
- Mainstreaming gender in energy policies
- Sharing experiences of women as leaders
- Awareness raising campaigns
- Equitable and flexible work/volunteer opportunities
- Other (please specify): \_\_\_\_\_

23. Do you have any further comments about gender equality in renewable energy cooperatives? *Open ended question*

#### *Demographic questions*

In the following questions, we will ask some demographic questions to control our survey sample. All responses in the survey will be kept anonymous. Any response that might be used in any future publication will not be made directly attributable to you or your cooperative.

24. What is your age? *Single choice*

- |                                |                                      |
|--------------------------------|--------------------------------------|
| <input type="checkbox"/> 18-24 | <input type="checkbox"/> 25-34       |
| <input type="checkbox"/> 35-44 | <input type="checkbox"/> 45-54       |
| <input type="checkbox"/> 55-64 | <input type="checkbox"/> 65 and over |

25. What gender do you identify as? *Single choice*

- |   |  |
|---|--|
| <input type="checkbox"/> Female                           | <input type="checkbox"/> Male              |
| <input type="checkbox"/> Other (please specify):<br>_____ | <input type="checkbox"/> Prefer not to say |

26. What is your marital status? *Multiple choice*

- |                                  |  |
|----------------------------------|--|
| <input type="checkbox"/> Single  | <input type="checkbox"/> Living with partner   |
| <input type="checkbox"/> Married | <input type="checkbox"/> Divorced or separated |
| <input type="checkbox"/> Widowed | <input type="checkbox"/> Prefer not to say     |

27. Do you have any children, or other dependents, that you look after? *Single choice*

- |                              |                             |
|------------------------------|-----------------------------|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No |
|------------------------------|-----------------------------|

Prefer not to say

28. What is the highest degree or level of education you have completed? *Single choice*

- |  |  |
|--|--|
| <input type="checkbox"/> No formal education | <input type="checkbox"/> Elementary school |
| <input type="checkbox"/> Middle school       | <input type="checkbox"/> High school       |
| <input type="checkbox"/> Bachelor`s degree   | <input type="checkbox"/> Master`s degree   |
| <input type="checkbox"/> PhD or higher       | <input type="checkbox"/> Prefer not to say |

29. What is your current employment status? *Multiple choice*

- |   |   |
|---|---|
| <input type="checkbox"/> Employed full-time | <input type="checkbox"/> Employed part-time |
| <input type="checkbox"/> Self-employed      | <input type="checkbox"/> Unemployed         |
| <input type="checkbox"/> Home-maker         | <input type="checkbox"/> Student            |
| <input type="checkbox"/> Retired            | <input type="checkbox"/> Prefer not to say  |

30. What is your annual net household income? *Single choice*

- |  |   |
|--|---|
| <input type="checkbox"/> Less than 20,000€   | <input type="checkbox"/> 20,001€ - 50,000€  |
| <input type="checkbox"/> 50,001€ - 80,000€   | <input type="checkbox"/> 80,001€ - 110,000€ |
| <input type="checkbox"/> 110,001€ - 150,000€ | <input type="checkbox"/> More than 150,000€ |
| <input type="checkbox"/> Prefer not to say   |   |

### **Interview Guideline (Translated from German)**

#### *Membership and motivations*

1. What was your motivation to be involved in your cooperative?
  - a. How did you learn about the investment opportunity at your cooperative?

#### *Activities*

2. What is your role at the cooperative?

#### *For the board/management members:*

3. What activities do you do at the cooperative?
4. What do you think are the advantages of being in the board/management?
5. How do you attract citizens as members?

#### *For the members of the cooperatives:*



6. What activities do you do at the cooperative?
  - a. Which of your activities connect to voting?
7. Would you have like to be in the board/management? Why?

*Volunteering/working and personal life balance*

8. How much time in a week do you spend for the cooperative related work and activities?
  - a. Does this time affect your household workload? (E.g. chores, child or elder care)  
If yes, how did you balance your domestic tasks?
  - b. Does this time effect your leisure time? (E.g. hobbies, social life, personal time)  
If yes, how did you create work-life balance?

*Perceptions and experiences*

9. Do you think women and men at your cooperative experience similar investment opportunities? Are opportunities same for women and men members?
  - a. What is the approximate percentage of women members at your cooperative?
  - b. Are there women board members in your cooperative?
    - i. If no, why do you think there is none?
    - ii. If yes, do you think this is common in other cooperatives?
10. What could be the some barriers for women to invest in renewable energy cooperatives?
11. Did you face any challenges while becoming a member of the cooperative?
12. Does your cooperative have any measurements to increase number of women members?
  - a. Can you think of any measures to support women in renewable energy cooperatives?
  - b. Are there any opportunities to promote the leadership of women in your cooperative?
13. Do you see other social groups that are underrepresented in your cooperative?
14. Is there anything else you would like to add on this topic?