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How just are regional Austrian energy transitions? Exploring the role of energy justice and social sustainability in the energy model district Freistadt in Upper Austria

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Abstract

Addressing climate change requires urgent reductions in carbon dioxide emissions and the transformation of critical systems, such as the energy sector. While technological advancements and economic sustainability often dominate discussions on energy transitions, social aspects – such as fairness, inclusiveness and justice – are equally important. This thesis applies the framework of Energy Justice (EJ) to explore how principles of justice can guide the shift to low-carbon energy systems. EJ focuses on three dimensions: distributional justice, procedural justice and recognition justice. Together, they can help identify inequalities, highlight marginalised groups and propose ways to address these issues. The concept of Just Transition (JT) underpins EJ by emphasising equity in socio-economic transformations. Since the Paris Agreement in 2015 and the adoption of Sustainable Development Goals (SDGs), JT has gained prominence as a framework for ensuring fairness in sustainability efforts. EJ builds on this by offering a detailed approach to understanding justice in energy systems.

This thesis investigates how EJ principles are applied in practice through the case study of Freistadt, a climate and energy model district in Upper Austria. Since 2009, Freistadt has made a notable effort to transition to renewable energy sources. Combining two methods, the study uses policy document analysis and semi-structured interviews with stakeholders from the region. These include policymakers, regional development agencies, investors, academics and energy industry professionals. Findings reveal that integrating EJ principles enhances social acceptance, citizen participation and long-term success but also highlights challenges such as power imbalances and limited representation of marginalised groups. By embedding fairness and inclusiveness into energy transitions, this thesis demonstrates how EJ can contribute to broader goals like equity and energy resilience. It offers practical recommendations for Freistadt's continued progress while underscoring EJ's potential to shape future approaches to sustainable energy transitions.

Kurzfassung

Die Eindämmung des Klimawandels erfordert eine dringende Reduktion der Kohlendioxidemissionen und die Umgestaltung kritischer Systeme, wie beispielsweise des Energiesektors. Während technologische Fortschritte und wirtschaftliche Nachhaltigkeit häufig die Diskussionen über die Energiewende dominieren, sind soziale Aspekte – wie Fairness, Inklusion und Gerechtigkeit – ebenso wichtig. Diese Arbeit wendet den Ansatz der Energiegerechtigkeit (EJ) an, um zu untersuchen, wie Grundsätze der Gerechtigkeit den Übergang zu kohlenstoffarmen Energiesystemen begleiten können. EJ konzentriert sich auf drei Dimensionen: Verteilungsgerechtigkeit, Verfahrensgerechtigkeit und Anerkennungsgerechtigkeit. Zusammen können sie dazu beitragen, Ungleichheiten zu identifizieren, marginalisierte Gruppen hervorzuheben und Wege zur Lösung dieser Probleme aufzuzeigen. Das Konzept des „gerechten Übergangs" (Just Transition, JT) stützt EJ, indem es Aspekte der Gerechtigkeit bei sozioökonomischen Transformationen, wie etwa der Energiewende, betont. Seit dem Pariser Abkommen von 2015 und der Verabschiedung der Ziele für nachhaltige Entwicklung (Sustainable Development Goals, SDGs) hat JT als Rahmenkonzept für die Gewährleistung von Fairness bei Nachhaltigkeitsbemühungen an Bedeutung gewonnen. EJ baut darauf auf und bietet einen detaillierten Ansatz zum Verständnis von Gerechtigkeit in der Energieerzeugung und im Energieverbrauch.

Diese Arbeit untersucht anhand der Fallstudie von Freistadt, einer Klima- und Energiemodellregion in Oberösterreich, wie EJ-Prinzipien in der Praxis angewendet werden. Freistadt zeichnet sich seit 2009 durch sein Engagement für eine nachhaltige Energiewende aus. In der Studie werden zwei Methoden kombiniert: die Analyse von Strategiepapieren und halbstrukturierte Experteninterviews mit verschiedenen Interessengruppen aus der Region. Dazu zählen politische Entscheidungsträger, Abteilungen für Regionalentwicklung, Investoren, Wissenschaftler, lokale Vereine und Fachleute aus der Energiebranche. Die Ergebnisse zeigen, dass die Integration von EJ-Prinzipien die soziale Akzeptanz, inklusive Partizipation und den langfristigen Erfolg fördert, aber auch Herausforderungen wie Machtungleichgewichte und die begrenzte Vertretung marginalisierter Gruppen aufzeigt. Durch die Verankerung von Fairness und Inklusion in der Energiewende zeigt diese Arbeit, wie EJ zu übergeordneten Zielen wie Gerechtigkeit und Energie-Resilienz beitragen kann. Sie bietet praktische Empfehlungen für die weitere Entwicklung in Freistadt und unterstreicht gleichzeitig das Potenzial von EJ, zukünftige Ansätze für eine nachhaltige Energiewende zu gestalten.

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List of abbreviations

CO_2	Carbon Dioxide
EBF	Energy District Freistadt (**E**nergie**b**ezirk **F**reistadt)
EJ	Energy Justice
EU	European Union
JT	Just Transition
KEM	Climate- and Energy Model Region (**K**lima- und **E**nergie**m**odellregion)
LEADER	**L**iaison **e**ntre **A**ctions de **D**éveloppement de l'**É**conomie **R**urale, translates to Linking Rural Economy Development Actions in English
MLP	Multi-Level-Perspective
ÖVP	Austrian People's Party (**Ö**sterreichische **V**olks**p**artei)
P1, P2 etc.	Participant 1, Participant 2 etc.
PV	Photovoltaic
RES	Renewable Energy Sources
SDGs	Sustainable Development Goals
STS	Socio-Technical System

1. Introduction

Following a period of rather stable political, social and economic conditions in the decades after World War II, our society is currently going through a period defined by numerous crises (García-García et al., 2020). Transformative change is necessary to address major challenges including pandemics, the rise in social and territorial inequality, geopolitical unpredictability and anthropogenic climate change (Trippl et al., 2024). In order to mitigate the far-reaching impacts of climate change, a significant reduction of carbon dioxide (CO_2) emissions is needed. Achieving this overarching goal requires the change of numerous socio-technical systems, including the energy sector (Rohracher, 2018; Wang & Lo, 2021).

Discourses about energy transitions often focus on technological innovations and their economic and ecological sustainability (Irshaid et al., 2021; Sovacool et al., 2016). Yet, transforming the energy sector from mainly relying on fossil fuels towards producing more renewable energy, is a complex, multi-layered process that goes beyond technology (Delina & Sovacool, 2018; Hölsgens et al., 2018). New ways to support the transition towards ecologically sustainable and socially inclusive economic practices must be found, knowing that it entails the reorientation of regional innovation and economic policy (Benner, 2023). But tackling this challenge includes not only technological progress and changes in production methods, but also an adaptation of consumption patterns and lifestyles (Trippl et al., 2024). Therefore, it is essential to also consider societal needs, values and behaviours as well as resulting injustices and inequalities. Addressing these social components is crucial for creating a fair and inclusive socio-technical transformation (Komendantova, 2021). Building on these principles, the Just Transition (JT) concept serves as a fitting framework because it pursues the overall goal to place values like fairness and inclusiveness at the centre of low-carbon transitions (Abram et al., 2022). With a system-specific emphasis, Energy Justice (EJ) emerged at the intersection of energy research and social science (Heffron & McCauley, 2017). EJ provides a focused concept for examining how sustainability transformations unfold at different levels in the energy sector. It allows to investigate where injustices arise, which groups in society are overlooked and what mechanisms there are to address these issues, with the aim of uncovering and mitigating them (Jenkins et al., 2016). And since the concept of EJ is continuously developed in the context of energy studies at universities, it has significant potential to sustainably impact energy research and practice in the long run (Heffron & McCauley, 2017).

By moving beyond the traditional techno-economic focus that dominates conventional analyses, EJ brings renewed attention to the human dimensions that are often marginalised in energy studies and research on global environmental change (Delina & Sovacool, 2018;

Forman, 2017). Like that, the topic is a suitable choice for a thesis in the master's programme 'Geography: Global Change and Sustainability', especially within the specialisation of socio-economic transformations. Matching the research inquiry of the thesis, more localised and potentially small-scale, inclusive approaches to energy production and consumption systems have recently received increasing research interest (Halonen et al., 2025). Due to the recognised potential, there has been a call for case studies in JT research (Heffron, 2024; Stark et al., 2023). As a response, this research seeks to answer the question:

How do agents in the energy model region Freistadt in Upper Austria implement principles of energy justice and social inclusiveness on their transition pathway to a self-sufficient low-carbon economy?

By applying the EJ framework to a case study, the thesis explores how and to what extent the principles of justice and inclusiveness have been incorporated in the regional development and transition planning so far. Laid out as a single-case study of exploratory nature, the Freistadt region in Upper Austria is particularly a good fit due to its rich and far-reaching history in sustainable energy (Energiebezirk Freistadt, 2022a; Stöglehner, 2003). Whenever the 'study region' is mentioned in this thesis, it refers to the political district of Freistadt. Apart from one municipality (St. Georgen am Walde), its area is identical to the former LEADER and KEM regions 'Freistadt'. Only recently, they were divided into the regions Mühlviertler Kernland and Mühlviertler Alm that now characterise the organisational structure and geographical scope of the Freistadt district (Klima- und Energiefonds, 2025b).

Going on, the content of this thesis is structured as follows. Chapter two provides both comprehensive background information and a review to the conceptual framework of JT and EJ, as well as their theoretical implications. The methodological section in chapter three covers the research design, case selection, data collection, analysis and quality criteria. The results that have been collected through document analysis and qualitative expert interviews, are presented in the following chapter five. After defining the regional context of the study region, a stakeholder mapping is conducted. The centrepiece is the analysis of the three EJ dimensions, followed by a description of potential barriers and challenges, as well as drivers and solutions. Lastly, the discussion puts the results both in relation to each other, but also into a broader thematical and theoretical context, before coming to a final conclusion.

2. Conceptual framework

To begin with, a comprehensive literature review is essential as it lays the foundation for the theory and backs up the conceptual framework. In order to identify both basic and specialised literature, an online search was conducted. In addition to the publisher's homepages directly, a number of literary databases and platforms, such as Scopus, Web of Science, Google Scholar, ScienceDirect and u:search by the University of Vienna were consulted. Structuring the search by keywords proved to be useful. Terms like ‘energy’, ‘justice/just’, ‘transition’, ‘sustainability’, ‘regional’, ‘social’, ‘innovation’ und ‘cooperative’ were be combined and resulted in an extensive body of outcomes. For further concretisation, the search results were filtered by variables such as keywords, date of publication (< 10 years), thematic field of study or regional focus. Like that, relevant results could be narrowed down to a manageable amount and consistently organised, citated and bibliographed with the reference management software Zotero. The precise extraction and selection process was conducted by reviewing and reading the selected sources for the use in this thesis. Starting with suitable articles, the snowball system was applied, leading to other relevant literature that was referenced in the thematic context (Healey & Healey, 2023). The compiled results covered in all kinds of different subject areas (Social- or Environmental Science, Economics, Business and Management, Earth and Planetary Science, Engineering or Computer Science) (Elsevier, 2025; Jenkins et al., 2021). Finally, the biggest part of the results were articles, published in scientific journals. They most frequently appeared in the journal Energy Research and Social Science (ERSS), followed by Energy Policy and Sustainability (Elsevier, 2025; Ferrall-Wolf et al., 2023).

2.1. Transforming a socio-technical system

Recognising that transformational change is needed in various realms, there are multiple ways to approach it. As sustainability transitions advance in different areas of life, they can be defined accordingly. Aligning with the everyday needs they cover, they can be structured in systems that fulfil different socio-technical functions. For example, these can include mobility, clothing, food and agriculture, healthcare, housing and construction, waste management and lastly the energy sector (Köhler et al., 2019). Consequently, energy systems are best understood as socio-technical systems (STS), meaning arrangements with a strong interrelation of technological and social elements (Sareen & Haarstad, 2018). These encompass a tightly interrelated network of actors (such as individuals, firms and organisations), institutions (including norms, regulations and standards), material artifacts and knowledge that collectively deliver specific services to society (Markard et al., 2012).

Transforming these STS to address the grand challenges of our time and meet the needs of the future, requires a system shift called sustainability transition (Trippl, 2023). By framing the energy transition as a socio-technical challenge, particular relevance is put on the deep entanglement of technologies and innovation with socio-cultural, political and economic elements (Rohracher, 2018). Accordingly, all elements of a STS need to be addressed, combining changes in technology, infrastructure, user practices, regulations and institutional structures. The transformation can only be successful if these broad-based objectives are achieved together (Geels, 2002; Markard et al., 2012).

In order to manage these profound changes, transition research has developed several approaches, theories and strategies. While every concept has their right to exist, they all specialise in different focus areas and naturally come with certain advantages and disadvantages. As the most widespread example, the Multi-Level-Perspective (MLP) has to be mentioned since it has been widely applied in the field of energy transitions (Binz et al., 2020; Geels et al., 2018; Hölsgens et al., 2018; Jenkins et al., 2018). The MLP views transitions as complex, non-linear processes arising from the interplay of three analytical levels: niches (where radical innovations originate), sociotechnical regimes (which encompass established practices and stabilising rules) and the broader, external socio-technical landscape (Geels, 2002; Rohracher, 2018). While this approach offers a fitting organisational framework for some examinations (Romero-Lankao et al., 2023), it was not chosen for this study as it does not bring the desired social aspects like justice, fairness and equity into focus. Since the MLP has come under critique for its technological bias and poor conceptualisation of people and agency, it is frequently seen as being overly functionalist, rationalist and structural (Geels, 2019). Critics argue that the MLP downplays the contributions of civil society and interconnections between different regimes. It further highlights the influence of dominating commercial and governmental players, without considering spatial perspectives (Hargreaves et al., 2013).

Apart from the MLP as a core framework for analysing change in sociotechnical systems, other approaches emerged with the goal of offering new solutions and counterpart the downsides of the MLP. Since elaborating on them would extend the scope of this chapter, only a selection will be named. The most established pathways to sustainability transitions include Smart Specialisation (Veldhuizen, 2020), Green Industry Development (Grillitsch & Hansen, 2019), Mission-oriented Innovation Policies (Mazzucato, 2018), Regional Innovation Systems (Isaksen et al., 2022) and as an advancement, Challenge-Oriented Regional Innovation Systems (CoRIS) (Trippl, 2023; Trippl et al., 2024).

2.2. Just Transition

Alongside the above-mentioned concepts and innovation strategies, Just Transition (JT) distinguishes itself by unique characteristics. Its emphasis on social inclusion, justice and equity make it a perfect fit for the objective of this thesis. But depending on the context, it can have a variety of meanings.

2.2.1. Term definition and review

At present, the concept of JT is well established and widely used in the contemporary literature. Before that, it started to emerge in the context of labour movement, sharing origins with environmental justice concerns (Wang & Lo, 2021) and developing alongside what is now referred to as energy justice (EJ). A more detailed elaboration on EJ will follow in chapter 2.3. But to begin with, the broad JT term needs to be categorised and defined. Due to its diverse and complex meanings, it is used in various ways. Wang & Lo (2021) have summarised these multiple understandings very accurately. Accordingly, JT can be classified as:

1) a labour-oriented concept
2) an integrated framework for justice
3) a theory of socio-technical transition
4) a governance strategy
5) a public perception

In this thesis, JT is first and foremost understood as a theory of socio-technical transition, since its goal is to place values like fairness and inclusiveness at the centre of sustainable, low-carbon systems. From this theoretical concept, an integrated framework for justice developed in the form of energy justice (Jenkins et al., 2016; Van Bommel & Höffken, 2023). For its application in practice, it can also serve as a strategy to govern socio-technical transitions. How these possible meanings relate to an empirical example is demonstrated in chapter 4. Overall, its success is still influenced by the public perception and especially those directly involved. Due to its complex and interconnected nature, different scholars have attempted diverse definitions. In the most basic terms, JT connects aspects of climate action with social justice (Stark et al., 2023). McCauley and Heffron (2018, p. 2) define JT as a "fair and equitable process of moving toward a post-carbon society". It captures the need to broaden climate ambitions beyond technological adjustment and allocate the costs and benefits of ambitious climate action in a fair and equitable manner (Heffron & McCauley, 2018). Decarbonisation without this focus holds the risk of ignoring or worsening already existing socio-economic injustices and

inequities at the local or global level, which makes it especially crucial (Abram et al., 2022). Rarely following linear trajectories, JT engages and consults with a broad set of stakeholders is a way that such contestation can be reduced and managed. While doing so, JT can encompass multiple forms of justice like climate, environmental and energy justice perspectives. Together, these expansive views help to achieve "a just, holistic societal transition" (Abram et al., 2022, p. 1036).

A review of the JT literature shows that over two thirds of the articles that had an industry focus were associated with mining and energy transitions. Other high emitting industries are not nearly as extensively represented in the literature, even though the interest in JT has increased considerably since 2015 (Bennett et al., 2019; Ferrall-Wolf et al., 2023). The focus on energy issues and the resulting amount of basic research can therefore be used positively for this work. Within the JT literature that included case studies, a geographic emphasis was clearly visible (Stark et al., 2023). The biggest volume of publications was released with cases in the United States, followed by Australia and China. The concentration of research in these nations is probably explained by the rise in output with a high exposure to future transition risks and potential downfalls. In total, the discourse and the majority of JT analysis and examples are largely covered by the social sciences (Jenkins et al., 2021; Stark et al., 2023).

2.2.2. Contextual definitions

In the context of JT, the terms of justice (*just*), equality (*equal*) and equity (*equitable*) are frequently worked with and therefore essential. Because the terms are often mistakenly used interchangeably, their meaning and use in the thesis are clarified shortly.

In the context of energy systems, **justice** is understood as a combination of ensuring and recognising the basic equal worth of all human beings, coupled with a commitment to the fair distribution of both benefits and burdens. This approach challenges researchers and policymakers to address justice concerns throughout the energy lifecycle (McCauley et al., 2013). **Equality** means providing the same resources and opportunities to everyone, regardless of circumstances, what can lead to overlooking differences in needs and vulnerabilities. In contrast, **equity** recognises these differences and seeks fairness by tailoring support to help disadvantaged groups and achieve comparable outcomes. While equality assumes uniform distribution, equity addresses systemic imbalances through need-based redistribution (Minow, 2021). In total, this makes it a more effective approach for advancing social justice.

2.3. Energy Justice

2.3.1. Just transition of the energy system

Discourses about energy transitions are often dominated by a focus on technological innovations and their economic and ecological sustainability (Irshaid et al., 2021; Sovacool et al., 2016). That is why issues of justice and injustice are not yet adequately addressed in the socio-technical transitions literature and the broader energy transitions discussion (Jenkins et al., 2018). This is where the EJ concept comes in, representing a paradigmatic shift from traditional energy transition frameworks by placing issues of equity and justice at the centre of energy policy and discourse (Swarnakar & Singh, 2022; Wang & Lo, 2021). Explicitly responding to the dual challenges of climate change and sustainability, this renewed concept seeks to free JT from its original strategic intent. It started with focusing solely on economic inequality and labour market impacts and shifted towards situating concerns within a broader historical context and elevating societal justice as fundamental for achieving sustainable change (Abram et al., 2022; García-García et al., 2020).

Since socio-technical transformations involve systemic change, energy transitions inherently carry the risk of an uneven distribution of gains and costs. Accordingly, some scholars suggest that taking into account this unequal distribution is essential to make sure that system shifts are not only more sustainable, but also more just (Williams & Doyon, 2019). However, the emerging challenges to transformative change are often rooted in epistemic, normative, institutional and cultural factors, rather than in technical limitations alone (Irshaid et al., 2021). They are further influenced by the interests, expectations and relationships of all actors involved (Rohracher, 2008). To address these challenges, scholars advocate for broadening representation in climate and energy leadership and implementing more inclusive and advanced platforms for public involvement and energy democracy. The goal is to establish new societal foundations that extend beyond the decarbonising of socio-technical systems (Skjølsvold & Coenen, 2021). In this context, frameworks like EJ that emphasise justice and trust are particularly well-suited for clarifying public participation challenges and local perspectives related to energy development projects (Knudsen et al., 2015) (see chapter 4).

2.3.2. Emergence and development

Examining the historic development of when and how EJ came into use, is essential for its understanding. Firstly, this is due to its practical applicability in policy development and implementation. Secondly its potential longevity, significance and impact within the field of energy research is vital. Looking back, the concept of EJ has evolved through three distinct phases, as outlined by Heffron and McCauley (2017). These phases trace the journey of EJ from its practical origins to its establishment as a defined academic framework.

Use in practice

During the first phase, EJ started to emerge within the realm of practice. Characterised by grassroots efforts, the term was particularly used among activists and non-governmental organisations to address energy-related injustices. EJ highlighted inequities in the distribution of energy benefits (like access to affordable and sustainable energy) and the resulting burdens (such as exposure to pollution or displacement due to energy projects) (Pellegrini-Masini et al., 2020). While the term EJ was not explicitly used in early academic debates, its key themes have been explored since at least the late 1970s and early 1980s (García-García et al., 2020; Van Bommel & Höffken, 2023). In this phase, it drew heavily from the principles of environmental justice that emerged at that time and responded to the disproportionate placement of environmental hazards, such as pollution and waste facilities in low-income and minority communities (Heffron et al., 2015). At its core, the movement advocates for fair treatment and meaningful participation of all people, regardless of ethnicity, nationality, gender or income, in shaping environmental policies, laws and regulations. Due to the pursuit of empowerment, public health, climate and social justice, the environmental justice's scope has been significantly expanded and applied specifically to energy systems. During this phase, EJ was not yet a formalised concept but rather a practical tool for advocacy and public engagement (Jenkins et al., 2016).

Early use in academia

Moving forward to the second phase, EJ began to be mentioned in the academic discourse, but without having a clear or consistent definition (Heffron & McCauley, 2017). Scholars started to use the term to explore various issues related to energy systems, such as fuel poverty, renewable energy adoption and infrastructure siting (Guruswamy, 2010). Because there was no unified framework or set of principles to guide the application, academic discussions during this phase were exploratory. This means that researchers borrowed ideas from related fields like environmental justice, climate justice and social equity and applied it to a broad spectrum of

contents (Jenkins et al., 2016; McCauley & Heffron, 2018). The term was used to address diverse topics, ranging from the ethics of nuclear energy policies to the socio-economic impacts of renewable energy projects (Guruswamy, 2010). Still, these discussions lacked a cohesive structure and theoretical background. This phase marked a transition period where EJ began to gain recognition as an important area of study for sustainable development, but had not yet been established as a distinct academic concept (Heffron & McCauley, 2017).

Defined concept in research literature

The third phase started around 2013 when social science scholarship on energy issues began to boom, as scholars like McCauley and Heffron formalised EJ into a defined academic framework (Basil & Heffron, 2025). Ever since, the growing volume of publications reflects its establishment as a structured concept with clear principles and methods for analysis. The Triumvirate of Tenets Approach by McCauley et al. (2013) defines EJ through three interconnected dimensions: distributional, procedural and recognitional justice. A more detailed elaboration including recent advancements of this chosen framework follows in the next chapter. Finally, the formalisation of these frameworks allowed the systematic analysis of injustices across the entire energy system from production to consumption (Baker et al., 2019). It also facilitated cross-disciplinary research by integrating insights from law, ethics, environmental studies and social sciences. This phase marked the maturation of EJ into a robust academic field with practical implications for both policy-making and societal transformation (Heffron & McCauley, 2017).

The evolution of EJ reflects its growing importance in addressing global challenges like climate change, resource inequality and sustainable development. This relevance in the academic field could also be confirmed by the literature review in the research phase. The number of scientific publications on the topic of “Energy Justice” has risen significantly over the last decade (Basil & Heffron, 2025; Ferrall-Wolf et al., 2023; Jenkins et al., 2021; Swarnakar & Singh, 2022). Starting from the first mentions in its evolutionary phase, the growing volume of publications aligns with the development timeline of the concept. Defining and establishing itself in academia, scholarly interest from different disciplines has not slowed down. Even though only the first half of 2025 has passed since the literature review was conducted, the total number for the current year is expected to reach an unprecedented peak. This indicates a nearly exponential growth rate of interest and engagement with the framework (Elsevier, 2025; Ferrall-Wolf et al., 2023), confirming its power and effectiveness for ensuring fairness and equity in energy systems worldwide (García-García et al., 2020; Jenkins et al., 2016).

2.3.3. Energy Justice concept

As shown later (see chapter 2.3.5), there is more than one way and concept to define EJ (Heffron & McCauley, 2017). The chronologically first and most widespread in EJ scholarship (Jenkins et al., 2021), is the Triumvirate of Tenets Approach by McCauley et al. (2013). Encompassing **distributional justice**, **procedural justice** and **recognition justice**, it provides a comprehensive base for analysing and addressing justice-related concerns within energy systems (see Figure 1Figure 1). These principles are interconnected and intend to ensure fairness and equity across all aspects of energy production, distribution and consumption. In recent years, the three original tenets have been extended by two other dimensions, restorative and cosmopolitan justice (Heffron, 2022, 2024).

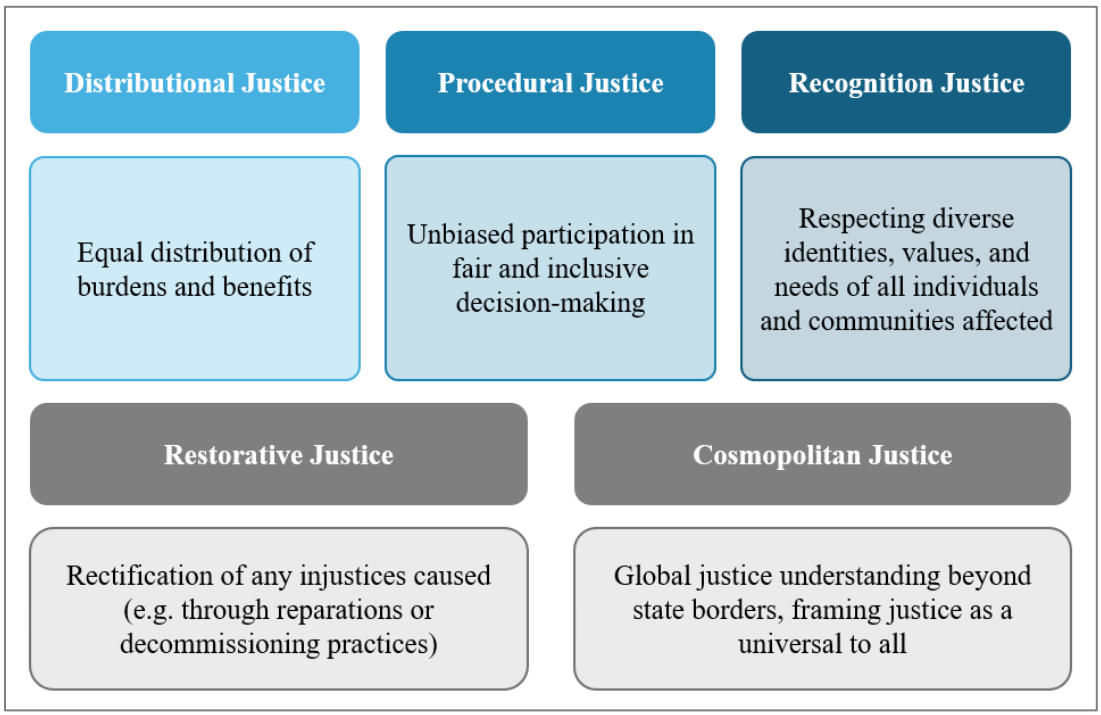

Figure 1: EJ dimensions (own representation based on Heffron (2024))

Distributional Justice

Distributional justice focuses on the equitable allocation of the benefits and burdens associated with energy systems. This dimension is inherently spatial as it addresses how environmental goods and ills are distributed across different populations (Knudsen et al., 2015). For example, it comprises the unequal siting of energy infrastructure, such as wind farms, coal power plants or nuclear waste facilities as well as the exposure to risks like as air pollution. In reality, these disparities often disproportionately impact marginalised or low-income communities (Kilimcioğlu, 2025; Welton & Eisen, 2019). Additionally, these most affected groups also face challenges like uneven access to affordable and renewable energy resources (RES),

exacerbating issues like energy poverty (Bouzarovski & Simcock, 2017). Whin the realms of research, distributional justice encourages investigations into how energy policies and projects can be designed to ensure that no group disproportionately bears the burdens while others enjoy the benefits. For instance, it calls for equitable access to RES and fair compensation mechanisms for affected communities (restorative justice) (Sovacool & Dworkin, 2015).

Procedural Justice

Procedural justice emphasises the importance of fair and inclusive decision-making processes in energy policy and project development. It ensures that all stakeholders, particularly underrepresented groups, have a meaningful voice in decisions that affect them (Shejale et al., 2025). This dimension is implemented through three key elements: *participation* gives all groups the opportunity to engage in decision-making processes, *impartiality* ensures that decision-making is free from bias or favouritism and *transparency* fully discloses essential information so that stakeholders can make informed decisions. Procedural injustices often occur when governments or corporations fail to engage communities adequately and dismiss local opposition groups without seriously considering their concerns (Kilimcioğlu, 2025). To avoid this during implementation, procedural justice calls for mechanisms that ensure equitable participation in energy governance. This includes the establishment of platforms for dialogue between stakeholders and improving transparency in subsidy allocation (Hazrati & Heffron, 2021).

Recognition Justice

As the third original tenet, recognition justice focuses on acknowledging and respecting the identities, values and needs of all individuals and communities affected by energy decisions. It addresses issues of underrepresentation and misrecognition, where certain groups are devalued or excluded from decision-making processes (Hernández, 2015).

But recognition is not just about participation but also about respecting diverse perspectives rooted in social, cultural, ethnic, racial or gender differences. Recognition justice means acknowledging the specific needs of various groups, especially the vulnerable (Heffron, 2022; Romero-Lankao et al., 2023). If this is not implemented in practice, misrecognition can show as cultural domination, stereotyping or rejecting attitudes toward certain groups. For example, dismissing the concerns of local opposition groups as irrational comprises recognition justice. These concerns often reflect a deeply rooted cultural thinking that is linked to the protection of local identity and landscape (Bouzarovski & Simcock, 2017).

In total, recognition justice calls for policies that respect local knowledge and values while addressing systemic inequalities. It puts a strong emphasis on understanding the lived experiences of affected communities and integrating their perspectives into decision-making processes (McCauley et al., 2013).

Further developments

As an addition and an extension to the three basic principles, two dimensions have recently emerged in the EJ literature (see Figure 1). Restorative justice seeks to repair harm, compensate injustices that have already occurred and rebuild relationships among affected parties (Heffron & McCauley, 2017; Wallsgrove, 2022). In the energy sector, it addresses environmental and social damage caused by energy projects and policies. This often involves genuine dialogue between stakeholders, environmental restoration and creation of community benefit agreements. The aim is to restore victims, whether they are people, communities or ecosystems, to their original state before harm occurred (Van Bommel & Höffken, 2023). It fundamentally shifts energy governance toward responsibility and lasting social and ecological well-being (Hazrati & Heffron, 2021).

Lastly, cosmopolitan justice is an ethical principle stating that justice should apply universally to all individuals, transcending borders and social divisions (Heffron, 2024). In the energy sector, this means a global responsibility for environmental impacts regardless of nationality or location. It promotes international cooperation and shared accountability for just and sustainable energy transitions worldwide (Sovacool et al., 2019; Stevis & Felli, 2020). Since this thesis analyses a concrete case study and thus focuses on a regional level, the principle of cosmopolitan justice is not suited to be applied here. Ultimately, all of these justice principles are deeply interconnected and mutually dependent. For example, distributional injustices often arise from procedural failures. As fairness is influenced by both processes and outcomes, a lack of participation in practice can lead to inequitable outcomes and decreased acceptance as a result (Knudsen et al., 2015). Also, misrecognition can worsen both distributional and procedural injustices by marginalising certain groups from decision-making processes entirely (Sovacool et al., 2017).

While identifying matching literature, it became evident that a varying number of EJ principles is used in different research articles. This can be explained either by the timeline of publication that is continuously evolving or the nature of the question that the respective research explores. For example, McCauley et al. (2013), Jenkins et al. (2016, 2018) and Heffron & McCauley (2017) apply the original three justice principles. Sovacool et al. (2019), McCauley et al. (2019),

Lacey-Barnacle (2020) and Abram et al. (2022) extend them by a fourth dimension, while Hazrati & Heffron (2021) and Heffron (2022, 2024) adopted all five. These extended principles of EJ provide a robust framework for analysing inequities within energy systems. Together, they emphasise fairness not only in outcomes but also in processes and respect for diverse identities (Van Bommel & Höffken, 2023). By applying these principles holistically, stakeholders can create more equitable and sustainable energy systems that address both local and global challenges.

2.3.4. Criticism and case relation

Nevertheless, every framework is characterised by certain strengths and weaknesses. Like that, EJ also faces notable limitations and criticism regarding its application and conceptual scope. The original three-tenet framework provides a theoretical backbone for identifying and analysing injustices within the energy sector. However, it fails to directly address the complex political and economic forces that frequently contribute to the emergence of energy injustice (Lee & Byrne, 2019). It is crucial to acknowledge that a just energy transition is not solely a socio-technical matter, but also intensely political. As EJ is fundamentally shaped by issues of power, resource distribution, access and the broader political economy, it implies a deeply political struggle (Healy & Barry, 2017). Also, justice itself is known to be an inherently contested concept. Rather than viewing it as absolute by trying to exactly define or measure justice, it should be used to identify evolving trends and developments within energy systems (Andreas et al., 2018). Without a deliberate focus on these pre-existing structural drivers of injustice in the wider socio-economic landscape, transitions may exacerbate or produce new inequalities. The path towards successful low-carbon transitions must therefore be grounded in shared beliefs, values, interests, resources, skills and relationships, supported by a collective understanding of sustainability (Sovacool et al., 2019).

Another major oversight in EJ scholarship is that only limited attention has been paid to the roles that individuals and communities can play in contributing to an energy-just future (Forman, 2017). Lacey-Barnacle & Bird (2018) emphasise both the opportunity and the necessity of more local and community-based bottom-up engagements. Whenever approaches like community energy were applied, the studies mostly focused on well-developed industrialised nations of the global north (Forman, 2017; Lacey-Barnacle, 2020; Maleki-Dizaji et al., 2020; Swarnakar & Singh, 2022). That is why, in an international context, the field of EJ research is frequently criticised for its western-centric perspectives and reliance on buzzwords, which hinders substantive knowledge building and diminishes the potential for transformative change (Osička et al., 2023). It is further argued that the field of energy justice would benefit

from more interdisciplinary collaboration and socially diverse research, since female authors or those from minority groups are under-represented (Jenkins et al., 2021; Sovacool, 2014).
Despite the growing volume of research on the EJ framework, a substantial part is rather theoretical without a link to real-world examples. Overall, a key limitation of the framework remains its insufficient reflection on how these conceptual models are transferred into practice (Heffron, 2022). Answering to these questions, the thesis aims to show their practical applicability.

2.3.5. Other approaches

The most prominent rival theory to the three (McCauley et al., 2013) or rather five tenet approach by Heffron (2024) is the energy justice decision-making framework by Sovacool et al. (2016). It encompasses eight principles that are partially similar to the contents of distributional, procedural and recognition justice. The dimensions in the so-called "EJ decision-making framework" encompass availability, affordability, due process, transparency and accountability, sustainability, intra-generational equity, inter-generational equity and responsibility. Even though it covers a variety of aspects that meaningfully contribute to a just energy future, it is less fit to serve as a conceptual framework. The title "EJ decision-making framework" but also the explanations including eight respective examples of contemporary application indicate that the research article offers more of a guideline or checklist throughout decision-making processes (Sovacool et al., 2016). Additionally, the categories are extensive and broad, making it rather difficult to apply to a case study. Despite not being chosen for this analysis, the framework still deserves recognition as it might be helpful as an additional evaluation tool.
Thematically adding to the three-tenet framework, Lee & Byrne (2019) further expand it by including transformative philosophies as well as a structural and ideological pillar, carried by the dominant forces of modernisation. Similarly, the philosophic background to the topic of EJ, has also been explored by other scholars (Baker et al., 2019), also arguing the meaningful impact that ethics have (Sovacool et al., 2017). Extending the justice-related thinking in the field of energy research, other thematic variations have developed. Special attention has to be paid to the growing realm of energy democracy (Allen et al., 2019; Osička et al., 2023), energy poverty (Carfora & Scandurra, 2024; Listo, 2018; Manjon et al., 2022; Middlemiss, 2020; Streimikiene & Kyriakopoulos, 2023) and energy gender research (Baruah, 2017; Cannon & Chu, 2021; Feenstra & Özerol, 2021; Fraune, 2015; Lahiri-Dutt, 2023).

3. Methodology

This master's thesis applies a qualitative empirical research approach. By using a case study as part of the research method, the transition of a regional Austrian energy system towards RES will be analysed through the lens of EJ. The data collected for this research project is evaluated using qualitative content analysis.

3.1. Research design

Research question:

How do agents in the energy model region Freistadt in Upper Austria implement principles of energy justice and social inclusiveness on their transition pathway to a self-sufficient low-carbon economy?

Sub-questions:

- How did the present energy system develop and what are local characteristics?
- To which extent are the EJ principles applied in practice? How just is the incumbent system?
- What past/current/future efforts and local initiatives were/are/will be there to advance the just energy transition in the Freistadt region?
- Which barriers and challenges slow the transition process and what drivers and solutions can help to overcome them?

In order to extensively answer the main research question, it was decided that using an exploratory single-case study design would be best. Choosing to pose a "how" question additionally matches the nature of this research design as it allows to examine current events that the researcher cannot influence or control (Yin, 2018) – like the renewable energy transition in rural Upper Austria.

The case study approach is commonly used in qualitative research and is especially suitable for studying real-life situations in greater detail. It is particularly effective in examining spatial and regional matters (Clifford et al., 2023), just like in this research. Considering the specific regional settings when drawing conclusions is important, since it *can* be difficult to apply case study results to a wider context. Nevertheless, Flyvbjerg (2006) rightly cleared up the misconception that single case studies cannot advance scientific development because one

individual case is not generalisable – something that this thesis also intends to prove. By covering just one case, the method allows researchers to look at the complexity and connections involved in the shift towards a low-carbon energy system from multiple viewpoints, leading to thorough insights on the topic (Yin, 2018). Through interviews and document analysis, the thesis aims to better understand how different stakeholders shape the regional energy transition process, which efforts are being undertaken and what practical problems exist in the application of different renewable energy initiatives.

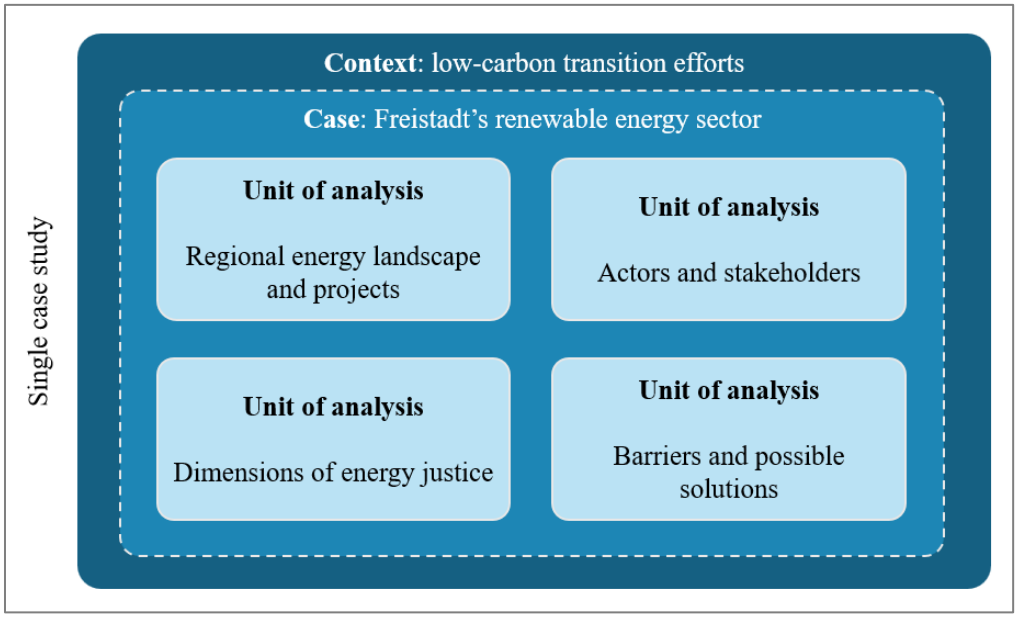

Figure 2: Research design (own representation based on Yin (2018, p. 88))

Figure 2 shows that the single case study design itself is subdivided into thematic parts, which helps provide a detailed look at Freistadt's energy sector as it moves toward a low-carbon economy. The comprehensive **context** of the study is formed by the underlying situation, meaning Austrias overarching efforts to transition to a low-carbon economy (dark blue frame in figure 2). This includes the scope of time with its past and recent developments as a part of the contextual background. The **case**, however, refers to specific regional dynamics and challenges, namely the renewable energy sector in the Mühlviertel region around Freistadt (medium blue frame). Multiple units of analysis can be identified within the case, that were also used to guide the semi-structured interviews. However, the sub-items all relate to each other and should not be regarded as independent, stand-alone components. Like that, a single case study design with multiple units of analysis was applied (Yin, 2018).

3.2. Case selection

In addition to the general methodological approach, the selection of the case study plays an equally important role. Theory-wise, the EJ framework can be applied from local to global levels, giving EJ an inherently multi-scalar dimension and flexibility for regional application (Sari et al., 2017).

For this case, it was decided that the district level serves as the best spatial and organisational unit of analysis. In contrast to stand-alone projects, single actors like company entities, transnational firms or governance networks, the regional district level is where the most policy making and political decision take place (Sovacool et al., 2019). Even though the national level offers the broadest statistical database, a trend towards smaller localities can be observed. Since the expansion of RES comes with the rise of distributed and decentralised facilities, the focus has shifted towards more localised and detailed units of analysis, including communities, individual consumers and local populations (Osička et al., 2023).

The process that led to the identification of Freistadt as the study region was guided by literature research. In the very beginning, references that covered the topic of socially inclusive energy transitions in Austria were reviewed. The first research process revealed some already well-covered study regions, as well as some emerging ones including Freistadt as an exemplary case of a rural district (Irshaid et al., 2021; Komendantova, 2021; Komendantova & Neumueller, 2020). To confirm the suitability, a more thorough search through the database of the national climate and energy model regions (KEMs) was conducted and confirmed the long history of development efforts in the energy sector (Energiebezirk Freistadt, 2022a; Klima- und Energiefonds, 2025b, 2025a; Stöglehner, 2003). To explain and validate the use of the Freistadt region (case) as a single case study (method), established literature offers the following rationales as guidance (Flyvbjerg, 2006; Yin, 2018). Their characteristics encompass being:

Critical: The realisation of this project as described makes a significant contribution to research in the field of EJ. Since the concept has only been a research topic for a decade, it can be considered relatively new. The focus of existing publications lies heavily on the theoretical concept while the applications to practice are fairly limited and called to be extended (Heffron, 2024; Heffron & McCauley, 2017; Wang & Lo, 2021). Therefore, the Freistadt district can serve as an example for rural Austrian regions, that aim to reach energy self-sufficiency. In doing so, this analysis fosters knowledge development and advancement while providing empirical insights at the same time. The link between JT theory and the energy sector, as demonstrated by the case study, makes this research work critically relevant.

Unusual: The district of Freistadt or the Mühlviertel region in Upper Austria has not received much academic attention because of their geographic and economic context. Academic publications have so far focused on large-scale low carbon transitions in well-known fossil fuel industrial areas of western industrialised nations like the United States (Baker et al., 2023; Swarnakar & Singh, 2022), the United Kingdom (Axon & Morrissey, 2020), Australia (Goddard & Farrelly, 2018), Norway (Knudsen et al., 2015), Spain (Standal et al., 2023) or Germany (Abraham, 2019; Komendantova, 2021; While & Eadson, 2022; Yildiz et al., 2015). Even when cases studies focused on Austria, mostly industrial regions with a history of extractive and carbon intensive industries were covered – the most prominent examples being Murau in Styria and Güssing in Burgenland (Suitner et al., 2023; Suitner & Ecker, 2020).
Theory-wise, this work takes an unusual approach because it looks at low carbon transitions from an EJ perspective. A usual normative perspective, like taken in the most studies (Köhler et al., 2019; Schinko et al., 2020), typically looks at the co-benefits of renewable energy, low-carbon mobility solutions or climate change mitigation strategies (Sovacool et al., 2019). Here, the social aspects, vulnerabilities and inequalities associated with low-carbon transitions are highlighted in a specific regional context.

Common: Because the initial properties and therefore the starting position of the study region are similar to many other decentralised, rural areas, the criterion of commonality is fulfilled. Without being a home to extractive industries themselves, the region is still highly dependent on fossil fuels and energy imports. And even though rural areas like the district of Freistadt are not the most CO_2 emitting, they are disproportionally affected by the negative externalities (Carley & Konisky, 2020). To change that, Freistadt faces the common challenge of expanding renewable energies and reducing their carbon emissions for a successful energy transition – just like many other rural areas around the world. Due to this commonality, reviewing transferability or exemplary function as a best practice example is of particular importance.

Longitudinal: The longitudinal criterion is partially applicable to the study region. Since Freistadt has joined the climate- and energy model regions (KEMs) very early on in 2009 (Klima- und Energiefonds, 2025b, 2025b), it allows for the examination of change and continuity regarding the EJ issues in the region. In theory, the longitudinal case study approach is useful for assessing factors of energy transitions over time (Volmar & Eisenhardt, 2020; Yin, 2018), such as the relevance of renewable energies or public participation in political and civic processes. Because the interviews for this thesis were conducted within the short time span of two months, they were only able to capture insights from one recent point in time.

However, the analysed documents reach back over a decade to the early stages of the KEM, covering its beginnings up until the present day (cf. Table 1). By considering this long-term development, Freistadt's energy transition path including its successes and failures can be understood over time.

3.3. Data collection

The data that served as the fundamental basis for the thesis was collected using a combination of methods (Heale & Forbes, 2013). In the beginning, comprehensive literature research laid the groundwork for the theoretical framework and the positioning within the subject area. The document analysis and the conducting of expert interviews in the empirical part provided thorough insights into a real word example of regional Austrian energy transitions. Explaining the selection and collection criteria in the following is meant to enhance methodological transparency and replicability (Döringer, 2021).

Document analysis

Within the scope of the case study, different kind of policy documents were considered. The methodical process of reviewing or assessing documents, whether they are printed, digital or published online, is referred to as document analysis. It involves examining and interpreting data to extract meaning, gain understanding and develop empirical knowledge (Bowen, 2009). Although organisational and institutional records have always been an element of qualitative research, their use as a component of the research methodology has become more common in recent years (Morgan, 2022).

Document analysis in qualitative research has several strengths and advantages that make it an important method for gathering and understanding data (Armstrong, 2022). One of its key benefits is that documents are often openly and easily available to the public, making this method highly accessible and practical. It is also efficient and cost-effective, as researchers can utilise pre-existing materials without the costs of creating new datasets. The non-reactive nature of documents ensures that they remain unaffected by the research process, providing reliable and unbiased data (Morgan, 2022). Furthermore, document analysis supports triangulation when combined with other methods such as interviews or observations as it helps to confirm findings and increase their credibility (Heale & Forbes, 2013). It also offers contextual insights and historical perspectives that help researchers to understand the background and setting of their study. Moreover, this method allows to track changes over time by analysing different versions of documents or periodic reports. This provides valuable information about the development or evolution within a given context, like the renewable energy transition in

Freistadt. Lastly, looking at documents can serve to verify or challenge findings from other data sources, adding depth and accuracy to the research process (Armstrong, 2022; Bowen, 2009). Document analysis is widely used in qualitative case studies and has also been useful for this research project. A variety of regional development strategies, final and interim reports, implementation concepts, descriptions of measures and project information materials could be identified via desk research. These were selected and screened based on their regional and temporal relevance, content relation and information density. Additionally, the factors for document selection by Morgan (2022, p. 71) "authenticity, credibility, representativeness and meaning" provided helpful guidance. The most important files used for document analysis are listed in Table 1 below.

Nr.	**Title**	**Authors**	**Year of publication**
1	Umsetzungsphase Endbericht	Miesenberger, N.	2013
2	Weiterführungsphase 1 Endbericht	Miesenberger, N.	2016
3	Weiterführungsphase 2 Endbericht	Miesenberger, N.	2019
4	Weiterführungsphase 3 Endbericht	Miesenberger, N.	2021
5	Weiterführungsphase 4 Endbericht	Steininger, S.	2021
6	KEM Mühlviertler Kernland Umsetzungskonzept	Miesenberger, N.; Steurer, T.; Hackl, S.	2022
7	Umsetzungskonzept Klima und Energiemodellregion Mühlviertler Alm	Steurer, T.	2022
8	Kernland 2030. Eine Region in Balance.	LAG Mühlviertler Kernland	2023
9	Strategie Photovoltaik Freiflächen	Energiebezirk Freistadt	2023
10	Regios Broschüre - Unsere Energie	Regios Energiegenossenschaft	2024
11	Jahresbericht 2024	OurPower Energiegenossenschaft	2025
12	Die Wirtschaftskraft im Bezirk Freistadt	Wirtschaftskammer Freistadt	2025

Table 1: List of documents used in the qualitative analysis

Semi-structured expert interviews

The semi-structured interview was selected for data collection because it presents a wide array of possibilities for researchers. It combines enough structure to address key research themes with allowing participants to introduce new perspectives and interpretations. Like that, enhancing insights can be gained and added to the literature and document analysis (Galletta, 2013). This adaptable approach allows questions to be organised in ways that generate large data streams as a combination of structured and unstructured techniques. The method typically begins with open-ended questions that set the context for understanding participants' views and continues with more focused ones based on theory (Bearman, 2019). A notable advantage that is central for the application in this case study, is the ability to connect real-life experiences with theoretical variables. Thereby, the multidimensional nature of the research topic is effectively addressed. The expert interviews further encourage a lively dialogue between the participant and the researcher, facilitating a dynamic interaction and deep examination of contents. Because this mutual engagement enriches the data obtained, semi-structured interviews are especially valuable for exploring complex insights of individuals with professional expertise (Naz et al., 2022).

In order to ensure credibility and relevance of the research findings, the selection of experts as interview participants followed a set of criteria. Components used to define an expert interviewee for this thesis include: formal education and training, professional experience, contribution to the field, relevance to the research question as well as regional connection or affiliation (Döringer, 2021). Nevertheless, while some of these criteria must always be given, the degree of fulfilment is always context dependent. This means that some participants relate to the research question more through practical experience and others maybe more by academic qualifications. Like that, a variety of viewpoints is depicted in the interviews, making them a valuable extension to the desk research completed beforehand.

For the implementation, a semi-structured interview guide was tailored to the thesis topic and research question (Bearman, 2019). The questions were designed to explore how the EJ principles (distributional, procedural and recognition justice) are applied in Freistadt's energy transition efforts. Due to their open-endedness, the questions ensure comprehensive coverage while simultaneously allowing flexibility. After the opening segment provided narrative space based on the participants' experiences, questions of greater specificity followed in the middle and main part. Even though the pre-defined question catalogue grouped by main themes guided all interviews, certain sub questions were customised depending on the respective participants' expertise. Lastly, the closing segment allowed a review of the previous themes, complementing

it by further ideas and developing a conclusion. Because individual interviews allow for a more personal and unrestricted dialogue, they were chosen over focus groups. Recording the interview audio on tape captured the richness and complexity of the responses, enabling a precise transcription for further analysis (Yin, 2018).

The participant recruitment was mainly conducted via E-Mail, since most of the addresses are linked on the webpages of the respective institutions, like the Energy District Freistadt (EBF) or other related companies and associations. After the first round of interviews, the snowball system was applied to recruit further participants over already existing contacts and their professional network. Like that, a group of people with diverse backgrounds could be reached, painting a representative picture of the stakeholders involved in the energy transition efforts (see Table 2Table 2). The final number of seven interviews is a result of the interplay of various factors that the researcher can only partially control (Dworkin, 2012). As proposed by literature on qualitative research, criteria like content saturation and purposive sampling were primarily focused on (Guest et al., 2006). During the process, other factors like the lacking response to interview requests or challenges in the research timeline proved to influence the number of interviews as well. Overall, the total of seven expert interviews is seen to be satisfactory and more than sufficient for this specific research inquiry, but also in the light of similar qualitative, in-depth interview studies (Dworkin, 2012; Guest et al., 2006).

Participant 1 (P1)	Regional manager
Participant 2 (P2)	Energy cooperative managing director
Participant 3 (P3)	Energy cooperative managing director
Participant 4 (P4)	Former mayor and chairman
Participant 5 (P5)	Photovoltaic technology expert and science educator
Participant 6 (P6)	Regional manager
Participant 7 (P7)	Energy innovation manager

Table 2: List of participants for the expert interviews

3.4. Data analysis

To evaluate the collected data, a comprehensive qualitative content analysis guided by Kuckartz and Rädiker (2022) was chosen, including the use of the computer assisted qualitative analysis software MAXQDA. In general, qualitative content analysis is defined as a systematic and structured approach to analyse qualitative data with the aim of identifying, coding and categorising patterns or themes. This method is known to be particularly comprehensive since extends beyond simple thematic analysis, by stepwise including both *deductive* (theory-driven) and *inductive* (data-driven) category development (Kuckartz & Rädiker, 2022). In total, the authors lay out three variants to the methodological approach of qualitative content analysis, being 'content structuring', 'evaluative' and 'type building'. The content structuring one focuses on identifying and evaluating themes or topics within the data. Because this thematic analysis emphasises understanding the content and meaning in relation to the research question, it was found to be the most suitable for this research project.

Accordingly, the analysis started with main categories developed deductively from the interview questionnaire, followed by the inductive creation of subcategories during a second coding round, enabling both simple and complex analyses in subsequent steps **Fehler! Verweisquelle konnte nicht gefunden werden.**(Kuckartz & Rädiker, 2022).

Phase 1 laid the groundwork in terms of preliminary tasks like familiarising with the case. This includes highlighting important passages and taking notes of ideas for later evaluation, while reading and summarising a variety of documents. On this basis, a guiding questionnaire for the interviews was designed. After conducting all expert interviews in German, they were manually transcribed using the open-source online tool "oTranscribe". This was found to be the best option since the often heavy Austrian-German dialect would have complicated an automated transcription and most other transcription tools (including the MAXQDA extension) required a paid subscription. The subsequent analysis was chosen to be performed in the original language to preserve contextual and linguistic nuance. Only later in the process, selected excerpts and key content memos were translated into English for the presentation in the result section. The transcripts were then uploaded to the computer assisted qualitative analysis software MAXQDA. The following phases focus on the coding the interview transcripts with MAXQDA.

In **phase 2**, the main categories were first drafted deductively, mainly taking inspiration from the interview guide. For this study, seven main categories were chosen, forming a clear and workable set. These focus areas are central to the thesis since they are closely linked to the research questions and make up the main groups used in the analysis.

Phase 3 advanced smoothly due to the first-established main categories. In this first coding process, the interview transcripts were manually encoded to match the seven categories. More specifically, this means that sections not relevant to the research were excluded and passages answering to one or more categories were matched accordingly. Every coded segment – whether it was a single sentence, multiple sentences or a paragraph – was assured to be self-sufficient and understandable without depending on the surrounding text.

Phase 4 is when subcategories were formed inductively. The material assigned to the main categories served as the basis for this. In this second coding approach, the system was thoughtfully adapted to fit both the data and the research question, making sure that it remained relevant and consistent throughout the process. The system was further improved by reconsidering the need for subcategories and by adapting or updating categories based on insights from existing research. The final coding system is represented in Table 3.

After their development, the subcategories were then applied to the data in **phase 5**. By going through the empirical data in MAXQDA for a second time, they could be matched to the codes more precisely. If one section could potentially be linked to multiple categories, this is where the final coding decisions were made.

In **phase 6**, the coded data reached the step of analysis. A category-based analysis was carried out along the primary categories for this study. Each primary and subcategory's parts were then analysed to find distinctions, parallels, noteworthy features and relationships between the categories. Furthermore, the notes and summaries from the document analysis were added in this part.

Phase 7 concludes the analysis by documenting and capturing the gained insights, as shown in chapter 4. There is a smooth transition between phase 6 and 7 since text modules in the form of paraphrases and notes were already available in the last step. This systemic organisation facilitated the presentation and discussion towards the end.

Nr.	Main categories	Sub-categories
1	Regional context	1.1 Spatial, 1.2 Economic, 1.3 Socio-cultural, 1.4 Political, 1.5 Regional embeddedness
2	Actors and stakeholders	No sub-categories
3	EJ dimensions	3.1 Distributional justice, 3.2 Procedural justice, 3.3 Recognitional justice, 3.4 Restorative justice and other
4	Barriers and challenges	4.1 Technological, 4.2 Political, 4.3 Financial, 4.4 Behavioural, 4.5 Organisational, 4.6 Structural
5	Drivers and solutions	5.1 Cooperation, 5.2 Participation, 5.3 Information and transparency, 5.4 Innovation, 5.5 Awareness and acceptance, 5.6 Mediation and discussion for change
6	Projects and best practice	6.1 EBF, 6.2 Helios and Regios
7	Future outlook	7.1 Projections, 7.2 Recommendations, 7.3 Wishes

Table 3: MAXQDA coding system for the interview data analysis

3.5. Quality criteria

Being able to judge the quality of research designs is an equally important element of the methodology as selecting the case and data before. In order to proceed in a structured way, Yin (2018, p. 42) offers four criteria to record and track different quality dimensions: construct validity, internal validity, external validity and reliability.

To ensure **construct validity** in the case study, it is essential to use multiple sources of evidence, such as a thorough review of relevant literature and documents, as well as conducting expert interviews. These different sources were triangulated to support the findings and make them more robust (Heale & Forbes, 2013). In addition, the general approach and drafts of the case study were reviewed by the thesis supervisor, which helped improve the research framework and provided valuable feedback. Like that, the study should succeed to capture the unique properties and details of the region being examined.

Internal validity means the establishment of a convincing causal argument where certain conditions are genuinely the result of identified factors rather than unaccounted variables or coincidence (Eisenhardt, 1989). In this case, internal validity is ensured by matching patterns of the observed outcomes (justice principles) and explanation building by providing detailed descriptions and evidence examples like time-series analyses (document analysis and expert

interviews). Additionally, addressing rival explanations helps to actively identify and rule out alternative interpretations to strengthen the validity of the proposed causal relationships (cf. chapter 2.3.4 and 2.3.5).

As a third test, **external validity** "deals with the problem of knowing whether a study's findings are generalisable beyond the immediate study" (Yin, 2018, p. 45). Embedding the case study in a detailed context and sound theoretical framework helps to build external validity. In this thesis, the use of the EJ concept enables an examination, critique and potential enrichment of this theory and concept up to potential transferability. The method not only improves the findings' generalisability but may also help other regions or states with comparable circumstances (Eisenhardt, 1989).

Finally, the most widely known criterion is **reliability**, meaning that the study's results are consistent and can be trusted over time (Yin, 2018). In order to minimise errors and biases, all research steps were carefully organised and documented. A digital database was created to store detailed records of documents, methods and procedures, allowing transparency, traceability and replicability. Due to these different documentation methods, every stage of the research process is consistently and coherently presented. Maintaining this chain of evidence through documentation and database maintenance strengthens the reliability and validity of the collected data and the resulting conclusions (Eisenhardt, 1989). Still, researcher reflexivity and bias needs to be considered, as subjectivity cannot be eliminated in qualitative research processes. Positionality is known to possibly influence both data collection and interpretation (Flyvbjerg, 2006). In this case, no prior connection or relationship to the region or its actors existed, supporting a neutral stand in the research process.

3.6. Ethical considerations

As a researcher, various ethical challenges must be considered when conducting a case study to maintain the credibility and protect the participants. To ensure this, informed consent for the entire research project, the integrity of the participants, the protection of their data and confidentiality are the most important ethical guidelines to be followed (Mayring, 2021). Before the actual data collection, gathering informed consent involves providing the participants with comprehensive details about the objective, methodology and data usage. This process enables individuals to make well-informed decisions regarding their involvement (Yin, 2018). Prior to interviews, participants were requested to sign a consent form laying out the study's purpose, potential benefits, risks and their rights as participants (see List of appendices).

Especially due to the use of semi-structured interviews, protection, confidentiality and data security are crucial. Given that interviews and data collection may involve sensitive information, it is essential to ensure the participants' anonymity and avoid any negative consequences like potential harm (Mayring, 2021). To address this, personal data gathered during interviews was anonymised and coded. Maintaining confidentiality throughout the research not only protects participants but also enhances the study's trustworthiness and reliability. Specifically in the interest of the EJ concept, special attention was paid to the equitable selection of participants, following the objective not to include or exclude any groups or people in an unfair way (Yin, 2018). That is why almost equally men and women with different academic backgrounds were chosen for the expert interviews.

As a further ethical annotation, it needs to be acknowledged that no generative artificial intelligence (AI) was used in this thesis, as it goes against both university guidelines and personal beliefs for good scientific practice. However, some AI-driven, non-generative tools were used to facilitate the research process. In the first phase before writing, webpages like Connected Papers, Semantic Scholar and Research Rabbit proved to be helpful for identifying relevant literature. In the reading and summarising stage SciSpace provided support in summarising paper content and answering questions on specific documents. For all German to English translations, the online translation tool DeepL was used. The online dictionary Thesaurus offered synonyms for frequently used words in order to try to avoid repetitions. Lastly, the tools Scribbr and Writefull supported the final improvement and review steps. All of the suggestions and results that followed from the mentioned programmes or applications were acknowledged as such and reviewed before their further use in the thesis.

4. Results

4.1. Regional context

4.1.1. Spatial context

As a case study, the district of Freistadt in Upper Austria was selected. The region is located in the north-east of the federal state Upper Austria and borders the districts of Perg and Urfahr-Umgebung to the south and west. In the east, the region is connected to the Lower Austrian Waldviertel and it shares an international border with the Czech Republic to the north. The closest major city and capital of the federal state of Upper Austria Linz is approximately 35 km away (Klima- und Energiefonds, 2025b).

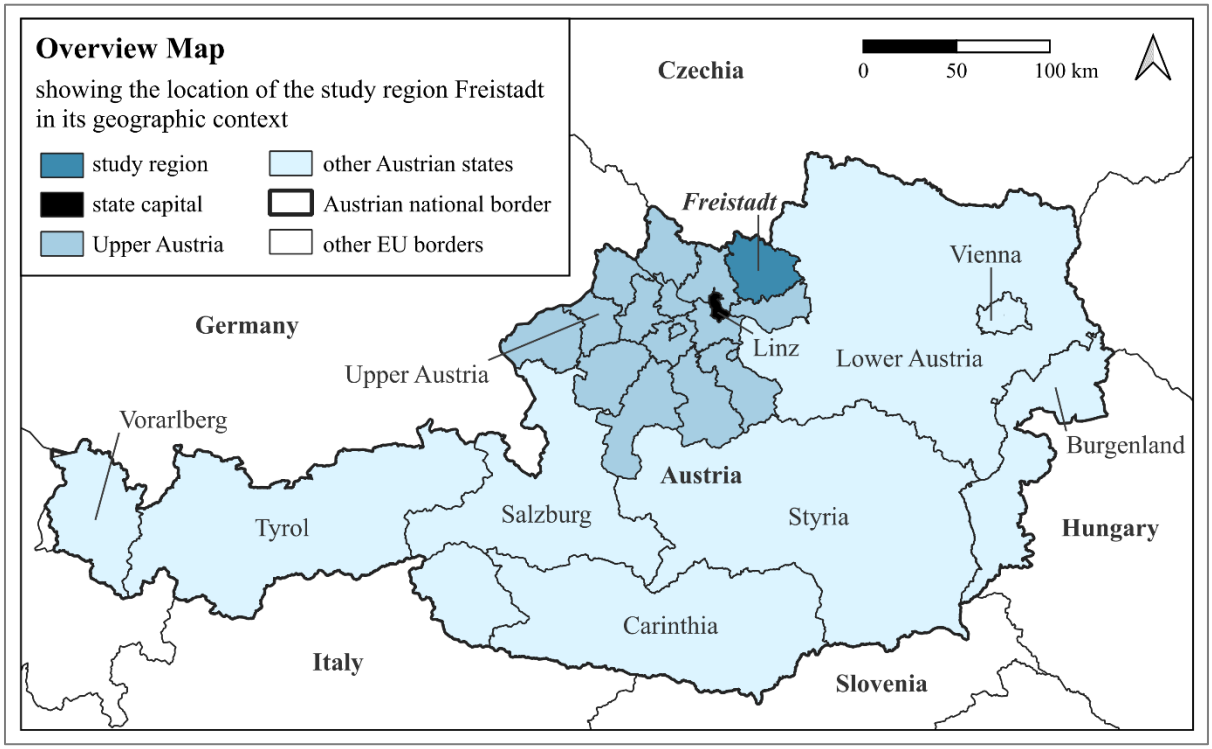

Figure 3: Overview map locating the study region (own representation with QGIS based on Eurostat data)

When this thesis discusses Freistadt as a region or study area, it refers to the political district as shown in the map above. Apart from the city of Freistadt, the district itself also consists of 26 municipalities and market towns (Wirtschaftskammer Freistadt, 2025). In relation to the surrounding districts, Freistadt comprises extensive land masses with an area of 995 km² (Land Oberösterreich, 2024). The topographic properties of the landscape are marked by hill country. At almost 50 percent, the proportion of forest cover is above-average (P2). These geographic challenges and its peripheral location near the Czech border have historically made transportation and logistics more difficult and discouraged large-scale industrial investment and

economic development. An additional drawback is the spatial proximity of the Czech nuclear power plant in Temelin which has sparked protests involving thousands and is deemed unsuitable for the area. Overall, these features shape the region not only in terms of geography but also in terms of economy (Miesenberger, 2013).

4.1.2. Socio-economic context

A variety of factors characterise the economic structure of the region. While the total population of the district stands at 68.336 (Statistik Austria, 2025) and the future development is forecasted to be slightly positive with a 2.6% growth until 2037, the number of working-age people is expected to decrease about 10,6%. Still, the unemployment rate of 2,9% in the Freistadt district is considerably lower than in both the state of Upper Austria (4,9%) and the whole country of Austria (7%) (Wirtschaftskammer Freistadt, 2025). Typically for rural regions, the average wage level is several hundred euros lower than in other, mostly urban areas (P6). As a result, 51% of employed persons in the Freistadt district commute to other districts for their daily work. A high commuter outflow to urban centres like Linz results in a loss of local purchasing power and reduces the economic vitality of the region itself (Wirtschaftskammer Freistadt, 2025). This trend is also reinforced by the demographic developments. The increasing proportion of older residents makes the younger, highly skilled people look for better opportunities in the surrounding cities.

However, the industries with the most employees in the district are construction, food trade and IT services, followed by gastronomy, metal and electric technology, hotel industry, agricultural trade and the wood industry (Wirtschaftskammer Freistadt, 2025). Yet, a very small-scale economic structure runs through all these areas. Freistadt is dominated by small agricultural holdings and family-run businesses (Klima- und Energiefonds, 2025b), limiting economies of scale and innovation capacity. This is a common trait in the broader Mühlviertel region, including Freistadt. According to the local Chamber of Commerce, the biggest part (56,6%) of the local business have only four or less employees (Wirtschaftskammer Freistadt, 2025).

Due to a combination of demographic, economic and geographic factors the Freistadt region can be identified as structurally disadvantaged in a nation-wide comparison. To address this issue with particular regard to the energy sector, the association "Energie Bezirk Freistadt" (EBF) was founded in 2005 with the goal of fostering local job creation (Miesenberger, 2013). The region's efforts to overcome these adverse initial properties include using their rich natural potential and collective societal resources.

In terms of its socio-cultural assets, the district of Freistadt possesses characteristics that are quite typical for rural regions in Austria. These encompass having strong community ties and bounds to their roots, sharing rather conservative values, as well as being very committed to voluntary work and living in close alignment with nature (P4). As for the local population, they are described as very thrifty, determined and hard-working when it comes to creating a future that is worth living (P3, P6).

4.1.3. Energy landscape and national embeddedness

Just like most nations worldwide, Austria and the district of Freistadt are on their mission to reduce CO_2 emissions in order to contain the climate crisis and preserve the quality of life, health and prosperity of its citizens. In the whole of Austria, the energy sector makes up for the vast majority of emissions (67%), followed by industrial processes and other product use (22%), agriculture (10%), land use change and forestry (6,1%) and waste (1,6%) (Umweltbundesamt, 2024). In this statistic, the energy sector is portrayed extensively, capturing fuel combustion activities, transport, manufacturing industries and construction, energy industries and other smaller categories. Reductions need to be made throughout all these sectors, since Austria has set itself rather ambitious climate targets, like reaching complete climate neutrality by 2040 (Schmidt et al., 2025). In order to master this challenge, immediate action is required. For the energy sector, measures include reducing the overall energy demand, increasing energy efficiency and substituting extractive energy sources with renewable ones (Energiebezirk Freistadt, 2025). Despite being defined at the national level in Austria, climate change mitigation targets are executed at the regional and local level (Komendantova & Neumueller, 2020). But before looking at specific measures and transition initiatives in the study region, Figure 4 below shows the overall energy consumption, usage and source in all municipalities of the Freistadt district combined.

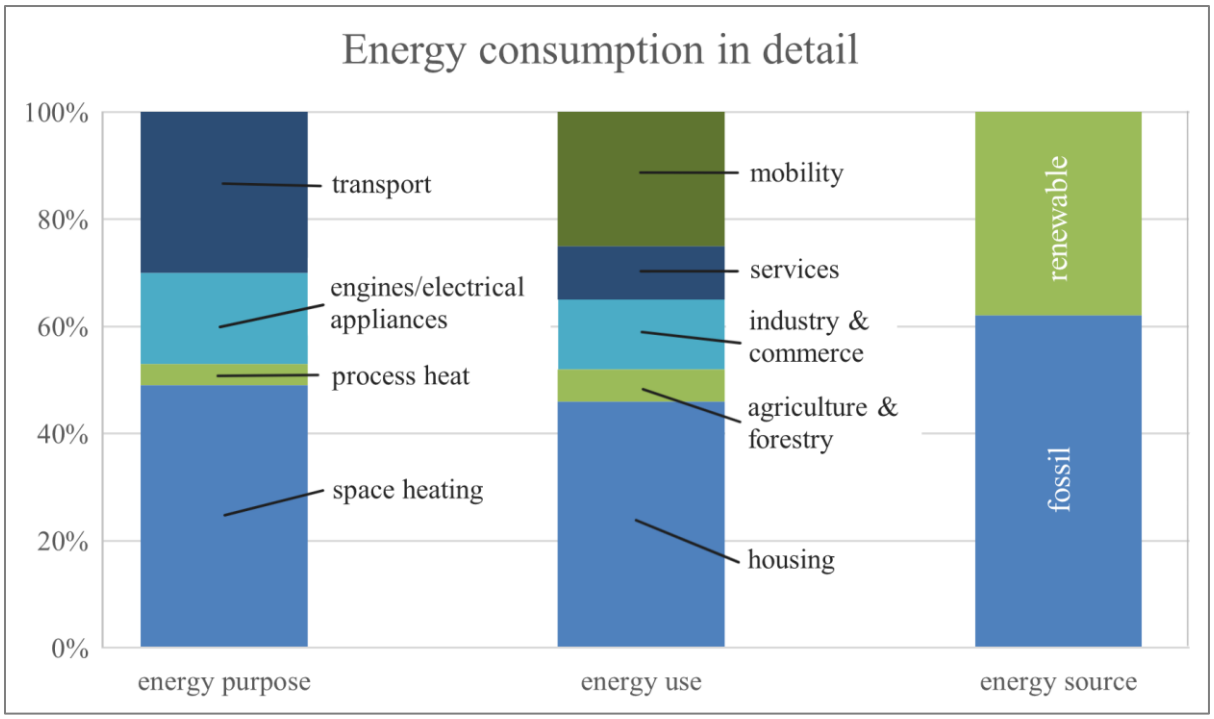

Figure 4: Proportional energy consumption (purpose, usage and source) in Freistadt (own representation based on Abart-Heriszt & Reichel (2022))

Breaking down the energy consumption in detail, the left column in Figure 4 shows how much energy is required for different individual purposes. They refer to various activities for which energy is utilised, making a distinction between space heating, process heating, electrical appliances and transport. The middle column represents the sectors, in which the energy is applied in like housing, agriculture and forestry, industry and commerce, services and mobility. The right-hand column illustrates the current contribution made by renewable and fossil fuels to meeting energy demand in the Freistadt district (Abart-Heriszt & Reichel, 2022).

Overall, the proportional distribution of extractive and renewable energy sources (RES) in the Freistadt district matches the national average. As data provided by the IEA - International Energy Agency (2025) shows, the total energy supply consists of 38% RES (hydro, wind, solar and biofuel combined) and 62% extractive sources (oil, coal and gas combined) (see Figure 4 and Figure 5.1). However, these comprehensive statistics include both domestic production and imports.

In total, 64% of the national energy supply is imported, making Austria highly dependent on foreign energy sources. Particularly fossil fuels like oil, natural gas and coal are highly represented amongst the imports (IEA - International Energy Agency, 2025). Only the smaller proportion of the energy is produced domestically, but the majority of it comes from renewable sources (see Figure 5.2). Biofuel and hydropower dominate both the Austrian average and the Freistadt region, where an active biomass cogeneration plant can also be found. Similarly, the

high proportion of forest areas offers a unique opportunity in the region for the conversion of wood waste products into electricity (P4). Nevertheless, the study region offers rather insufficient resources for the use of hydropower. In return, the topography creates favourable conditions wind and solar energy, providing them in above-average volumes and quantities (P6). Apart from their availability and great potential for expansion, both this thesis and the actual expansion in the region focus on solar and wind energy, because they also complement each other in terms of their generation.

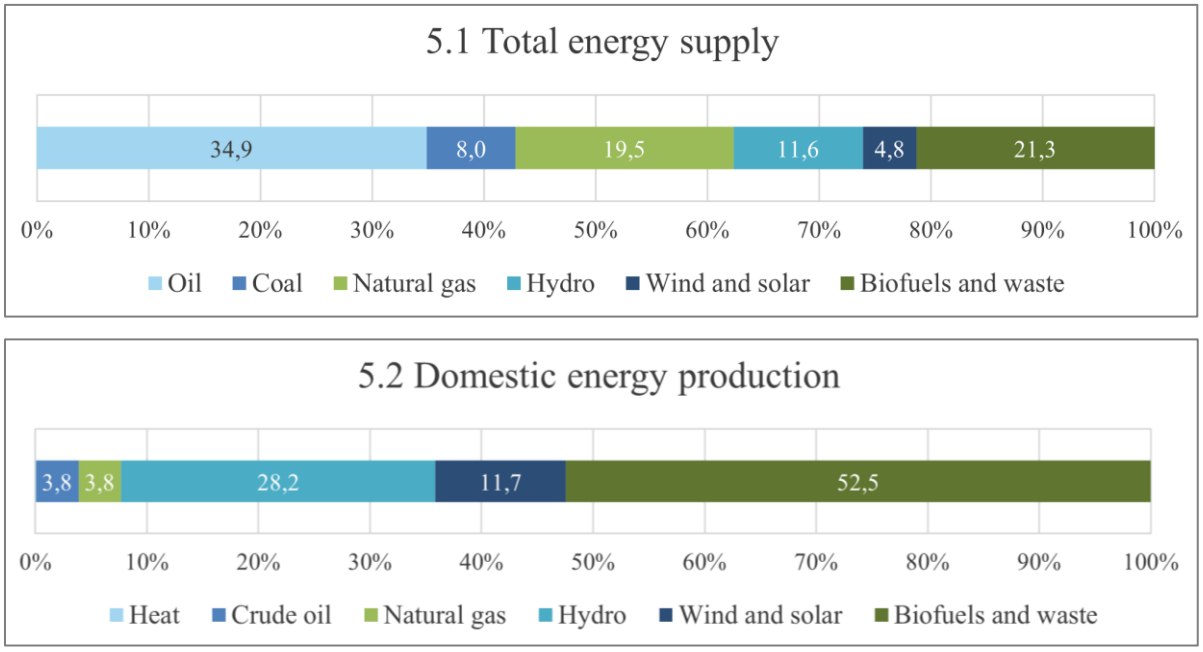

Figure 5: Energy sources in Austria (own representation based on IEA - International Energy Agency (2025) data)

4.1.4. Regional initiatives

The municipalities of the Freistadt district recognised the challenge of decarbonisation early on. Freistadt has been a member of the Austrian Climate Alliance since 1991, which, as a partnership of almost 2,000 municipalities in Europe, has set itself the goal of sustainably reducing CO_2 emissions (Energiebezirk Freistadt, 2022b). In general, the concept of sustainability has always been firmly established among the people in the Mühlviertel (P6). Originally emerging from the field of waste management, new questions arose regarding the availability of resources and how to deal with them in the future. With this expansion of responsibilities, the waste management association's capacities were exceeded, sparking the need for a new organisation and ultimately leading to the establishment of the energy district (P4). Since its foundation in 2005, the non-profit association **Energiebezirk Freistadt (EBF)** has been implementing forward-looking projects in the areas of renewable energy, sustainable

mobility, climate adaptation and climate protection, bringing together politics, business and private individuals (Energiebezirk Freistadt, 2022b). With regards to the energy sector, recent projects include the development of strategies for a resilient power supply by retrofitting power storage facilities and neighbourhood storage facilities in municipalities, examining the establishment of an inter-municipal renewable energy community and an information campaign on electricity from wind power (Energiebezirk Freistadt, 2025).

The EBF works closely with energy consulting experts, schools, non-profit institutions (e.g. Caritas for heating replacement) and many other stakeholders (see chapter 4.2). They usually coordinate three-year projects that are financed by the Climate Fund (P1). This can be explained by its organisational structure that is now made up of two **climate and energy model regions (Klima- und Energiemodellregionen, KEM)**: Mühlviertler Kernland and Mühlviertler Alm. Until 2022 they belonged together under the name KEM Freistadt, but were recently split up for better manageability, more precise adaptation to local needs and thus more effective future development (Klima- und Energiefonds, 2025a). Due to the overlap between KEM and the LEADER region Mühlviertler Kernland, regular exchanges take place with the LEADER manager. This allows synergies to be exploited, mutual advice to be exchanged and climate and energy projects to be jointly promoted externally as a region (Regionalverein Mühlviertler Kernland, 2025). Because they joined the KEMs comparatively early in 2009, the region looks back on a remarkable transition pathway (Klima- und Energiefonds, 2025a, 2025b). The EBF has been driving forward the energy transition as a KEM in the Freistadt district ever since. Their main vision is to phase out fossil fuels by 100% or as their slogan says: *"No more dependence on expensive oil imports, no more fear of gas crises – instead, clean energy generation from the sun, wind, water and bioenergy from the region"* (Energiebezirk Freistadt, 2022a, p. 6). The Climate and Energy fund promotes this switch from fossil-fuelled to sustainable energy systems by quickly and systematically organising targeted information events and advice sessions in the KEM regions (Klima- und Energiefonds, 2025b).

To advance these considerations and objectives in practice, **Helios Sonnenstrom GmbH** was founded in 2012 as a subsidiary of the non-profit association EBF. With the first ever citizen participation model for financing solar power plants in Austria, Helios made solar energy accessible for everyone (P4). Each interested party can provide a desired loan amount in the form of purchased solar bricks. One brick costs 500€ and is assigned to exactly one photovoltaic module of a specific plant. These solar building blocks are a safe, regional and ecological investment, while financing the expansion of PV systems in Upper Austria at the same time. Helios builds and operates these plants and repays the loan over a period of 13 years. In return

for allowing the roof space to be used, the house owners receive the entire system free of charge and can continue to operate it past the breakeven point. This ensures that the systems can continue to be used sensibly and to feed excess energy into the grid (Helios Sonnenstrom GmbH, 2025; Miesenberger, 2013). This citizen participation model has also been very well received in the region and was praised as a best practice model in the final reports and on the KEM homepage (Klima- und Energiefonds, 2025a; Miesenberger, 2013). While both the members of Helios and the number of PV systems expanded, the region also made further developmental progress, including the establishment of a local electric car sharing system (Mühlferdl) and receiving additional funding by becoming a Climate Change Adaptation Model Region (Klimawandel-Anpassungs-Modellregion, KLAR!) (Energiebezirk Freistadt, 2022a).

With the founding of the **energy cooperative OurPower**, the next major milestone in the energy sector was reached in 2018. Members of the EBF and Helios significantly contributed to the formation of OurPower as co-founders with existing expertise in the business (P7). OurPower has created a marketplace that brings buyers and sellers together and ensures that all energy and payment processes are transparent and secure. This guarantees a stable and fair price for green electricity in the long term and increases the independency of electricity exchanges (Energiebezirk Freistadt, 2022a). Thanks to the strong activities of the OurPower energy cooperative in the region, operators of renewable energy generation plants and citizens interested in the marketplace were able to become more involved. OurPower continuously works together with local businesses and citizens to further develop the digital marketplace and create new offerings for electricity marketing. The OurPower marketplace is now the leading structure that enables anyone to purchase electricity directly from regional plants (OurPower Energiegenossenschaft, 2025).

To use this new opportunity at a larger scale, the dimensions and capacities of the Helios Sonnenstrom GmbH did not suffice anymore. The **Regios energy cooperative** was founded in 2024 and integrated the Helios Sonnenstrom GmbH into the Regios cooperative as one of their first actions (P2). OurPower helped intensively with the work on the preparation and establishment of the Regios energy cooperative in the years before. Overall, more than 40 entrepreneurs, mayors and committed private individuals in the region around Freistadt were involved in its foundation (OurPower Energiegenossenschaft, 2025).

The overarching goal of Regios as a new cooperative is to establish its own energy supply and achieve complete energy self-sufficiency for the whole region. It substantially contributes to the climate-friendly transformation of the energy industry and thus, as a community, helps to master the energy transition challenges at the regional level (Regios Energiegenossenschaft,

2024). Through these collaborative investments and long-term financing, renewable energy can not only be produced on roof surfaces, but also on open spaces and jointly managed wind farms. While highly valuing self-determination over their own energy production and offering citizens the opportunity to participate, Regios ensures regional energy production and economic viability of the plants at the same time (P4). In doing so, they aim to keep the added value within the region, guarantee a secure energy supply, reach price stability and independence from foreign imports (P2).

OurPower and Regios have both chosen the legal form of a cooperative, or more precisely, an SCE – a European cooperative society (OurPower Energiegenossenschaft, 2024). In the context of the Freistadt district, Regios is the energy cooperative that builds and operates PV systems and wind farms with citizen participation. Regios possesses comprehensive in-house expertise ranging from land acquisition and planning to implementation and maintenance. OurPower is the partner organisation that markets the electricity Austrian-wide (P7, P2). Regios is considered unique in the region due to its formative influence in the areas of renewable energy, citizen participation and self-determination in the region for economic growth (P3).

4.2. Actors and stakeholders

The study region is associated with several stakeholders that all play their part in the regional renewable energy transition. To illustrate and explain them more clearly, this stakeholder mapping was created on the basis of interview contents and internal presentation documents provided by the regional experts.

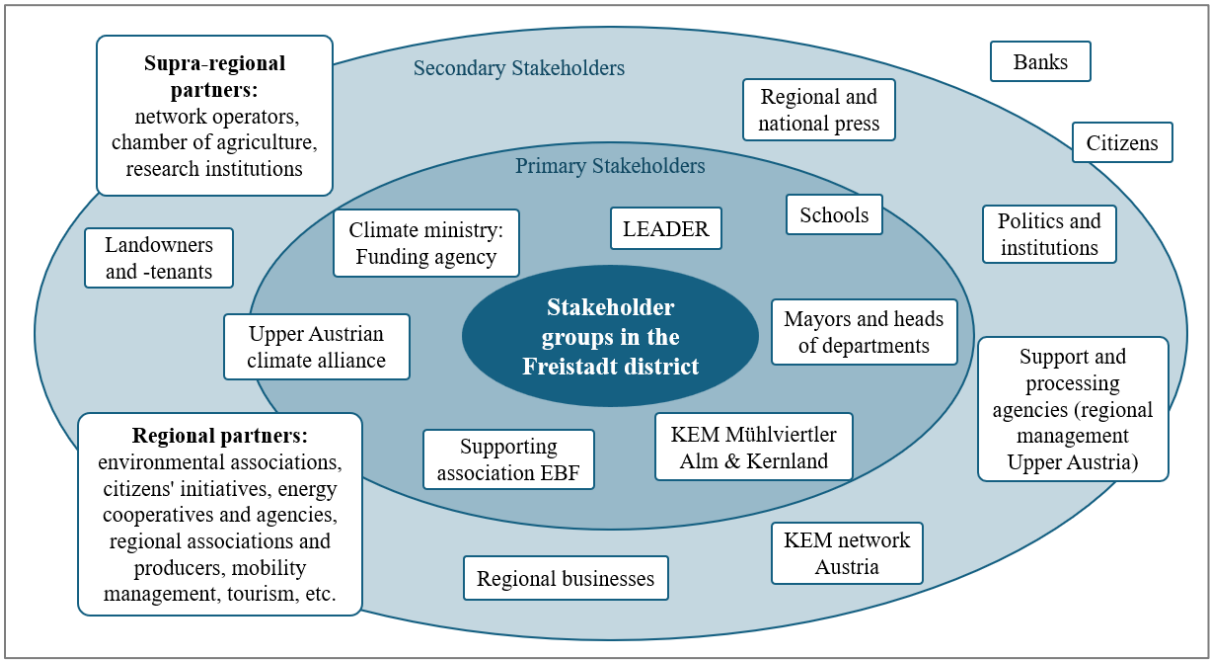

Figure 6: Stakeholder mapping (own representation)

As defined in the previous chapter, the region is the centrepiece and starting point of the research and therefore located in the middle of the map. Next comes the circle of primary stakeholders, who work together very closely and have a direct influence on the energy transition efforts. To begin with, these include the Climate and Energy Model (KEM) regions Mühlviertler Kernland and Mühlviertler Alm, whose mission it is to phase out fossil fuels by generating clean energy from solar, wind, water and biomass within the region. This happens in close cooperation to the Energy District Freistadt (EBF), being the regional association responsible. Additional support comes from subsidies like the rural development programme LEADER, which is funded by the European Agricultural Fund for Rural Development. Further financial aid can be applied for at the project funding agency of the climate ministry (P6).

Another equally important set of actors in the inner circle are the mayors, heads of departments, local councillors of the 27 municipalities in the region. Although they usually represent a political party, there are also independent candidates. However, when it comes to cooperation on the expansion of renewable energies, they primarily represent the interests of the local population and regions in general. At this lowest level, party political affiliations play a subordinate role and decisions are made across these divisions (P1). At the state level, federal ministers and state councillors can still have a considerable influence on it, but do not directly affect Freistadt's transition mission. That is why they are already a part of the secondary stakeholder circle, as well as the network of other KEMs that have an Austrian-wide connection. Along that border between the levels, the Upper Austrian Climate Alliance is located, just like the public schools that are crucial for knowledge transfer and science education. Additionally, science communication is influenced by the regional and national press.

The next highest level also features the two most substantial stakeholder groups: regional and supra-regional partners. Starting with the latter, these comprise the network operator in charge of the high voltage power lines, namely Linz Netz, Energie AG and Ebner Strom. They will become increasingly important later on due to their monopoly position and bargaining power (P6). In contrast, science is also extremely powerful as a neutral and external actor. Whether in the form of consulting by individual experts or institutional research, science can provide the necessary momentum to stimulate transition efforts and make an important contribution in the form of a call to action. This is achieved by providing the necessary technical solutions on the one hand, but also by establishing a factual basis on which it is possible to highlight all advantages and disadvantages and conduct scientifically sound discussions about the expansion of renewable energies (P2, P7).

Even though the headquarters of Freistadt's chamber of agriculture are located outside of the region, they still possess negotiation power with regard to the land. As a considerable area is used for agriculture, the farmers that own or lease the land have a say in the matter through their representation in the chamber. And if the tenants are represented in the region, the landowners' origins mostly lie elsewhere. In Freistadt, the Count Benno Czernin-Kinsky of the bohemian noble Kinsky family is the one of the largest land- and forest owners in the region and administers his countries as managing director and shareholder of multiple businesses (P2). Differently, the Hereditary Prince Hubertus of Saxe-Coburg and Gotha owns sizable amounts of forest and manages the properties from their residency in Germany (P6). Although they are the owners of the land, they often lease it from afar, so they lack a direct connection to the region and are therefore placed in the secondary circle. These complex ownership and usage relationships will be of particular relevance in the following chapters.

In addition to regional businesses such as the timber industry, construction sector and technical trade in the Mühlviertel region, regional partners with a wide range of fields are also highly represented. These include clubs and societies like hunters, the local fire brigade, the farmers' association, the cycling lobby and mobility management, the tourism department, environmental and waste associations, citizens' initiatives, regional organisations and producers. Energy agencies can also be considered a regional partner, since the Mühlviertel has a rich history in the genesis and development of energy cooperatives and communities. As explained beforehand, it began with emergence the of the EBF, that later formed the Helios Sonnenstrom GmbH as a subsidiary company. This developed further into the Regios energy cooperative, which offers green electricity collectively with the help of the OurPower marketplace (P3, P7). These players are deeply rooted in the region, shaping their energy sector significantly in a positive way and distinguishing it from others, especially by giving citizens their possibility to participate. In the figure, they might be located at the margin of the stakeholder circle, but that is because only a small part is represented in decision making. Even though the opportunity is there in theory, only the minority of citizens become involved or are represented in the local energy decision making (P5). The causes and obstacles to this, as well as the options for equitable participation are outlined hereafter (chapter 4.4 and 4.5).

4.3. Energy justice in practice

As the centrepiece of the analysis, this chapter looks at the way in which the different EJ dimensions are implemented in practice. The interviewed stakeholders report from their point of view, providing numerous real-world examples of where EJ was both intentionally applied or evolved along the way as a by-product of other measures and initiatives.

4.3.1. Distributional justice

The logic behind distributional justice, meaning the equitable distribution of benefits and burdens, is known and recognised throughout the set of actors in the region. In fact, they consider it to be very important, especially with regard to supply security in times of crisis and the need for further extension of renewable energy in the future:

> *"The fair distribution of energy and access to it in general is a huge issue, especially in times of rising energy prices." (P1)*

For example, it will be necessary to allocate new areas for building solar installations and wind power plants. Together with many other factors that are determined in an assessment procedure, the location will depend heavily on network availability and grid capacity. This means that a certain dependence on predefined, unchangeable constants exists from the outset and a completely fair distribution is not possible from a logistical point of view (P2). Only if the expansion of the network infrastructure allows it, fairness dimensions can be considered. For that purpose, agents in Freistadt developed an open space allocation formula that takes various factors and burdens into account and should serve as a guideline for future location matters. It was important to regional decision-makers to find an approach that would allow the required space to be distributed fairly among the municipalities (Energiebezirk Freistadt, 2023). In addition, there was an agreement that structurally weaker municipalities in peripheral locations with a higher proportion of land and lower natural soil fertility should be given special consideration in the expansion of PV systems (P2). However, this allocation formula must be evaluated annually in line with the network expansion and adjusted in consultation with the parties involved (Energiebezirk Freistadt, 2023).

Just as in the landscape, there are also inequalities in distribution within society. When talking about the possibility to engage in renewable energy initiatives, some individuals clearly have better conditions from the outset than others. This phenomenon can also be observed in the study region, as some families face energy poverty because they struggle to afford high electricity and heating prices during the winter (P6). Another financial injustice occurs when

citizens cannot make the best decision regarding their energy supply because they lack the necessary capital. For example, in many cases it would pay off to invest in clean energy solutions in the long run, but the hurdle of having to make large initial investments like replacing heating systems or installing their own rooftop PV system is too high (P1). That is where the local initiatives and citizen participation projects in Freistadt step in, intending to balance out these disparities (P4).

An exemplary option is given by regional energy cooperatives like the Regios, or formerly Helios. They offer the possibility to own shares of a PV system, where power is evenly distributed and jointly managed. These low barriers to participating in decisions about energy supply facilitate the access for everyone – both across society and geographically within the district. And even beyond the district, cooperative marketplaces like the one of OurPower now offer the opportunity to purchase green energy throughout Austria (P7). Active participation as given by these opportunities, creates a bond and a certain degree of self-determination, preventing them from placing all decision-making power in the hands of large corporations (P4). Still, experts say that regional inequality is not the biggest problem, but rather the unequal distribution of power within the system (P7). In practice, large companies still exploit their dominant position in the energy market, making ordinary citizens pay disproportionately high prices for their products and services. Extending the scope of consumers, it even affects uninformed farmers that receive far too little compensation for leasing their properties to large corporations (P6).

After all, one pointed out that achieving absolute distributional justice is simply not possible, as someone must establish the rules for assessing said justice (P3). If the assessment is always purely subjective, there will always be someone who feels unfairly treated, neglected or disadvantaged. While the theoretical goal of distributing burdens equally across all shoulders is most desirable, it has not yet been achieved in reality, because only approximations are possible (P3).

4.3.2. Procedural justice

According to experts of the local energy industry, aspects of procedural justice like transparency, participation and the right to have a say are considered to be essential (P1) and are already being practiced within the scope of their capabilities (P2). In regional management at district level, this can be traced with the help of project documents. In case of the EBF, these records are accessible to associated members. However, reports and grant applications are usually so extensive that their volume may deter potentially interested parties (P1).

Nevertheless, the overall transparency is considered high, with mechanisms such as open local council meetings supporting the visibility into decision-making processes (P3). Various stakeholders, including the public sector, are represented in projects by the two regional KEMs, further enhancing oversight and inclusivity. Since the KEMs receive grants from the national and European level, certain requirements, specifications and guidelines must be met. For their documentation, the development progress is recorded and assessed on the basis of selected success factors, as displayed on the webpage of the model regions (Klima- und Energiefonds, 2025a, 2025b).

As representatives of a natural monopoly, network operators are required to maintain strict neutrality. This structural obligation supports fair access and prevents biased service delivery, aligning with overarching values of transparency and justice within the system (P3). In cooperatives like the Regios, accountability is maintained through strict regulatory compliance, including regular audits, proper tax filings, sound operational management and adherence to procurement rules (P2, P3). When marketing the energy on platforms like OurPower, transparency regarding the origin of electricity is ensured, along with systematic documentation of work processes and milestones. In combination with new reporting standards, procedural transparency improves traceability and supports better monitoring (P7).

The opportunity to participate in a wide variety of decision-making processes is especially given in cooperative structures. Regios and OurPower both emphasise their democratic principles by ensuring that every vote carries equal weight, regardless of the member's share size (Regios Energiegenossenschaft, 2024).

"Through the energy cooperative, citizens have the opportunity to participate by purchasing shares, allowing even small-scale shareholders with as little as 100 euros to get involved, in addition to large investors with up to a million euros. [...]
And regardless of how high the investment is, each shareholder has only one vote." (P6)

This commitment to procedural fairness already begins in the early stages of project planning, where inclusive participation is encouraged before key decisions are made (P5). In order to bring all parties involved to the same level of understanding, a helpful step is to hold a preliminary project meeting that provides an overview of the current status (P2). Ongoing communication measures, such as information events and updates via online newsletters, help to sustain this fairness throughout the whole process. Existing citizen engagement measures that enhance credibility include surveys, informational meetings and direct interaction with decision-makers (P4, P6). Transparency about the potential disadvantages, particularly regarding environmental and social consequences must be communicated early and openly (P5). However, perceptions of transparency can vary – while official structures may appear open, some individuals believe that processes are only pseudo-transparent (P6).

4.3.3. Recognition justice

Representation and recognition are crucial for governance processes to be perceived as fair. This includes pursuing greater diversity and social representation of people in important decision-making processes and positions of power. In doing so, everyone's needs should be taken into account and considered as equally important (P2).

When the recent renewable energy expansion strategy for Freistadt was developed (Energiebezirk Freistadt, 2023), efforts were made to exclude no one (P2). From the beginning, all political positions were represented, also hearing and seriously acknowledging critical voices. When making these decisions, care was taken to ensure that different professional backgrounds and members from different organisations were represented (cf. Figure 4) (P1). To establish a general scientific consensus as a basis for discussion, external representatives from the scientific community are particularly well suited to present facts objectively. It is especially advisable to involve experts, as they maintain a certain distance and do not spread emotionally driven opinions like other parties involved may do (P5). That is why the Regios cooperative has an extensive advisory and supervisory board, that is made up of several representatives from the academic community (P2).

Yet, holistic societal representation in the governance of renewable energy transitions depends on active engagement. For citizens to participate, an initial interest and initiative of individuals must exist to begin with (P3). While opportunities to engage are generally accessible to all, actual representation of diverse societal groups remains a goal yet to be fully realised (P7). Political alignment or distance can influence the degree to which citizens feel connected to or supportive of such initiatives (P4). Within the energy cooperatives, equal voting rights for all members, regardless of share size, foster a strong sense of recognitional justice and democratic

legitimacy. This egalitarian structure is widely perceived as fair and enables individuals to feel part of a larger collective effort, enhancing both representation and motivation to support the energy transition (P6). Still, the representation of different societal groups in the transition process remains uneven. When being asked about experiences with recognition justice in their respective fields of work, the agents' responses were somewhat similar and can be summarised as follows:

> *"From a social perspective, the circle of decision-makers is still very homogeneous. I think we have few young people in positions of political responsibility, we have few women in positions of political responsibility and we have practically no migrants in positions of political responsibility. This means that large sections of the population are mis-recognised and disregarded in decision-making processes." (P1)*

The reason for the exclusion and lacking access to leadership roles among women, migrants and economically disadvantaged individuals can partly be explained with limited voting power, insufficient information or a lack of financial resources (P1). Historically, involvement in initiatives like the EBF and the former Helios cooperative has been dominated by men over 40, primarily because this demographic tends to have accumulated the most capital (P7). Regional data from energy cooperatives also show that 76% of members are men, with an average age of 50 to 55 (OurPower Energiegenossenschaft, 2025). But improvements are emerging in recent years, as participation rates among women and younger people have begun to rise (P2). Targeted interventions, including a series of women-focused dialogue events and youth outreach via the PowerYouth project network aim to address these gaps (P7). Additionally, future initiatives such as social tariffs are already in the planning phase and would to help include underrepresented groups (P2). Particularly older, retired individuals who are vulnerable to energy poverty, currently lack meaningful representation (P6). This ongoing challenge highlights both the need and the opportunity to build a more inclusive and socially just energy transition.

4.3.4. Restorative justice and other dimensions

Apart from the three main pillars of energy justice, both literature and practice suggest additional dimensions. As outlined in the theory (see chapter 2.3.3), restorative justice is the most common extension. It involves the use of targeted incentives, such as subsidies and compensatory measures to promote the expansion of RES (P4). In order to ensure that the advantages are both clear and accessible to the wider community, identifying and actively disseminating these benefits is essential, especially for gathering widespread support (P1, P5).

Moreover, restorative justice emphasises options for compensation and balancing the costs and benefits of the participating stakeholders if certain inequalities or impairments cannot be completely avoided. For instance, residents can be reimbursed if they are directly affected by the negative impacts of a power plant, such as restricted views or noise. In the past, there have been cases with hydroelectric plants where compensatory services or facilities, like building a community hall, served to offset these disadvantages (P5). Such compensation not only addresses the costs borne by the local population but also fosters goodwill and mitigates opposition (P4). Equalising disparities and building trust with restorative measures also contributes to the distributional dimension, advancing the overall justice in the regional energy transition.

Lastly, other measures that help decision making processes be perceived as fair, are clear rules and guidelines. For example, capping the energy prices per kilowatt hour like on an energy community's marketplace, helps to regulate the market and prevent unfair practices so that electricity producers and suppliers cannot exploit consumers (OurPower Energiegenossenschaft, 2025). Additional certifications, such as Verified Social Enterprise, may help to increase credibility and build trust in a company, their actions and intensions, improving the perceived fairness (P7).

4.4. Barriers and challenges

On the transition pathway to a low-carbon energy system, numerous barriers and challenges arise for the local agents. Directly or indirectly, they especially hinder the prioritisation and the implementation of EJ principles. The examination was able to identify said challenges and group them into the following six categories.

4.4.1. Financial barriers and challenges

Finances are a key barrier in the planning and implementation of energy projects. Especially at the municipal level, there is little funding available, putting the communities in a financially strained situation (P1). A substantial part of the limited resources is used for the regional office infrastructure, personnel costs and occasional events. This means that smaller projects with minimal financial expenditure are prioritised at regional levels, like in the EBF. Therefore, when it comes to collaborations, the municipalities also heavily depend on the goodwill of its partners and volunteer work. In particular, there is a lack of funds to obtain the professional opinions of external experts and to remunerate them fairly (P1). The limited, available resources, however, are not being used efficiently. Financing based on the "scattergun approach" might distribute funds everywhere but does not evaluate the actual demand of where

the support is needed the most. As a result of this equal but not equitable approach, injustices persist. Without said necessary funds and subsidies, attractive incentives for sustainable development are lacking and less projects are likely to be implemented. Particularly in light of the recent cuts to the national budget in the area of climate protection, additional challenges lie ahead (P1).

At the citizen level, financial constraints can also become obstacles to investing in renewable energy solutions. Freistadt is addressing this issue with citizen energy consultations and cooperation initiatives to replace heating, electrical appliances and more (Energiesparverband Oberösterreich, 2025). Further, the problem frequently lies in the high initial acquisition costs or in the words of a regional expert:

> *"If the initial investment is large, even if it would pay off in the short or long term, but if the economic benefits only become apparent after a few years, it is always difficult for many people, including our communities, to be honest." (P1)*

Financial incentives like provided by the local Regios energy cooperative are an exemplary way to get the population on board. Taking control of your own energy supply through the cooperative model can be a way to combat financial inequalities and achieve economic independence (P4). Otherwise, energy consumers reported to feel overlooked and taken advantage of by large energy corporations that maximise their profits at the expense of smaller players (P5). Even after the crisis situation on the volatile energy market eased, the adjusted prices were not passed on to the consumers accordingly (P6). Eventually, financial imbalances and inequities are decisive for all kinds of injustices at many levels. Given differing financial preconditions, the capitalist system continues to reward the wealthy with additional power and influence (P7).

4.4.2. Behavioural barriers and challenges

Apart from financial obstacles such as higher investment costs compared to conventional, less expensive energy sources, the transition to renewable resources and production methods requires a conscious decision and change in behaviour. Behavioural barriers present a significant and persistent challenge, since they often root in deeply entrenched personal attitudes and opinions that are hard to change – even in the light of scientific evidence (P4). As positions on the opposing sides harden, discussions tend to become less constructive, fuelling a growing polarisation within society (P1, P4). This division is exacerbated by social dynamics such as envy, where individuals may resent others who benefit from renewable energy projects, particularly if they themselves do not perceive any direct advantage.

Such emotional responses, including feelings of scepticism, dissatisfaction and a sense of powerlessness, contribute to a prevailing negative mood. These perceptions of fraud and disloyalty that can spread rapidly throughout communities (P2, P6). A crucial barrier arises from the fact that established opinions are rarely questioned, even when confronted with robust scientific data supporting the benefits of renewable energy (P4). This resistance is frequently founded on unjustified fears, typically grounded on loss or change. That is when emotional reactions overshadow factual discourse, making rational discussions increasingly difficult (P6). Furthermore, a substantial proportion of the population is not well informed about the technical or societal aspects of energy transitions. The positive correlations between information, understanding and acceptance of renewable energy projects will be discussed in more detail later. But with respects to reality, the actors must acknowledge that widespread expertise or in-depth interest cannot be expected from everyone (P5).

4.4.3. Political barriers and challenges

In the renewable energy transition process, an essential proportion of decisions is made at the political level. Since the local mayors hold influential positions of power, they have the responsibility to actively focus their attention on energy issues and overcome the often very narrow-minded party-political thinking (P4).

At the regional level, however, political affiliations are less noticeable than at the state or federal level. Local politicians primarily want to do good for their community, forming an “alliance of the willing” (P1). With this gathered amount of goodwill and engagement in the community, cooperation across party lines becomes possible. Naturally, a certain closeness or distance to the topic of renewable energies does exist based on party affiliation but is not definitive (P2). Like in the case study region, the mayor most often belongs to the conservative Austrian People's Party (ÖVP) and has still supported the expansion of renewables because it empowers and enables the citizens of his political district (P1).

Yet, at the state level, such contradictions would be hardly conceivable. Like in the heavily polarised wind farm debate in Upper Austria, opposing positions and internal conflicts are dividing the ÖVP. That is because the higher the political level, the bigger the focus is on factors like economic growth, before social aspects such as quality of life can be considered. And putting off these priorities is most likely to harm one's political career and advancement opportunities (P4). These implications are closely accompanied by politically motivated lobbying that becomes problematic when projects or partners are selected accordingly. For example, an energy expert was only invited to a corporate event with the hidden agenda to ‘greenwash’ their reputation. Actions like that can easily be mistaken for bribery or corruption

and must be prevented from the outset (P5). This also applies to abuse of power, which large energy companies are also accused of in this context. Prioritising their own interests, like pleasing their shareholders, is achieved through gathering high revenues at the expense of electricity customers (P7). It can even create the impression that large corporations want to prevent the regions from becoming autonomous and controlling their own energy production (P6).

To counter this trend and represent the interests of society in the Austrian energy landscape, the emergence and facilitation to found energy communities was a crucial development. Still, it was a thoroughly political process. The decisive legislation, namely the Renewable Energy Expansion Act, has only been in place since 2021, making the future development and advancements dependent on the decisions of political stakeholders (P7).

4.4.4. Organisational barriers and challenges

Organisational barriers to renewable energy transitions are multifaceted and can include all kinds of bureaucratic, regulatory, controlling and managerial challenges that may affect the perceived justice of administrative processes. To begin with, the effective supervision of internal structures, such as through external audit bodies, is critical for ensuring justice, especially due to past issues of embezzlement at the district level (P1). Power structures and questions of who provides support for which project outcomes significantly shape organisational procedures in the region. Inadequate consultation or even abuse of power add to complicated processes and eroding trust within the communities (P6). Organisational processes must also be adaptable and revised according to feedback, as approval and application procedures can vary greatly across departments (P2). Diverse stakeholders might have different wants and needs, which must be accommodated in planning and implementation. Some businesses, for example, prefer consistent over cheap energy (P3). These organisational considerations require a lot of patience and perseverance, especially when it comes to convincing people of the general necessity of expanding renewable energies (P2). In this context, the public sector often plays a mediating role with the aim to reconcile various interests and ensure early and inclusive feedback from citizens and municipalities (P3, P1). Where dissent arises, popular petitions and referenda can help to better reflect the opinions of stakeholders and add legitimacy, though their outcomes are not always binding (P4).

"So you really have to think everything through carefully when communicating with the public about energy issues." (P5)

As shown in the quote above, communication stands out as a crucial cross-cutting challenge. Information about projects should be accessible and easily understood by all (P7), yet poorly timed or insufficient outreach has sometimes left stakeholders feeling disregarded (P1). It is unrealistic to expect everyone to become an energy expert, so clearly assigning roles and responsibilities is fundamental to organisational clarity and capacity-building efforts (P5). Informing not only citizens but also decision-makers at all governmental levels is essential, as insufficient knowledge among officials can hinder approval processes and slow the systemic transformation (P5). However, the way that scientific evidence and recommended actions are communicated to the general public is vital, especially in a media environment prone to misinterpretation and the deliberate spread of misinformation. These barriers have shown to be particularly problematic in the polarised debates concerning the extension of wind farms in Upper Austria (P5, P7).

Further, administrative, economic and legal obstacles hinder developmental progress. Especially in the case of regional energy communities, the complexity of founding associations or cooperatives and adapting to evolving laws and market frameworks is challenging (P7). Given these factors, strategic outreach should begin at the community level, gradually expanding to broader regions to ensure local engagement and acceptance before scaling up (P4).

4.4.5. Structural barriers and challenges

A considerable number of obstacles along the transformation pathway is structurally induced. To begin with, the agents report that existing energy systems are exceptionally old, inert and fundamentally unprepared for the kind of comprehensive and rapid transformation that is required (P1). This challenge can be traced back to the region’s historical economic orientation, that was formerly dominated by large-scale industry such as Voestalpine, influencing local capacity for adaptation and readiness for decentralised energy forms (P6). Despite the urgency, the spread of renewable energies in Austria overall has been very gradual in the perception of the actors, reflecting the broader systemic inertia (P5). But since effective structural change is a continuous process, it depends on evolving production and consumption behaviours as well as gradually establishing new frameworks and alliances. Because the more actors collaborate within new enterprises or project companies like Regios, the greater the progress that can be achieved (P2, P7). However, structural power imbalances persist, with large and powerful entities sometimes dominating or marginalising smaller communities and citizens, potentially compromising the energy transition's participatory spirit (P3).

Additionally, renewable energy systems themselves face structural disadvantages. In relation to timing and the natural variability of sources, the different energy forms must complement each other to ensure a reliable supply (P3). Similarly, energy communities might offer a valuable structural framework but also need to be heterogeneously composed. Otherwise, if generation and consumption behaviours among members are too uniform, sharing potential is lost (P7). A strategic and structurally intelligent approach should involve comprehensive resource planning to identify existing capacities and set clear, targeted goals (P4). As the energy system changes towards RES, its structure is increasingly shaped by decentralisation. Implicating more visible infrastructure like wind and solar installations, local acceptance and engagement become even more critical (P6).

"These are forms of energy that affect (...) many people. That wasn't the case in the past, because electricity used to come out of the socket and no one noticed where oil and gas were produced. Now, all of a sudden, all these plants are popping up on our doorsteps." (P6)

Special attention must also be paid to regional circumstances because of structural and distributional disparities regarding infrastructure. In many cases, key assets like grid infrastructure have not been upgraded for decades, leading to limitations in capacity or outright unusability (P7). These shortcomings further hinder the pace of change and are closely related to the technological conditions.

4.4.6. Technological barriers and challenges

Technological barriers pose significant challenges to the regional energy transition in the Mühlviertel, since expanding and modernising the electricity grid is essential for a successful energy future and distributional justice (P6). The network operator plays a vital role in this context, carrying key responsibilities for maintaining and upgrading the regional supply infrastructure (P6). Nevertheless, there is uncertainty but also hope about the speed of network capacity expansion, which is needed to keep up with the growing renewable energy generation (P3). A particularly acute barrier in the Mühlviertel involves power storage. Options are severely limited and the construction of storage power plants is turning out to be difficult due to the region's topography (P3). As a result, there is an urgent need for technological solutions, especially for addressing surplus electricity production at midday. As participants note, building intelligent grids, developing smart control systems and enabling efficient interaction between producers and consumers are core technical challenges that still require innovation (P7). The existing technology is not yet reliable or functional enough to ensure a constant power supply, calling for further advancements (P5).

Moreover, technological progress in energy systems also supports developments in broader economic and social areas. Acting as an indispensable prerequisite, technology lays the foundation for successful innovations of any kind. For example, smart meters are responsible for billing and reliable data management in energy communities, enabling a collective production and consumption of locally generated renewable energy (P7). Yet, it is not enough to focus solely on advanced technology. It is equally important that the solutions are application-oriented and user-friendly, ensuring broad adoption and effective implementation (P5). Together, these barriers highlight that ongoing innovation and practical application are critical prerequisites for a successful energy transition.

4.5. Drivers and solutions

In order to tackle these challenges, the agents in the study region propose a variety of solutions. Adapted to the local context, democratic engagement platforms help to foster awareness and acceptance through information and transparent communication, resulting in increased participation. In combination with cooperative and innovative efforts, these factors drive a successful and socially just energy transition.

4.5.1. Innovation

Responding to the barriers, innovation can offer solutions and opportunities for a just transition in a variety of realms. Technological innovation is the most fundamental in the energy sector since it enables comprehensive energy supply and serves as a basis for economic and social development. Thus, to drive innovation across all departments, the focus lies on improving reliability and functionality, particularly through storage options like battery-based systems and advanced energy management to address fluctuations in production (P5, P6). While these measures are still in the research phase, renewable energy solutions like agricultural PV installations are already being implemented in the Freistadt region. They serve as an innovative example because it allows land to be used for both agriculture and energy generation. Since these solutions provide advantages and added benefits, such as improved soil quality and minimal impact on crop yield, they should be promoted more actively (P3). For instance, this also applies to the long-term financial returns of PV systems after their initial investment period (P3). Further, innovative progress in digitalisation, such as enhanced energy monitoring, helps to achieve greater energy savings (P1).

Even though technological and economic considerations often dominate innovation discussions, ecological and social criteria should also be given equal priority (P1). Innovation should go beyond technical invention and include effective local implementation and user-

friendly solutions, developed in cooperation with the community (P5). This combined approach will help ensure that technological, economic and social innovations truly benefit the regional transition. As a prime example of social innovation, energy cooperatives must be highlighted – both due to their structure and their societal impact. They create new ways for everyone to collaborate, produce, share and consume renewable energy at the local or regional level. Unlike traditional energy models dominated by large utilities, energy cooperatives like Regios foster democratic participation by enabling members to collectively own and manage energy resources, regardless of their personal financial capacity or technical expertise (P2, P3). Even within the energy cooperative model, new developments are emerging. Innovative marketplace platforms like OurPower expand the possibilities for energy exchange, making it more direct and easier to participate (P2, P7). Also new digital tools, like the upcoming OurPower community app, provide users with weather-based production forecasts and consumption recommendations, further increasing system intelligence and user engagement (P7).

In sum, energy cooperatives qualify as a social innovation to a significant extent. They introduce new ways to organise, participate and share the benefits of energy production, with a strong emphasis on inclusivity, equity and social impact, in addition to their economic and environmental contributions.

4.5.2. Cooperation

Cooperation serves as a powerful driver for the regional energy transition in the Mühlviertel, operating across multiple levels and disciplines. As evidenced by yearly exchanges in the KEM regions and cross-border initiatives with the Czech Republic like Interreg, networking is essential and occurs both internally and externally, beyond the borders of Upper Austria (P1). Furthermore, the scope and impact of these joint initiatives are expanded through interdisciplinary collaboration with a diverse range of organisations. Such cooperation is essential for unlocking new sources of funding or using existing ones more efficiently (P1). Collaboration with strong partners also sends a unified and credible message to external audiences while providing best-practice examples that can inspire other regions (P2).

Importantly, cooperation can succeed even among actors with differing perspectives, provided there is a willingness to reach compromise (P2). Sometimes that becomes necessary because certain collaborations are simply indispensable. For example, not all technological or supply chain components for the expansion of renewable energy facilities can be sourced within the Mühlviertel region, so it is often needed to engage international suppliers and distributors. Nevertheless, local importers and service providers remain crucial for ensuring that value creation stays rooted in the region (P3). Working with external experts not only increases the

independence of local projects but also enhances their credibility within the regional community (P5). Finally, the personal relationships built through cooperative networks deepen trust and cohesion among stakeholders. The individuals involved act as bridge builders and trusted advisors, helping to advance the shared vision of a sustainable energy future for the Freistadt region (P7).

4.5.3. Information and transparency

Disseminating information in a transparent way is crucial for ensuring a just transition. Otherwise, there is the risk of stakeholders being informed too late, too poorly or not at all (P1). This is especially important in the handling of public funds, which, as a public good, must be managed with utmost responsibility and ethical consideration. Proper justification of actions is necessary to guarantee fair and equitable use of these resources (P1). For true transparency, it is essential to clarify how requirements and targets are defined, relying on factual measurements and calculations as the basis for understanding (P4). Direct communication of any risks, along with potential solutions, further supports the principle of fairness (P1).

Going on, the way that information is communicated is key to the success of the energy transition and should target all audiences, both expert and non-expert. Information must be presented clearly, ensuring scientific facts are accessible to everyone (P4). For instance, the district of Freistadt used a relatable and graphic example for their community: a shopping basket consisting of different ‘products’, illustrating the breakdown of the local energy use. Like that, communication is not only exemplary in its content but also demonstrated through transparent actions (P3). Other low-threshold participation formats that were offered in the region are local discussion groups or organised excursions to nearest wind turbines. The provision of tangible information like this encourages dialogue, including with critical or opposing voices (P4, P6). Presenting information to all, especially those who are unfamiliar with the topic or have distanced themselves from it in terms of content and politics, emphasises the regions focus on inclusivity (P6). However, science communication requires particular care because building trust and understanding is a delicate process, having to avoid both information overload and concealment (P5). Additionally, expert assessments can help in disseminating reliable information, address misconceptions and resolve unjustified fears around the energy transition, since a lack of knowledge is often the root cause of (P7).

4.5.4. Participation

Participation is a central driver of the energy transition in the Mühlviertel. But in order to truly advance the transition, it must be broad and inclusive, encompassing the whole of society (P2). If the circle of participants is too small or heterogenous, both equity and democratic principles are at risk (P1). To achieve social justice, inclusiveness should extend across all social dimensions, such as age, gender, origin and professional background. Still, social diversity remains underrepresented to date and holds significant untapped potential among those who did not yet get involved (P1). As can be seen in the example region of Freistadt, participation is most effective at the community level, where close relationships and strong networks make engagement natural and impactful (P4). By bringing a wide range of actors into the process, the importance of each individual is highlighted, making everyone feel valued (P4). In addition to involvement and co-determination, financial participation is equally important. When people invest their own resources, they develop a deeper connection to the project. Sharing decision-making power encourages personal responsibility and strengthens commitment (P4). Financial participation also creates new opportunities and incentives, such as revenue generation for local stakeholders, which can increase approval and prevent opposition or protest.

Still, a successful expansion of RES requires collective conviction and action, not just passive agreement. All relevant parties, particularly landowners, must be genuinely persuaded to participate and show demonstrable commitment that is reflected in real-world actions and decision-making (P2, P7). Role models and local representatives are vital in this regard, as their involvement can have a positive "snowball effect," encouraging others to join through demonstration and peer influence (P7). Importantly, the differing interests and underlying motives that lead to opposition must be recognised early on. Careful observation and inclusive engagement strategies should help to mitigate behavioural obstacles (P5). Overcoming these barriers demands fostering a spirit of courage and confidence in place of scepticism. Trusted contacts within the region can help to support the ongoing dialogue and local advocacy for renewable energy projects (P2, P7). Ultimately, this broad-based participation fosters a strong sense of community, identification with the project and lasting acceptance (P5).

4.5.5. Awareness and acceptance

The development of awareness and acceptance as a fundamental driver is deeply interwoven with and mutually dependent on other, previously mentioned factors like information, transparency and participation. All together, they create a solid foundation for broad support and just advancement (P2).

Boosting awareness should start with highlighting what is already going well, as this establishes a positive basis for further progress and builds a sense of achievement and confidence (P1). The further process ideally unfolds in these steps: first, fostering awareness, then visualising the connections between issues and possible solutions and eventually raise genuine acceptance (P4). For that, the comprehensive presentation of all aspects of the energy transition is essential, since understanding and acceptance among the local population are recognised as key factors for success (P4, P3). But in order to succeed and show results, raising awareness and fostering acceptance needs to encompass both societal and political spheres. While the majority is generally willing to engage, certain drawbacks and regional debates, like the one surrounding wind power, must also be openly addressed (see 4.5.6) (P3). In response to this, identifying and emphasising unique selling points or special features of local projects can highlight the advantages and as a result, significantly boost acceptance. Phrased in the words of a local decision-maker: *"We can also have something that others don't have"* (P4). However, efforts to raise awareness must always go hand in hand with visible, practical implementation, because without tangible results, motivation and engagement quickly fade out (P4). Stressing the importance of emotional investment, participation with a sense of ownership in local projects enhances personal awareness and creates a unique connection to the energy transition (P3). To maximise acceptance, it is beneficial to leverage synergy effects. These include recruiting major local supporters, companies or employers as role models. Their reputations foster trust and through their broad networks, they can act as effective advocates and multipliers within the community (P6).

4.5.6. Mediation

In search of solutions to overcome entrenched barriers in the energy transition, mediation between different stakeholders and interest groups has become established in the Freistadt region. Even though opinions on renewable energy are often less clear-cut at the local level than at the national level, fears and concerns are so deeply rooted that constructive discussion is sometimes abandoned and positions become increasingly polarised (P1). Despite being in the minority, critical voices are often louder and have the power to control the conversation, which further hardens opposition. Addressing issues early on in the process is crucial to avoid animosity, rather than waiting for conflicts to advance (P5).

A key strategy is to consistently take critical voices seriously and to provide opportunities for practical engagement, such as excursions and real-world examples that can help to gain access to processes and technologies (P1). Mediation should actively aim for a middle ground, seeking to bring together both enthusiastic supporters and sceptics. While a just transition is always the

ultimate objective, dialogue and compromise need to help everyone understand that no solution will be perfectly fair for everyone (P3). In highly emotional debates like the expansion of RES, it is especially useful to identify the main opinion leader among critics and to establish respectful and personal contact. In the past, targeted engagement such as focusing dialogue efforts on this individual, has proven to be effective in the region. Since these opinion leaders can influence their network, that should help to ease tensions and foster broader acceptance for the energy transition (P6).

4.5.7. Change and system shift

Overall, the actors in the Freistadt region believe that a general change in mindset is necessary for a successful transformation (P3). Recognising that the current developments come at the expense of future generations, the long-term perspective must be considered: *"Think not only about tomorrow, but also about the day after tomorrow"* (P1). This necessary change relates both to the direction in which resources are allocated and distributed, but also to the evaluation mechanisms and ground rules of the prevailing economic system. Based on the principles of more, higher, faster, its main objective focuses on growth and neglects justice dimensions. In the long term, the current trajectory is unsustainable, necessitating a revision of the fundamental rules oriented towards growth (P4). Some even believe that the mechanisms are so deeply rooted that they are difficult to transform and can only be changed with a major shift. This radical system change is inevitable if the necessary systemic change does not succeed (P4).

4.6. Future outlook

4.6.1. Projections

Advancing the regional energy transition in the Mühlviertel is and will continue to be a pressing and complex challenge. Especially its socially equitable implementation stands out as one of the greatest societal tasks of our time (P5). Central to this effort is the region's ability to take control of its own energy supply, which is vital for future development, long-term economic stability and the perceived satisfaction of the local population (P2). If the expansion proceeds steadily, Freistadt could achieve a level of energy self-sufficiency that not only meets local needs but also supplies parts of the greater Linz area (P2). While aiming for financial independence and a secure, self-sufficient energy supply is important, complete isolation is neither possible nor desirable. The integration into local networks and sustained cooperation will remain essential (P3).

Going forward, the thematic connection to a broad range of topics will become evident when communicating the urgency and relevance of the transition. This includes the geopolitical and economic situation, migration and other global challenges that highlight the interdisciplinarity of the task (P5). Apart from affecting various realms, the transition is also inherently intergenerational, demanding future involvement and active contribution from all age groups, not just younger generations (P4, P7). Ultimately, reducing dependence on fossil fuels will not only strengthen energy resilience but can also most likely lower the risk of conflicts and wars, underlining the far-reaching benefits of a successful and socially just energy transition (P5).

4.6.2. Recommendations

In order to keep advancing the energy transition progress in Freistadt, a strategic reorientation of priorities is required – beginning with a redistribution of subsidies away from fossil fuels and towards renewable energy and related infrastructure. Because as P1 stresses, *"an insane amount of money is still being spent on the wrong things"*. Instead, resources must be allocated with directionality, based on clear demand, urgency and necessity. In this process, decision-makers carry a great responsibility and should act according to high ethical standards (P1). This also means making forward-looking, long-term decisions that open up new perspectives and ways of thinking, rather than being constrained by short-term considerations (P6). Given that a complete restructuring of the energy system has far-reaching implications (P5), educational measures should be implemented as early as possible to foster generational change, starting with teaching in schools (P6).

Recognising their interdisciplinary nature, projects should be planned from a holistic perspective. For example, this means that large-scale initiatives consider multiple modes and purposes, like integrating railway lines, cycle highways, charging stations and high-voltage power lines alongside traditional road infrastructure (P1). In doing so, economic, ecological and social dimensions must be factored in across the entire lifecycle, leveraging synergy effects for sustainable outcomes, especially since *"the most profitable investments today are not investments for the future"* (P1). The focus needs to be directed towards regional needs and priorities. Approached with determination and perseverance, it will help to keep the energy transition on track (P3). At the same time, spotting potential opposition early and involving all stakeholders in an open and inclusive way can increase acceptance, strengthen participation and make the process more meaningful for everyone (P5). Finally, the progress that has already been achieved should be acknowledged and built upon, ensuring that no steps are taken backwards (P7).

4.6.3. Wishes

To conclude the interviews, the participating agents were asked about their personal and professional wishes for a just energy future. Overall, they share the common goal of successfully transitioning the regional energy system with the vision of achieving full energy self-sufficiency by 2040 (P1, P2, P7). To accomplish this, regional stakeholders express a clear wish that long-discussed ideas and concepts for energy projects are finally put into practice, supported by sufficient funding and strong political will (P1). They expect responsible parties to act with integrity and without negligence. This means taking accountability in the event of damage and thinking with more foresight in planning and decision-making (P2). Stakeholders are called upon to fulfil their role model function sincerely and act according to their own stated principles without double standards (P6). A central aspiration is that the local population should benefit visibly and tangibly from energy transition projects (P2). As a result, long-term prosperity should be secured while maintaining a balance between quality of life, economic growth and progress (P3).

Additionally, there is a strong desire to see more young people involved. Thanks to the structure of energy cooperatives, they can contribute by exercising their democratic rights and participating within the scope of their possibilities, even without significant capital (P2). Stakeholders hope for a broader awakening, perhaps even a decisive change of direction that fosters a new social awareness about the future (P4). Increasing the number of committed individuals who recognise how exciting and enriching the restructuring of the energy system can be, is considered vital. By convincing more people of their potential, hopefully more interest can be sparked in energy issues (P5). Active participation is always encouraged, *"because the bigger we are, the more we can achieve"* (P7). In this spirit, everyone is advised to reflect on their own potential contribution and the role they could play. Ultimately, the aim is to cultivate a deeper sense of personal responsibility – not only for individual actions in the energy transition but also for one's own consumption patterns and lifestyle choices (P6).

5. Discussion

Following up on the obtained results, this fifth section situates the findings from the Freistadt case study within the broader theoretical framework of energy justice. Like that, the research question is addressed and the results are contextualised within the current discourse. By interpreting the empirical evidence in terms of distributional, procedural and recognition justice dimensions, the discussion elaborates upon the meaning and practical value of applying EJ to regional energy transitions.

5.1. Interpretation of findings and case study evaluation

The study was guided by the central research question: *How do agents in the energy model region Freistadt in Upper Austria implement principles of energy justice and social inclusiveness on their transition pathway to a self-sufficient low-carbon economy?* Through document analysis and expert interviews, evidence was gathered that Freistadt's energy transition is marked by conscious efforts to embed fairness and inclusivity within regional governance and decision-making practices.

As the results show, the agents in the district of Freistadt are highly familiar with the topic of energy justice and cover it extensively within their respective functions – either directly or indirectly. The participating actors work at different key positions of the energy transition and all pursue the aim to advance core justice themes in the industry. By prioritising different aspects, highlighted as drivers and solutions, they contribute to making the local energy transition more just. Like that, the described barriers and challenges are addressed correspondingly. Implementing these principles in their current and future everyday work adds to the fulfilment of the EJ criteria.

From a theoretical perspective, the framework of EJ served as the main analytical lens. Building upon the work of McCauley, Heffron, Jenkins, Sovacool and others, the study operationalised EJ via its three tenets: distributional, procedural and recognition justice. The empirical data indicates that all three justice dimensions are actively considered in Freistadt's participatory initiatives, planning procedures and stakeholder engagement. Distributional justice is pursued through the establishment of a region-specific allocation formula for renewable energy infrastructure and has advanced ever since. Due to this code, the assignment of new areas follows a structured, consistent and retraceable approach, avoiding distributional inequalities. The goal of balancing benefits and burdens between urban and rural, economically strong and structurally weaker communities was thus effectively put into practice.

Procedural justice is fostered by emphasising transparency, for example through the publication of strategy papers and reports, like the ones from the continuation periods ("Weiterführungsphase") of the KEM funds (see Table 1Table 1: List of documents used in the qualitative analysis

). Early stakeholder consultation through events and projects organised by the EBF further helps to advance procedural justice dimensions (Energiebezirk Freistadt, 2022a). Most importantly, the formation and continuous development of local energy cooperatives like Regios and formerly Helios make it possible for everyone to get involved and take control of their own energy supply (OurPower Energiegenossenschaft, 2024; Regios Energiegenossenschaft, 2024). Like that, multiple dimensions of inclusive innovation are realised in practice (Morales et al., 2025). Recognition justice is addressed through the deliberate inclusion of diverse actors and representatives from private and public entities (see Figure 6). These agents encourage and enable a societal dialogue that also allows critical voices to be heard.

Nevertheless, certain limitations remain and leave room for future improvement. The dimension of distributional justice, for example, is also highly dependent on the preexisting energy infrastructure and availability. Without advancements in those realms, justice efforts can hardly progress. Despite these limiting factors, the spatial dissemination is still well realised. The intention of equitably distributing the burdens and benefits of RES seems to guide the decision making throughout the region.

Certainly, the implementation in practice is proving to be more difficult than planned. A gap between theoretical planning and practical application also exists between the other two justice dimensions. While transparency, open dialogue and participatory approaches all benefit procedural justice, they cannot guarantee it. Because even if the regional agents suggest information services and multiple participation possibilities in renewable energy projects, that does not mean the offers are automatically adopted. The reasons for such discrepancies are multi-layered. For instance, they might be due to a lack of knowledge and information about opportunities to participate, hesitation or unwillingness because participation processes can be time-consuming. Questions about the effectiveness or change impact are often combined with a lack of trust in decision makers that are in charge of implementing participatory processes (Komendantova, 2021). This additionally reinforces the challenge of fully representing vulnerable groups within the energy transition (Jenkins et al., 2021).

Such residual power imbalances also persist in the Freistadt region. In reality, there are still structurally induced predispositions that favour active participation in renewable energy initiatives, like having a certain standing within the municipality and possessing a significant amount of land or financial capital. Although some solutions such as energy cooperatives are already available, the opportunities they offer need to be better publicised and accepted by the general population, boosting recognition justice in the long term.

5.2. Relation to the broader literature

The results reinforce the growing consensus in energy transition literature that localised, participatory and justice-oriented approaches can strengthen social acceptance and resilience in regional sustainability pathways. The evidence from Freistadt resemble the findings of Abram et al. (2022) and Jenkins et al. (2021) who highlight that meaningful stakeholder inclusion and fair benefit distribution are central to public support and effectiveness of low-carbon transition strategies. By embedding EJ principles, Freistadt contributes to the international trend identified in Heffron's 2024 review, which calls for transformation beyond purely techno-economic frameworks towards holistic approaches that integrate societal well-being (Heffron, 2024). Similarly, it embraces the "social and normative turn in energy policy" (Osička et al., 2023, p. 1) by realising measures that go beyond technological solutions and move away from the previous technocratic perspective (Sovacool et al., 2019). While innovations for advancing economic and ecological sustainability are equally important, they need to be complemented and combined with social notions in order to support a holistic and successful transition (Osička et al., 2023; Sovacool et al., 2016).

Going on, energy justice scholarship has for the largest part been accused to pay limited attention to how individuals and communities could build an energy-just future from the ground up (Forman, 2017). Rising local conflicts indicated that the conventional top-down method of planning and expanding grid infrastructure is no longer adequate. This situation shows a clear need for stronger and more inclusive public participation. Engaging and consulting with communities early in the process is valued highly by citizens, as it fosters trust, transparency and a greater sense of shared ownership (Knudsen et al., 2015). With initiatives like the EBF and Regios that offer more local and community-based approaches to energy systems, the district of Freistadt has shown how to overcome this original problem.

As suggested by Irshaid et al. (2021), focusing on the organisational level of climate and energy model regions (KEMs) proved to be useful as a focus of the empirical investigation. That is because the KEM program adopts a multilevel governance approach that is based on the principle of networked resources, with various activities promoting collaboration. These activities include the exchange of information through both formal and informal channels among designated energy managers, as well as quality management processes that are directed and supervised at the federal and state level (Irshaid et al., 2021). For this study, the two KEMs in the Freistadt region (Mühlviertler Kernland, Mühlviertler Alm) offered just the right scope. The KEM level was also chosen as the spatial scale for similar research in the Austrian energy sector (Komendantova & Neumueller, 2020; Schinko et al., 2020).

Nonetheless, the findings from the case study also nuance some reoccurring hypotheses. While the international literature often highlights significant urban-rural contrasts, Freistadt is an example of a more heterogeneous and complex approach to spatial justice, where structurally weaker areas are prioritised for renewable siting and resource allocation. In general, sustainability transitions have increasingly focused on urban areas, much like broader research trends in the geography of innovation (Skjølsvold & Coenen, 2021). Even though city-regions generally offer more advantageous conditions, Freistadt is still classified as rural and has managed not to get left behind. Therefore, the district can be seen as a great example for regional path-creation as described by Suitner & Ecker (2020) and adds to other notable examples (Munro, 2019; Naumann & Rudolph, 2020).

The findings also challenge the idea of procedural justice as an automatic guarantee of inclusion, as implied by Shejale et al. (2025) and Jenkins it al. (2016, 2021). Even in contextually advanced cases like Freistadt, barriers to meaningful engagement still exist (see chapter 4.4). Although the cooperative approach supports procedural and recognition justice, it meets practical limitations when trying to expand inclusivity due to wider structural and economic challenges. While acknowledging potential for improvement and further development, as well as the successes already achieved, it must be noted that justice principles are still being explored. The holistic realisation of all dimensions throughout the whole energy system is a process that will need more time.

5.3. Implications for theory and practice

The case of Freistadt in Upper Austria highlights the importance of EJ as a flexible and multi-dimensional framework that can be used to understand and analyse energy transitions at the regional level. As supported by Sovacool et al. (2019), it shows that including justice and fairness in the process of changing energy systems helps to provide clearer explanations and guidance for sustainability efforts. The example of Freistadt illustrates how EJ can help to put innovative policies into practice, such as cooperative governance and fair ways to decide the allocation of renewable energy projects. This approach can serve as a useful model for other regions that face similar challenges. Especially if they share comparable geographical, economic and structural characteristics, transferability should be considered. The initiatives originating from Freistadt have recognised the opportunity to connect with other regions, as regional citizen energy projects are emerging everywhere. That is why Regios and OurPower have joined an international network, encompassing energy cooperatives from Styria, Bavaria and Spain. At the latest energy symposium they presented insights from their regions, sharing

knowledge and discussing concepts for expansion and transferability in the future (OurPower Energiegenossenschaft, 2024).

Continuing to broaden the practical perspective, the case study provides a useful example on how to make energy transitions more just and inclusive. Ensuring fairness in decisions about where renewable energy projects are located can help distribute both benefits and burdens more evenly between communities. Transparent and democratic governance structures, such as energy cooperatives, strengthen trust and give local people a meaningful role in shaping energy development (Komendantova et al., 2021). It is equally important to establish clear and permanent ways for critical or minority voices to be heard, so that diverse perspectives are reflected in decision-making (Jenkins et al., 2021). Furthermore, improving material and informational access for everyone helps to broaden participation by enabling individuals to engage, regardless of their background or resources (Abram et al., 2022). These measures enhance not only acceptance, but also the long-term viability of socio-technical transitions in the long run (Kluskens et al., 2019). For regional and national policymakers, the study highlights the necessity of supporting decentralised governance (Swarnakar & Singh, 2022), maintaining continuous stakeholder dialogue and designing funding or regulatory schemes that facilitate both innovation and inclusion (Sovacool et al., 2023).

Building on the need for decentralised governance and inclusive stakeholder engagement, several deeper challenges must be acknowledged as energy transitions move from theory to reality. In practice, the fair balancing of diverse interests and values within society present significant difficulties, because decisions over infrastructure, benefits and burdens invariably require the weighing of competing priorities. In this context, the genuine participation of all affected stakeholders becomes crucial not only for legitimacy but also for substantive justice (Knudsen et al., 2015). Yet, bridging the gap between knowledge and action across the energy system remains a persistently complex and sometimes uncertain endeavour (Delina & Sovacool, 2018). Transition studies increasingly recognise that the problems underlying sustainability efforts are “wicked” in their nature. They lack singular, undisputed solutions and are embedded in contested negotiation processes that reflect different worldviews and material interests (Benner, 2025). That is also why there are no easy solutions: one partial solution at one point in time may generate new additional problems at a different point in time or place. These multiple causes and consequences coexist in various societal domains, complicating the overall transition (Axon & Morrissey, 2020). This complexity makes it even harder to formulate and maintain shared societal visions for change, since societies appear to experience increasingly diverse socio-technical realities (Coenen et al., 2021).

The restructuring of incumbent energy systems can impact territories and social groups in different ways and risk resistance from those who see themselves as disempowered or marginalised (Skjølsvold & Coenen, 2021). This underscores that a failure of implementing EJ dimensions can reinforce or worsen issues such as energy poverty and the under-representation of women or minorities, since these groups frequently bear disproportionate costs without benefitting (Jenkins et al., 2018). Additionally, low-carbon transitions can worsen preexisting or create new disadvantages for those with low incomes, those living in rural areas and those with health or accessibility issues (Sovacool et al., 2019). In response, appropriate policy tools need to be thoughtfully deployed, including the alignment of social and environmental objectives within economic policy. This ensures that interventions are tailored to the local context, creating democratic participation platforms and fostering transparent communication (Abram et al., 2022). Importantly, as many of the forces that guide the low-carbon transition have also profited from earlier, unfair regimes, caution is needed to avoid simply reproducing or recreating the injustices of the past (Sovacool et al., 2019).

Despite policy ambition, questions remain about how to accelerate the pace of transitions and foster the effective diffusion of social innovation at scale (Delina & Sovacool, 2018; Hölsgens et al., 2018). As the pressure rises and transitions become more urgent, time itself can become a scarce resource, potentially undermining thorough participatory processes. Under increasing complexity and speed, the risk grows that hasty transitions will sacrifice inclusiveness or fail to address social justice concerns (Coenen et al., 2021). As a consequence, delivering inclusion outcomes remains complex and contested, especially at the sub-national scale (Morales et al., 2025). Together, these insights highlight the ongoing need for adaptive governance frameworks that can manage contestation, learn from diverse experiences and remain observant both to old and emerging patterns of injustice.

6. Conclusion

The thesis demonstrates that the integration of EJ principles can meaningfully shape the course of regional, low-carbon energy transitions. As shown in the case of Freistadt, incorporating distributional, procedural and recognition justice has advanced not just technological decarbonisation, but also societal equity, social acceptance and participation. By empirically applying the multidimensional EJ framework to a rural Austrian energy transition at the district-level, this thesis makes a meaningful contribution to existing research. It further links the largely theoretical justice debates to concrete policy documents, stakeholder practices and governance structures in the study region. The case of Freistadt shows how energy cooperatives, inclusive participation formats and locally embedded communication strategies can operationalise principles of fairness and inclusiveness in regional energy transitions. This approach showcases social sustainability and legitimacy, while offering valuable lessons for other rural regions that strive for a socially just, low-carbon development. Still, the empirical data reveals that the effectiveness of these justice measures depends on a dynamic alignment of local institutional practices, stakeholder engagement and policy design that is adapted to the regional context. The Freistadt region highlights both the promise and the lived complexity of operationalising justice in energy transitions.

While the single-case, qualitative research design provided rich and contextualised insights, it also comes with certain disadvantages and limitations. The emphasis on expert interviews may have introduced a sample bias, since the focus on a single Austrian district constrains the generalisability of results. Expanding the scope from a single to multiple case studies could be a way to overcome the otherwise rather narrow geographical focus, while also allowing for regional, national or international comparison.

Even though literature and document analysis added to the semi-structured interviews as a data collection method, the number and variety of seven consulted experts could more extensive. While the volume and content density were more than satisfactory for the scope of this research, the nature of the approach favours a certain judgement bias. The interviewees may have had different professional backgrounds but are all highly familiar with the topic of renewable energy and deal with it on a daily basis as a part of their current role. Because the actors involved in energy projects are generally in favour of it, they might be more likely to report in a positive way. Yet, representing critical voices in interviews is difficult for different reasons: the recruitment and consent to participate and the lack of expertise. Recognising the dilemma of these struggles with regard to the proposed participatory approach, makes it especially contested and hard to evaluate from outside. As EJ scholarship itself notes, the assessment of

justice is inherently disputed and shaped by its local histories, values and institutions. Therefore, the study's focus on Freistadt as a best-practice case may not capture the diversity of experiences in more conflicted regions or amongst less-engaged social groups.

Despite these constraints, the in-depth analysis enables a nuanced picture of the drivers, barriers and everyday realities of implementing EJ. The findings thus provide a sound foundation for future comparative and multi-dimensional research. For instance, focusing on the perspective of civil society rather than industry experts offers a future research opportunity that highlights the perspective of previously overlooked agents. Going on, it would be interesting to further investigate unresolved questions that arise from thematically connected disciplines, specifically in the relation to energy democracy and energy poverty, the role of gender in energy as well as science communication. These possible extensions invite the further exploration of variations in justice outcomes across regions, governance modes and energy systems.

Based on the gained insights, several recommendations can be summed up for policy and practice. Policymakers should advocate for the formal integration of justice principles within energy transition strategies, in order to establish robust standards for equitable distribution, inclusive participation and diverse representation. It is equally important to ensure that support for local energy cooperatives and participatory platforms is reflected in both funding frameworks and regulatory policies. It should become an institutionalised part of decision-making to keep an ongoing dialogue between all stakeholders, especially marginalised groups. Finally, incorporating effective monitoring and adaptive evaluation mechanisms will allow justice strategies to be regularly reviewed and refined as transition processes develop in the future.

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List of appendices

Appendix A: Declaration of consent and data protection information

Einverständniserklärung / Informationen zum Datenschutz

Vielen Dank, dass Sie sich bereit erklären an einem Interview teilzunehmen, das als Grundlage für eine Masterarbeit an der Universität Wien verwendet wird.

Der Schutz Ihrer persönlichen Daten ist bei dieser Datenerhebung ein besonderes Anliegen. Ihre Daten werden ausschließlich auf Grundlage der gesetzlichen Bestimmungen (§ 2f Abs 5 FOG) erhoben und verarbeitet. Der Inhalt des Interviews wird aufgezeichnet und transkribiert. Das Transkript erhalten Sie danach zur Freigabe, bevor es für die Arbeit verwendet wird. Sie müssen Ihre Zustimmung zu dieser Art von Interview geben, da Ihre Aussagen in der wissenschaftlichen Masterarbeit verwendet und ggf. anonymisiert zitiert werden. Weiterhin können die Daten vom Betreuer der Abschlussarbeit zur Leistungsbewertung herangezogen werden.

Eine akademische Abschlussarbeit muss nach dem österreichischen Universitätsgesetz veröffentlicht werden (durch Einstellen in die Österreichische Nationalbibliothek und die Universitätsbibliothek Wien). In der Regel ist sie auch online zugänglich. Grundsätzlich ist es nach Art 89 Abs 1 DSGVO zulässig, die erhobenen Daten für einen unbegrenzten Zeitraum zu speichern.

Sie können Ihre Zustimmung zur Verwendung dieses Interviews jederzeit widerrufen. Die bis zu diesem Zeitpunkt in der Arbeit verwendeten Aussagen entsprechen jedoch den gesetzlichen Vorgaben und müssen nicht aus der Arbeit entfernt werden. Sie haben außerdem das Recht, von dem für diese Studie Verantwortlichen über die erhobenen personenbezogenen Daten informiert zu werden, das Recht auf Berichtigung und Löschung sowie das Recht auf Widerspruch gegen die Verarbeitung und auf Datenübertragbarkeit.

Wenn Sie Fragen zu dieser Umfrage haben, wenden Sie sich bitte an die für diese Studie zuständige Person: Evelyn Werner (evelyn.werner@univie.ac.at), Studentin im Studiengang Global Change and Sustainability an der Universität Wien.

Bei allgemeinen rechtlichen Fragen zur DSGVO und zu Forschungsarbeiten von Studierenden wenden Sie sich bitte an den Datenschutzbeauftragten der Universität Wien, Daniel Stanonik (verarbeitungsverzeichnis@univie.ac.at). Sie haben auch das Recht, eine Beschwerde bei der Datenschutzbehörde einzureichen (z.B. über dsb@dsb.gv.at).

Hiermit stimme ich der Aufzeichnung des Interviews und der Verwendung meiner persönlichen Daten im Rahmen der wissenschaftlichen Arbeit zu.

_____

Ort, Datum, Name

Appendix B: Recruiting letter

Sehr geehrte/r Frau/Herr (Name),

mein Name ist Evelyn Werner und ich absolviere derzeit mein Masterstudium (Geographie des Globalen Wandels und Nachhaltigkeit) an der Universität Wien. Ich arbeite gerade an meiner Abschlussarbeit, die sich mit der Entwicklung zu einer „Gerechten Energiewende (Just Transition, Energy Justice)“ mit regionalem Fokus im Mühlviertel beschäftigt. Aufgrund Ihrer Expertise und Ihres Engagements in der Region möchte ich Sie hiermit zu einem Experteninterview einladen, das einen großen Beitrag zu meiner Arbeit leisten wird.

Mein Ziel ist es, innovative Ansätze und Erfolgsfaktoren regionaler Energiewendeprozesse zu untersuchen, mit besonderem Blick auf Bürgerbeteiligung, erneuerbare Energien und nachhaltige Innovationen. Zentrale Rolle spielt das Energy-Justice-Framework, das Gerechtigkeitsprinzipien in den Fokus rückt, um soziale Akzeptanz zu stärken und strukturelle Ungleichgewichte zu adressieren.

Ihre Einblicke und Erfahrungen wären sehr wertvoll für das Verständnis der aktuellen Landschaft und des zukünftigen Potenzials von einer gerechten Energiewende in Oberösterreich. Ich glaube, dass Sie aufgrund Ihrer bedeutenden Rolle als (…) der/die ideale Kandidat/in für diese Diskussion wären.

Das Interview ist eher als informelles Gespräch und nicht als strukturierter Fragebogen konzipiert und soll ungefähr 30 bis 40 Minuten dauern. Inhaltlich würde es um die folgenden Themenblöcke gehen:

- Energiewende im regionalen Kontext
- Drei Dimensionen einer gerechten und nachhaltigen Energiewende
- Bestehende Ungleichheiten und Hindernisse
- Verbesserungsmöglichkeiten und Antriebsfaktoren
- Best Practice Projekte und Beispiele
- Akteure und Kooperationsmöglichkeiten
- Zukunftsperspektiven und Ausblick

Ihre Teilnahme würde nicht nur zum akademischen Verständnis einer gerechten Energiewende beitragen, sondern auch helfen, praktische Schritte und Strategien für künftige Entwicklungen abzuleiten. Wären Sie in den nächsten Wochen für ein Gespräch verfügbar? Ich bin in der Terminplanung flexibel und kann mich gerne auf eine Zeit einstellen, die Ihnen entgegenkommt. Ich würde mich freuen, für das Gespräch in Ihr Büro zu kommen, alternativ könnte es auch gerne digital via Zoom stattfinden.

Ich weiß Ihre Zeit und Aufmerksamkeit sehr zu schätzen und freue mich auf Ihre positive Rückmeldung.

Mit freundlichen Grüßen

Evelyn Werner