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Learning from Other Community Renewable Energy Projects: Transnational Transfer of Multi-Functional Energy Gardens from the Netherlands to Germany

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Abstract: Citizen energy in general and renewable energy communities (RECs) in particular are becoming key vehicles for decentralisation, but also for the democratisation of the energy system. These initiatives are now more diverse than ever and are likely to continue to act as incubators for significant projects in the transition to a renewable energy system. Beside the legal, regulatory, and financial challenges, there are several socio-economic and regulatory barriers that hinder the implementation of community energy projects. For this reason, policy learning and the dissemination of good/best practices that are transferable also to other contexts are important. This is an aspect that has not yet attracted much investigation, and only a few studies have explored the importance of transfer activities for the implementation of REC initiatives and their motives. This article aimed to address this knowledge gap by focussing on the transfer processes of best practices initiated in a particular region and discusses how these can be adapted and transferred to other contexts. We analysed the transfer case of a community renewable energy initiative, the multifunctional energy gardens, from the Netherlands to the German federal State of Thuringia, and extracted lessons with an overall validity for the transferability of drivers and success factors. We show how examples from other contexts with similar enabling conditions can represent significant foundations on which to build an effective strategy and what framework conditions are necessary to enhance the uptake of pervasive community energy initiatives in regions with low community energy development.

Keywords: renewable energy communities; citizen energy; renewable energy; integrated energy systems; best practice transfer; business models; public participation; local acceptance; Germany; Netherlands

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1. Introduction

In recent years, collective forms of energy consumption and supply have been the subject of a growing number of scholarly and empirical studies that also addressed the definition of the concept of community energy in its various forms. IRENA [1] defines community energy as the economic and operational participation and/or ownership by citizens or members of a defined community in a renewable energy project. The European Union defines two kinds of community energy initiatives: citizen energy communities (CECs) in Electricity Market Directive 2019/944 [2] and renewable energy communities (RECs) [3] in Renewable Energy Directive (RED) II 2018/2001. We define RECs in line with RED II [3] as collective renewable energy projects, which are characterised by democratic participation and governance and generate tangible and collective benefits for the local community. A REC is based on open and voluntary participation, autonomous, and effectively controlled by shareholders or members located in the proximity of the project.

The primary purpose of this paper is to show the dynamics of the transfer process of best practices in community energy projects initiated in a particular region and discuss under which circumstances and how these can be adapted and transferred to other contexts.

In particular, we analysed the transfer case of a community renewable energy initiative (multi-functional energy gardens) from the Netherlands to the German federal State of Thuringia and investigated the possibilities and limitations for extracting lessons with an overall validity for the transferability of drivers and factors for RECs' success. In doing so, we address the following specific questions:

- Q1: What kind of benefits can the project bring for the territory and the community (ecologic, social, economic, etc.) of the "learning" region?
- Q2: What are the conditions and procedures for the transfer and adaption of the best practices to the Thuringian context?
- Q3: Which elements can be directly transferred, and which need adjustments? What are the similarities and differences of the two contexts?
- Q4: What were the motivations of the stakeholders in engaging in the transfer process? What kind of benefits do they expect?
- Q5: What are the major elements of a viable business model for the MFEG in Thuringia as a learning region?
- Q6: Which challenges are involved in such a transfer process and in a possible implementation of the project?
- Q7: What opportunities are there in organising a cooperation with mentoring organisations, and what are the most important initial implementation steps?

1.1. Literature Review and Background

Our investigation relied on a vast literature that has addressed various theoretical and empirical aspects linked to collective forms of energy production and consumption. Studies on community energy have focused not only on identifying the motivation for establishing and participating in such collective initiatives, on factors determining success [4–7] and their benefits [8,9], but particularly on the still existing barriers for realising community energy at the national and regional level [8,10–12]. Research investigating social acceptance of renewable energy shows that local ownership and local benefits are important acceptance factors as they contribute to generating trust and enabling civic empowerment [12–19]. Another large strand of literature concentrates on the role that energy communities can play in the transition to a low-carbon society [20–22], enhancing the move from a centralised energy system dominated by a few market players to a decentralised system with civic involvement to increase the share of renewables in the energy mix and providing flexibility to the electricity system through demand–response and storage [23–25]. Community energy and specifically RECs, therefore, provide the potential for a bottom-up transformation of the energy system [26–29].

RECs are commended for having a large impact also on socio-economic and environmental factors, for their regional value creation potentials, and for strengthening social cohesion and enabling the participation of vulnerable groups, thus helping mitigating energy poverty [30,31], but recently, there has been a critical review of the social impact of energy communities in Europe [32]. The authors admonish that the adduced positive social impacts of energy communities often rely more on "intuitive assumptions", rather than robust empirical evidence and on a social–romantic narrative of energy communities, which may downplay possible deficiencies.

Lately, research has started concentrating also on the transposition and implementation of the Clean Energy Package and its provisions for RECs and CECs in single-country settings and in comparative analyses [27,33–38]. However, with a few exceptions, comprehensive reviews of regulations at the European level governing energy communities are rare [39]. In spite of the many initiatives flourishing in Europe, the transition to a citizen-led distributed energy production/consumption model based on renewable energy sources (RESs) still presents economic, socio-political, and regulatory challenges in most European countries. These challenges have been investigated by many collaborative research projects of the European Commission [34,40–42]. Recently, the COME RES project aimed to facilitate the diffusion of RECs in these countries, for each of which a target and a model region had been selected. This project's overall objective was to accompany the implementation of a regulatory framework for RECs in nine European countries (Belgium, Germany, Italy, Latvia, the Netherlands, Norway, Poland, Portugal, and Spain) at the national level through a number of initiatives including informal stakeholder forums (country desks) [37,43]. In this way, learning and transfer processes jointly with exchange between regions with advanced REC development and regions with expansion potential were initiated.

Regulatory complexities associated with community energy are difficult to address, especially since planning and participation practices as well as new ownership models require time. Engaged citizens, but also local authorities, often face time, informational, and resource constraints. Many energy communities rely on unpaid work and volunteers [19]. For this reason, the existence of intermediaries in facilitating policy learning and coordination [7,9] and the dissemination of good/best practices that are transferable to other contexts are valuable. This is an aspect that has not yet attracted much investigation, and only a few studies have explored the importance of transfer activities for the implementation of renewable energy communities and their motives [44–46]. Whilst investigations into the transferability and upscaling of good practice policies and practices are relatively scarce, research on policy transfer is more numerous [47] (p. 6). Dolowitz and Marsh [48] (p. 5) developed a policy transfer framework, which many scholars use as a reference system. In their definition, policy transfer is "concerned with the process by which knowledge about policies, administrative arrangements, institutions and ideas in one political system (past or present) is used in the development of policies, administrative arrangements, institutions and ideas in another political system." Conversely, Stead [49] (p. 107) critically remarks that, despite the use of best practices in policies, programmes, and projects, "*little is known about the ways in which best practices are produced and used, and their role in processes of policymaking*". Our article addresses this knowledge gap by focussing on processes aiming to transfer the best practices of energy communities that were initiated in a particular region and discusses how these can be adapted and transferred to other contexts. We analysed the transfer of an integrated community renewable energy initiative (multifunctional energy gardens (MFEGs) from the Netherlands to the German federal state of Thuringia. We based this analysis on a systematic investigation of the best practices case itself, the findings from the learning region Thuringia, as well as on the examination of the legal, socio-economic, spatial, and environmental context. We explain why both learning from other experiences and undertaking a comprehensive analysis of good/best practices can represent a congenial way to provide useful indications on how to face implementation barriers, enhance the market uptake of RESs, and promote community energy initiatives at the local level.

1.2. Structure of the Article

This article is structured as follows: Section 2 describes how the transfer process was carried out and which methods were used. Section 3 illustrates the evolution of the MFEGs as a form of community energy activity with a special emphasis on the Netherlands and presents the Thuringian context and elements of its renewable energy policy. The benefits and viability of MFEGs are analysed from an economic, ecologic, social, and educational perspective. Section 4 is dedicated to the discussion of the results and analyses the elements of the concept that are transferable to Thuringia and some practical steps for the accommodation of the concept from the Netherlands. The conclusions show how successful examples from other contexts or similar enabling conditions can represent significant foundations on which to build an effective strategy and what framework conditions are necessary to enhance the uptake of renewable community energy initiatives in regions with comparatively low community energy development. The success of the model(s) depends on the ability of the involved parties to transfer experiences from one context to another. Effective transfer strategies are those that allow for sharing of knowledge about the best practices while considering the local political, socio-economic, and cultural situation.

2. Methods

The empirical data were derived from research carried out within the COME RES project. The transfer case analysed here is part of a portfolio of ten best practices of community energy initiatives identified and selected within the project, which provided a synthesis and comparative analysis of the selected cases that could be potentially adapted and replicated under specific conditions or through the modification of certain variables [45]. The corresponding report developed an assessment of the selected ten best practice cases and conducted a comparative evaluation of the drivers and factors of success.

Prior to the selection of the best practices, a common methodological framework for good practices identification, data gathering, analysis, and portraying was elaborated [46]. A good practice can be defined in line with the Food and Agriculture Organisation [50] of the United Nations as a practice that has been proven to work well and produces good results. It is a successful experience that has been tested and validated, in the broad sense, and that has been repeated and, therefore, recommended as a model to be adopted. In the COME RES project, we understood best practices to be superior to good practices because they require innovative, testable, and replicable approaches, which contribute to the improved performance of a project or policy, usually recognised as best by peer organisations [46]. Based on a cluster of criteria including innovativeness, compliance with RED II, the provision of environmental, social, and economic benefits, inclusiveness, and transferability, the COME RES project identified a total of 21 good practices in the nine partner countries with an elaborative description and preliminary evaluation scheme. This was followed by the selection of 10 best practices following the preselected criteria [51] (p. 8).

The transferability of a good practice can be broadly defined as the extent to which a practice can be easily adapted and used in other contexts. It refers to how a policy or measure can be transferred from one country or region to another context and to the elements that should be considered during the transfer [47] (p. 5). Transfers do not usually occur in a top–down fashion, where relevant public authorities decide which practice is to be transferred. Furthermore, searching good practice repositories for inspiration is apparently not a widespread strategy. Practitioners usually receive inspiration from other countries, regions, or municipalities during mutual learning meetings [47] (p. 16).

On the operational side, the major vehicle for the transfer process was the establishment of transfer teams consisting of approximately ten experts in the field of renewable energy and community energy, as well as stakeholders and market actors in the learning and mentoring region. The transfer encompassed transfer visits, trainings, transfer workshops, and validation exercises. The transfer team, also including mentoring experts, visited the sites of the selected best practice. The key stakeholders from Thuringia recruited for the transfer team included experts from the Thuringian Energy Agency with its wind energy and solar energy service centres, members of the Thuringian citizen/community energy association, a member of the Thuringian Parliament, as well as a board member of the German Alliance for Citizen Energy, environmental NGOs, and a cooperative.

Subsequently to the first visit to the Netherlands by the German stakeholders in June 2022, the return transfer visit took place in October 2022 in Thuringia. Furthermore, the approach and tools (i.e., guided questions/matrices) used for the transfer visits in the workshops made use of peer learning methods. Peer learning enables the transfer of knowledge, skills, and experience from a group of stakeholders to others and facilitates reciprocal learning even on complex issues where, for example, different legal, normative, and economic aspects are to be shared among participants [52].

The data and input were obtained through workshops with stakeholders based on peer learning methods. The COME RES project encouraged the transfers of good/best practice measures to "learning regions" serving as "learning laboratories" taking appropriately into account their specific economic, social, political, and cultural contexts. During the workshops, the researchers carried out a structured observation, adhering to a two-phase structure (initial and operational phase), thus covering the theoretical implementation of the transfer case. After the workshops, a qualitative content analysis was carried out [53].

The observations were coded by the two researchers, and a comparison between the interpretations was undertaken to ensure a comparability and similar interpretation. The limits of this kind of data collection is that the involved researchers have a strong influence on the direction of the discussions, thus on the topics that are (not) discussed.

Studies in knowledge sharing highlight the frequency of challenges for knowledge transfer, especially in connection to geographical and cultural distance [54]. However, the peer learning approach used in the transfer workshops proved to be an appropriate method to motivate "*the receiver to actively attend to messages and perceive and interpret the content that is provided by peers. This includes iterative and transactional solicitation of feedback, and activates elaboration of arguments and counterarguments to encourage individuals to move through the process of learning*" [55] (p. 10).

The major issues addressed in the workshops were: (1) the analysis of the available resources (what can be taken from the experience of the best practice country of origin presented); (2) the identification of the main aims and objectives to meet the needs of the recipients and/or defined by the working group (learning region and the country of origin of the good/best practice); (3) the assessment of the adaptability according to criteria set by the participants and based on the established objectives (learning regions and the country of origin of the best practice); (4) the evaluation of the peer criteria of the interventions and of the transferability potential (learning region).

The potential impact and opinions towards the transfer process were evaluated ex post by the participants via written questionnaires comprising six open questions, such as the motivation for participation, the perceived effect, challenges, organisational effects, needs for support, as well as the opportunities of the transfer process. From the participatory observations and assessment of the outcomes of the workshops together with this last ex post evaluation, we tried to derive lessons on how knowledge and resources can be shared and how the process of sharing can be structured to promote the development of collective action. This includes understanding the motivations of the various stakeholders and how they interact and enable a better understanding of the feedback loops and power dynamics involved in the transfer of best practices. Based on our approach, in the following sections, we discuss how a sense of reciprocity or mutual benefit can be created and could be applied to encourage collaboration between different stakeholders in a community energy project, such as local governments, NGOs, renewable energy organisations, cooperatives, citizens, etc. We then identify how knowledge and resources were exchanged between different actors and how by transferring/adapting community energy projects, stakeholders can develop effective strategies and policies to support their implementation and ensure that they are successful.

3. Case Study and Results

In the frame of the COME RES project, in total, four best practice transfers were initiated including three cross-national and a domestic one [55]. These were:

- Transfer of the model of multi-functional energy gardens from the Netherlands to Thuringia.
- Transfer of the business model of the energy cooperative Ecopower (Flanders) to the Italian region of Apulia.
- Transfer of a municipality-driven REC model from Magliano Alpi (Italy) to Latvia.
- Transfer of the concept of COMPTEM Enercoop, a Spanish energy cooperative, to the Canary Islands.

Although Ecopower's producer/supplier model, representing the second transfer case, is appealing for other regions including the learning region of Apulia, the Belgian–Italian transfer team identified critical bottlenecks precluding its direct transfer. Italian legislation currently does not allow RECs to act as energy suppliers, although they are entitled to these rights according to RED II. Nevertheless, the experience with citizen engagement and the strong role that the local municipality played in promoting Ecopower's success was inspiring to the Italian transfer team. Several actions were devised by the Italian experts on how to better engage citizens to participate [56].

The transfer of the Italian case "Energy City Hall REC-1" to Latvia has shown that the core business model, which is based on collective electricity self-consumption, electricity sharing, and surplus sales, could be principally transferred to the Latvian context. The new legal framework in Latvia enables electricity sharing, although the details need to be specified by secondary legislation. In Latvia, municipalities assume a key role as facilitators and initiators of RECs because bottom–up initiatives primarily driven by citizens are still very scarce. The Latvian–Italian transfer team concluded that considerable added value can be created by applying elements of the REC model employed in Magliano Alpi, particularly by further promoting business models based on energy self-sufficiency and selling surplus electricity on the energy market. To mitigate energy poverty, the supply of electricity to social housing building, as well as the inclusion of energy-poor citizens directly in the REC is going to be explored.

The fourth transfer initiative aimed to facilitate the domestic transfer of the specific energy service model of the energy cooperative COMPTEM Enercoop to the Canary Islands. COMPTEM Enercoop is a non-profit energy cooperative located in Crevillent in the Valencian Community. The service model allows new members of an REC to avoid initial investments or up-front payment when joining. Instead, the initial investment is covered by means of a loan (preferably ethical financing institution of choice), arranged by the cooperative. Once the installation is operating, 50% the financial savings obtained from the energy savings are used to pay back the loan, while the remainder of the savings is used to reduce the electricity bill. The intra-Spanish transfer process helped to create a collaboration framework, which is going to be continued between the mentoring organisation COMPTEM and Gran Canaria's Energy Council promoting REC creation policy development on the Canary Islands.

The following sections present the characteristics and benefits of the best practice case, which is in the focus of our article, namely the multifunctional energy gardens (MFEGs), and illustrate the evolution of this innovative concept in the Netherlands. Subsequently, we provide some details on the development of the MFEG in the Dutch province of Gelderland as well as a related project in Thuringia, a landscape park including some elements of MFEGs. This is followed by the contextual and renewable energy policy characteristics of Thuringia, which are illustrated in order to discuss which elements of the concept are transferable and better explain the drivers and barriers the transfer faces.

3.1. Characteristics and Benefits of Multifunctional Energy Gardens

While solar farms and urban (energy) gardens are relatively widespread in Europe, especially in the U.K., where the Energy Garden Community Benefit Society has 500 members who have raised more than GBP 1 million for solar development so far [57], multifunctional energy gardens are just emerging. These initiatives, however, though involving local communities, are not necessarily organised in the form of RECs. In the Netherlands, van den Berg and Tempels [58] counted 110 solar farms, of which only two were identified as multi-functional solar farms. This number rose to ten multifunctional solar farms when considering the planned initiatives. The reason for the popularity of multi-functional solar farms and related concepts including MFEGs can be found in the Dutch Climate Agreement of 2019, which considers multifunctionality as one of the leading spatial principles of the renewable energy transition [58]. Pursuant to the national spatial planning vision [59], solar power should preferably be installed on the roofs and facades of buildings. If this is not possible, unused sites in built-up areas are then preferred. In order to meet the (stringent) regional energy targets, it may turn out that locations in rural areas are also needed. In that case, preference is given to seeking smart combinations of functions. Although nature and agricultural areas are not entirely excluded, preference is given to land with a different primary function other than agriculture or nature, such as water treatment plants, landfills, inland waterways or land managed by the state, including, where possible, the verges of railroads and freeways.

MFEGs were first established in the Netherlands in 2019 and were initiated by the Dutch organisation "Natuur en Milieufederaties" (NMF), an umbrella organisation of Dutch environmental organisations that is active in all provinces, in cooperation with Wageningen University & Research [60]. However, according to our knowledge, up to now there is no established definition for MFEGs. We understand them as bio-diverse community renewable energy projects under the participation of local citizens encompassing small-scale energy installations that can be set up in residential areas or public spaces. These energy gardens typically rely on solar energy, small wind turbines, hydropower, energy storage, or biomass [60]. MFEGs are a way for citizens to participate directly in renewable energy production and reduce their reliance on fossil energy sources. Additionally, through the involvement of residents in co-creation, they can provide a source of community pride and enhance the aesthetics of the area. The installation of MFEGs enables municipalities, locals, and local/regional companies to shape their local energy mix, as well as to implement a place for the community to thrive. Ecological aims are also incorporated into the concept: local specificities, such as landscape structures, ecological and historical values, and local flora can be enhanced and pronounced by an energy garden, thus providing an accessible space for locals to come together and learn about the area and enjoy recreational benefits. Such projects, designed to be highly participatory and inclusive for people who live in the vicinity of the MFEG, are not necessarily organised as RECs, since democratic control and citizen ownership are not mandatory for MFEGs.

In Germany as well, similar kinds of energy gardens exist, e.g., in the form of biodiverse solar parks, but to our knowledge, none of them has the character of an REC. In Thuringia, an exemplary case makes use of solar energy, but this case is mostly to be considered a landscape park. The park, which spreads across an area of over 160 hectares, is located on the site of a former helicopter airport, and like many former military estates in Thuringia, it was taken over and renatured by the State Development Corporation (LEG). From 1996 on, the association "Arche Nohra" accompanied the development of the area with a retreat for rare animal and plant species. In order to update the concept of use, the municipality of Nohra acquired the entire area from LEG and, with the help of committed citizens and "Arche Nohra", founded a few years later the "Nohra Landscape Park Foundation" to which the area was transferred. Photovoltaic systems with an output of 18 kWp each were already installed on the roofs of existing buildings during the years of their renovation, between 2006 and 2009. In 2013, the foundation invested in a 5.2 MWp ground-mounted PV system, the revenue from which is used to finance some projects in the field of education and species conservation. The foundation aims at creating ecological value and landscape preservation and uses the revenues from the PV plant to empower local citizens, strengthen their relationship with the surrounding landscape, and initiate educational activities [61]. Although this concept represents a good example for a spatially well-balanced (ecologic, economic, social suitability for the site [62,63]) expansion of renewable energy projects, it has not received much research attention yet.

3.2. The Best Practice Transfer Case: MFEGs in the Netherlands

In 2019, NMF submitted the energy gardens concept for a project grant to the national postcode lottery. Three potential locations for the realisation of the concept were also submitted together with the application, together with local parties who were open to the idea. In the Netherlands, the postcode lottery finances good causes with the sale of lottery tickets, and energy gardens received a grant of EUR 1.6 million for a period of 5 years [45].

The real motor for establishing the MFEG was NMF, who owns and promotes the energy garden concept and is responsible for the organisation of local participation in the design and implementation of the MFEGs. In all cases, a local energy initiative, a municipality, local nature, and environmental volunteer groups are involved and, in some cases, also a commercial developer. At present, three MFEGs are under construction (cf. Table 1).

Table 1. Characteristics of the four energy gardens currently under development (based on [64]).

Initiative	Area	PV Area	Social Function	Capacity	Connected Households
Mastwijk, Utrecht	20 ha	12 ha	40%	10.9 MW	3000
Assen-Zuid, Drenthe	53 ha	23 ha	56%	21.3 MW	6000
Noordmanshoek, Overijssel	25 ha	8 ha	68%	7.8 MW	1900
De Langenberg, Gelderland (initial phase)	~20 ha	<1.5 ha	92.5%	N/A	N/A

They differ from each other with respect to ownership, size, extension of the solar field, and power generation capacity, but also with respect to the percentage dedicated to societal functions [60]. Mastwijk is realised on a renaturated landfill site, and the waste company Afvalzorg owns the landfill site. In Assen-Zuid, the Municipality owns the project land, and a local energy cooperative has been created as a result of the participation process. In Wijhe, the project site belongs to the municipality, and the project development is led by a local foundation called "De Noordmanshoek" (cf. Table 1). The three MFEGs are expected to be operational by 2024. Further, MFEGs are in an advanced stage of planning, as for example the Energy Garden De Langenberg (cf. Figure 1).

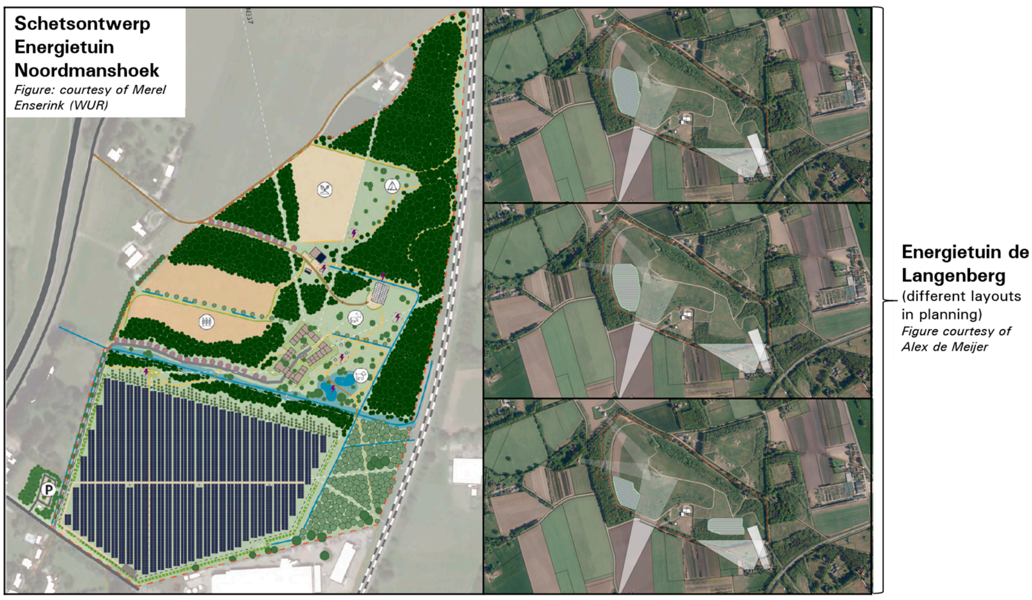

Figure 1. Concepts of layout options for energy gardens in the Netherlands (composed by the authors, based on plans kindly provided by Merel Enserink (WUR) and Alex de Meijer (Natuur en Milieu Gelderland).

The Energy Garden De Langenberg is being implemented on a former landfill used in the 1960s. The municipality of Bronckhorst, which originally planned to install a solar park in De Langenberg, subsequently initiated the project as an MFEG. The concept is based on a multifunctional site where the generation of sustainable energy creates synergies with nature conservation, education, and recreation [65]. The MFEG is administered by a managing entity in which the project developers, the Dutch Nature and Environmental

Federation, as well as the local community are represented. NMF does not pursue any commercial interest in solar parks, operates independently, and is cost neutral.

The Energy Garden De Langenberg will stretch over an area of 15 hectares, but most of that area will not be specifically used for solar energy. The number of solar panels is still being determined in consultation with residents and other stakeholders. Local citizens and stakeholders are directly involved in the project's design from the start and are trying to consider local characteristics (landscape, cultural–historical values) [66]. The design and construction are taking place in cooperation with the surrounding municipalities and a local energy cooperative [56,67]. In December 2021, the municipality organised a kick-off meeting where neighbours and interested parties received information about the plans and had the opportunity to engage actively [66]. Local residents and other stakeholders could then address the issue of how existing values can be preserved and, at the same time, can be enriched with new ones [56,67]. In the participatory design, interests and ambitions are put on a map, without immediately making choices about the design itself. For example, local residents expressed the wish to keep the area peaceful for nature as well as people while wanting the solar panels to be as invisible as possible. Subsequently, landscape designers developed a zoning plan [65], showing the functions and activities, such as solar panels, nature development, water storage, and recreational facilities, about which residents and stakeholders can give their feedback.

3.3. Financial Requirements and Economic Benefits

The initial project grant for the first three pilot gardens received from the postcode lottery (EUR 1.6 million) was used to pay for process support (participative co-design of the energy gardens), part of additional furnishing (educational packages, additional plants, picnic areas), and dissemination activities (networking, communication, training, sharing). The solar parks required investment by (a) project developer(s). Project developers should not aim for the highest financial gain possible since part of the available area will be destined to ecological functions. If the municipality takes the lead (land ownership), then other functions can be added (municipalities can generally borrow at very low interest rates). Local energy cooperatives are relatively well suited to manage energy gardens because they have usually lower financial return expectations than conventional market actors. Unlike the other three pilots, in the case of Gelderland, the costs for initiating the process were covered by a federation, the NMF Gelderland division, which organises the participation process and is supported for that at cost price by the project developers.

In the Netherlands, there is a specific operational subsidy for energy cooperatives called the "Cooperative Energy Generation" (SCE) subsidy, which is paid out per kWh produced. Each year, a basic amount is set for each type of installation. The basic amount is the amount per kWh produced, which is necessary to make the installation profitable. The basic amount for the year in which a cooperative applies for the funding is granted for a period of 15 years. In this way, there is long-term certainty about the return on investment [45]. Several economic benefits relate to energy production and distribution, such as financial participation with shares/certificates of the project by citizens and local companies, employment for local companies, and compensation for the local community by a local fund (*omgevingsfonds*). Compared to commercial projects, economic benefits are more limited, since additional costs for the development of the ecological functions of the energy gardens have to be considered [58].

3.4. Renewable Energies and Evolution of Community Energy in Thuringia

The transfer case under scrutiny involves the German learning region Thuringia, a former GDR region and the mentoring regions of North Brabant and Gelderland in the Netherlands from which the best practice examples originate. Thuringia, one of the 16 German federal states, is situated in the centre of Germany and, therefore, landlocked and bordering five other federal states. With approximately 2.1 million inhabitants and a surface of 16.2 km^2, the population density is comparatively low (~130 inhabitants/km^2). The energy supply of this region experienced a transformation after the German reunification in 1990. Noteworthy is the significant increase in the development of renewables, which was achieved at the beginning of the 2000s, primarily through the expansion of bioenergy and wind power. Thuringia was the first Eastern German state to pass a climate law in 2018, aiming to reach full coverage of the energy demand by renewable energy sources in 2040. By 2020, renewable energy sources covered 25.6% of the primary energy consumption, ranking third behind the two wind-strong German states of Schleswig-Holstein and Mecklenburg-Western Pomerania [68,69].

Around 40% of the Thuringian electricity demand is covered by imports from other states [70], while nuclear power and coal are not part of the Thuringian electricity mix. Conversely, renewable energy sources (excluding hydropower) covered approximately 60% (i.e., 5.98 TWh) of the electricity generation in 2021, of which 27% was wind energy, 15% photovoltaic, and 16% bio energy (see Figure 2) [71].

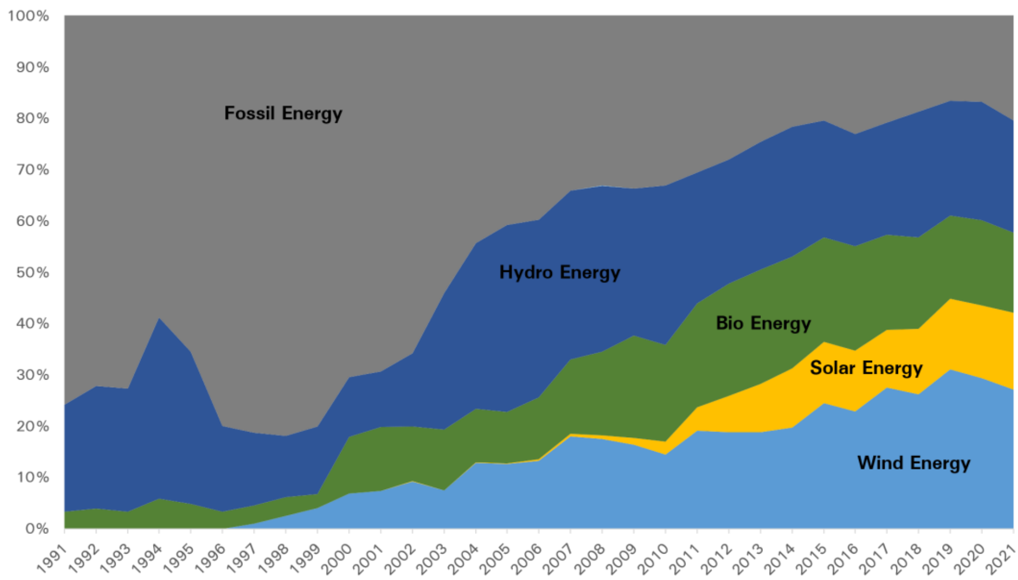

Figure 2. Gross electricity generation (MWh) from 1991 to 2021 in Thuringia (authors' elaboration based on [72]).

In spite of the advancement of renewables, the development of RESs in Thuringia has stagnated notably in the last few years, especially when considering the installation of new wind turbines. This is due to a high restriction on land use: Around 60% of Thuringia's area is excluded from potential use for wind turbines because of settlements and minimum distances between these and the turbines alone. Presently, only 0.4% of the total territory is reserved for the use of wind energy. The Thuringian Climate Act of 2018 envisages that 1% of the total territory shall be made available for the development of wind farms. According to the Wind Energy Area Needs Act (*Windenergieflächenbedarfsgesetz*) of 2022, in which the federal government established binding individual area targets for all federal states, Thuringia has to increase the share of land dedicated for wind energy to 1.8% by 2027 and 2.2% by 2032.

Another reason for the slow development of RESs is the low project-specific acceptance. New projects, especially wind energy projects, often face strong opposition due to concerns related to nature and landscape protection, health (e.g., noise pollution), aesthetical reasons, or just because of the abuse of such arguments for populistic purposes [73–75]. However, direct investment opportunities for municipalities and citizens, as well as voluntary financial transfers of plant operators to municipalities, can positively influence the attitude towards RES projects and the energy transition in general [76].

In Thuringia, there are currently 36 energy cooperatives, in addition to several other community/citizen renewable energy initiatives, which are not organised as cooperatives, but which use different legal forms (e.g., limited partnerships). In East Germany, including Thuringia, socio-economic conditions are generally less favourable for community energy initiatives than in the rest of Germany. In 2021, the GDP per capita in Thuringia was 28% below the German average. The disposable income per person in 2020 (12%) and households' savings rates (25%) were equally below the German average. Public support for the energy transition and renewable energy in East Germany is generally lower [76,77].

Up to now, the investments by energy cooperatives were made mostly in PV projects. There are only very a few wind energy plants owned and operated by cooperatives or other types of energy communities. The low diffusion rate of community-owned wind farms in comparison to the number of wind farms owned by commercial developers may be partly explained by socio-economic and socio-cultural reasons and the unfavourable land ownership structure that resulted from the privatisation of formerly state-owned agricultural and forest land [78]. Today, often the owners of the land are not local farmers, local residents, or municipalities. MFEGs add value to the community, which is a factor that could positively influence the acceptability of these projects and provide a further rationale for the transfer process.

In January 2023, the state government of Thuringia established a citizens' energy fund. Cooperatives can receive a grant for the planning and start-up phase of projects, i.e., for feasibility studies, site analyses, expert opinions, and other services in connection with the necessary urban land use planning and approval procedure and public relations work. The funding rate is up to 80% of the eligible expenditure, and the maximum possible grant per project is EUR 200,000. The Thuringia Citizens' Energy Fund is particularly valuable for the start-up of large-scale projects, such as open-space photovoltaic systems along railway lines and on former landfills as the planning and preparation of such projects is cost-intensive and risky. The aim of the funding is to strengthen citizen energy projects in electricity generation from RESs, i.e., wind, solar, or biomass, heat generation, energy efficiency and supply of buildings and neighbourhoods (e.g., heat pumps), or new mobility solutions (e.g., hydrogen). Funding is available for citizens' energy cooperatives, as well as project companies that were established by a majority of citizens' energy cooperatives. The citizens' energy cooperatives must have at least seven natural persons as members whose primary residence is in the municipality or municipalities in which the project is carried out or within a radius of 5 km. The participation of municipalities or municipal corporations as well as legal entities is possible as long as the majority of votes remains with the natural persons involved or they have a right of veto.

4. Discussion

In this section, we discuss the results from the perspective of the research questions and working hypotheses. We review the findings and their implications in a broader context and highlight similarities and differences between the two contexts of the mentoring and learning regions.

4.1. MFGEs' Benefits for the Territory and the Community of the "Learning" Region

Citizens' MFEGs can provide a range of ecological benefits. By planting trees and other vegetation, MFEGs can help to capture pollutants from the air, thus improving air quality in local areas, reducing the urban heat island effect, as well as stormwater run-offs. MFEGs can also increase the amount of green spaces available in urban areas, providing a space for people to connect with nature and relax. MFEGs increase local biodiversity as they are designed to provide a habitat for a variety of plants and animals [79]. Citizens' MFEGs have the potential to bring many social benefits to local communities. The process of planning, establishing, and maintaining energy gardens can bring people together and raise the sense of community in a local area. This in turn can help to strengthen social ties and reduce social isolation. The economic benefits of MFEGs are numerous: First, participation in an MFEG can help to diminish energy costs. Additionally, if realised as a REC, these projects can generate revenues from selling the energy they produce, creating a new source of income. MFEGs can also create jobs in the local community. They require labour to develop and maintain the gardens and can be a source of employment for local people. They also trigger demand for technologies and products, which can further stimulate the local economy. Community members may receive tax credits or other incentives for participating in the garden. Local businesses may benefit from increased investment and tourism opportunities as a result of the garden. Additionally, MFEGs can provide educational benefits and function as touristic attractions (especially for educational and professional tourism). Depending on the context, homeowners in the vicinity of the gardens may benefit from increased property values.

The cost of implementing citizens' MFEGs depend on the size, scope, and complexity of the project. Factors such as the type of energy system, the size of the garden, the materials used, and the labour required will affect the cost. Financing an MFEG can involve a variety of sources. Additionally, local and regional governments or municipalities may be willing to provide financial assistance for energy gardens, e.g., in the forms of low-interest loans or grants. Ethical, environmentally oriented, and other commercial banks and financial institutions may be able to provide loans for the implementation of an MFEG.

4.2. Conditions and Procedures for the Transfer and Adaption of the Best Practices to the Thuringian Context

In assessing the transferability of the best practices, the first step in the process is the evaluation of the local context where the MFEG can be potentially established. This includes assessing the availability of resources such as land, water, and labour, infrastructural conditions (e.g., grid connection, existence or feasibility of district heating networks), as well as the local community's capacity to manage and operate the MFEG. In addition, it is important to understand the natural environment and nature conservation requirements, local culture, and political environment, as these factors will determine how the MFEGs are going to be designed and implemented. Once the local context has been evaluated, the next step is to identify potential partners beyond the municipality who can help with the transfer and implementation of MFEGs. These partners should possess the skills and resources necessary to support the MFEGs, such as technical expertise, financial resources, and political connections. The latter are usually necessary and helpful when citizens want to initiate RES projects of any kind in Germany [80] and probably elsewhere.

From the discussion above, it is also evident that the geographical requirements for a site determine what kind of project can be implemented. Especially in a densely populated country such as Germany (and the Netherlands as well), securing a site is a major barrier to the implementation of innovative energy projects such as MFEGs.

We have seen that the MFEG in De Langeberg was established on a decommissioned landfill. Due to the historic presence of the Soviet army in Thuringia, many former (contaminated) military sites require renaturation. This could be carried out by implementing an MFEG, eventually combined with educational measures informing about its former land use. The Thuringian Ministry of Environment, Energy, and Nature Conservation has prepared a cadastre that comprises contaminated and former landfill sites. Under certain conditions, such sites are suitable to host an MFEG.

The analysis of the Dutch experience suggests that MFEGs enrich the community, since they are open to the public, offer recreational and educational activities, and are well embedded in the landscape. By involving local nature and environmental citizens´ initiatives for the maintenance and monitoring of biodiversity, the community keeps freehold over nature and landscape and the MFEG is co-owned by the community also in an ideal sense. However, we consider the concept of the MFEGs most of all as a form of community energy that involves the use of sustainable energy sources to preferably provide energy to a community, and as such, we want to scrutinise the overall concept and especially detect the elements that appear transferable to the Thuringian context.

Depending on the land ownership, the legal and regulatory context, and the local actors' constellation, there are different options to implement an energy garden in terms of organisational and legal forms, business models, and financing. The establishment of a "citizen energy company" (the equivalent of a renewable energy community in German law) may be one option. Other options include setting up more flexible forms of energy communities, e.g., citizen energy communities (as defined in the IEMD [2]) or other forms (e.g., community co-ownership, municipal ownership, etc.). A crucial issue remains, however, land ownership. Concerning the social elements of the concept, a large portion of its fundamentals, e.g., the educational elements and participation methods can be transferred with minor adjustments.

4.3. Need for Adjustment: Similarities and Differences of the Two Contexts

Geographically, there are striking differences between the two regions Gelderland and Thuringia. Gelderland is a densely populated province (population density in 2018: 414.7 persons/km^2) [81], and land for new project developments is scarce. From the regional socio-economic perspective, there are also disparities ranging from the level of income to the acceptance of renewable energy projects. Thuringia is much less densely populated (130 persons/km^2) than Dutch provinces and has a high share of forestland, and therefore, the recreational function of an energy garden may be less relevant.

As Germany and the Netherlands have additionally also distinctive institutional and legal settings, it is necessary to evaluate which aspects can be transferred directly and which need to be adapted and how. For analytical purposes, it can be helpful to subdivide the transfer process into two stages and, within these, also subdivide the stages into an initial stage (planning and initiation of the process) and an operational stage.

Concerning the matter of how to adapt the MFEG concept, there is a high number of issues to be addressed ranging from the availability of suitable sites and requirements for securing it; the choice and use of RES technologies, especially PV panels; potential members of the REC or related organisational and legal forms, shareholders, and customers; and investments and the availability of funding sources and how the business model can be designed to enable efficient decisions. These open questions cannot be directly answered by looking at the best practices and carrying out a *copy and paste* transposition of its elements. The need for adjustment is far-reaching. In the following, we summarise the similarities and differences between the best practice case and pinpoint the specific need for adaptation to the Thuringian context.

The identification of a suitable location is a priority. The range of locations in the Dutch pilot cases offers a good reference. However, ad hoc criteria for the identification and choice of a potential site in Thuringia need to be elaborated, and on the basis of these, the best location for an energy garden can be determined considering local regulations. As in the Netherlands, preference should be attributed to areas where the additional impairment of nature, if any, is minimal. These include, among others, contaminated sites and landfills. The registry of contaminated areas including former landfills and military sites currently being updated by the Thuringian Ministry of Environment can help to identify and develop potential sites for energy gardens in a systematic manner.

Following the identification of potential sites, during the initial phase, questions regarding ownership and financing arise. Dyląg et al. [82] advised to pursue two different kinds of financial backing, one for planning and initiating the process site and pre-feasibility studies (initial phase) and one for securing land, the installation of the RES technology, and ecological/recreational/educational measures (operational phase) [55,56]. This is in line with the Dutch experience, which also splits the initial conceptual part (e.g., preparation of the concept, feasibility studies, site analysis, expert opinions, participation process, renaturation of the site) from the operational part (the renewable energy infrastructure) of the MFEG project, for which separate types of funding could be sought.

As we have seen, in the case of the three Dutch pilot MFEGs, the initial phase was supported by means of a lottery, which covered the process cost (participative co-design of the energy gardens), part of additional instruments (educational packages, additional plants, picnic areas), and dissemination activities (networking, communication, training, sharing).

To tread this path in Thuringia appears more complicated. Although in principle, support for the initial conceptual phase through funding from the German Lottery Foundation could be conceivable, it has to be considered that there is a strong competition for the use of these funds and the support provided is relatively small. However, there are other foundations that might be approached and alternative sources that have just been created. In January 2023, the Thuringian government established the citizen energy fund, which provides start up finance for RES projects of energy cooperatives, and this could represent an important source for financing. Additional sources could include financial contributions of the potential shareholders (equity capital), grants, donations, and loans, but also crowd funding.

Operational support, similar to in the Netherlands, is also available in Germany where for example, open-space solar farms may—under certain conditions—be eligible for a market premium. However, the range of sites is restricted, mainly to a 500-metre corridor next to motorways and railway tracks, conversion areas, and some areas defined by individual federal states. Agri-PV, floating PV, and moorland PV systems may be supported as well. There is a growing number of developers that do not make use of public support, but refinance their investment on the electricity market alone. In order to enhance local acceptance of wind energy and open-space PV projects, operators may offer voluntary payments of up to EURO 0.2 kWh for the electricity generated by the plant to the affected municipalities. For plant operators who benefit from financial support, the payments are economically neutral, as they may request refunding from the grid operator.

With regard to the most-suitable actors to initiate and then implement MFEGs in the "learning region" and whether similar constellations as in the Netherlands can be found in Thuringia, we need to underline again that that the starting conditions, including the institutional and legal settings, are different. The Dutch case has shown that an MFEG can succeed if local stakeholders (e.g., municipalities, mayors, etc.) and residents initiate the project. As we have explained above, in the Netherlands, some MFEGs are entirely owned and developed by an energy cooperative and some are jointly owned and developed in cooperation with a commercial partner. The final governance structure and combination of members/shareholders and stakeholders of the initiative depend on the existing actor constellation and ownership of the site where the garden should be located.

In the Netherlands, sometimes, the initial impulse for planning an MFEG came from the municipality in which the garden was to be located or from commercial actors in a public–private partnership model. In the case of De Langeberg, the consortium includes a collaboration between energy cooperatives and the municipality. Some of the energy cooperatives are already active in the vicinity of the former landfill. These parties jointly design, develop, realise, and manage the energy garden [55]. This model and actor constellation could also be activated in the Thuringian case.

The Dutch case also showed that NGOs as initiators would be perceived as trustworthy and their direct involvement could help to enhance the social and local acceptability of the project [55]. Given the different framework conditions and depending on the location, in Thuringia, it is important that the following groups of stakeholders be involved, e.g., the land owner(s), existing local or regional energy cooperatives or other energy communities, municipal and district authorities, municipal multi-utility companies (*Stadtwerke*, *Gemeindewerke*), local citizens, community members, SMEs, installers, nature conservation authorities and environmental NGOs, and permitting authorities.

An additional issue regards at what stage of the process NGOs and local grass-roots initiatives can come into play. As we already pointed out, it is conceivable to follow a two-stage strategy, i.e., an initial phase and an implementation phase, for which the choice and involvement of stakeholders could be different. For the social part of the project (e.g., the participation process), NGOs could take the lead and also apply for funding that is accessible only to non-profit organisations. Furthermore, it could be very helpful for the project implementation and project monitoring to consider a neutral team of experts, who can provide advice and help. However, the possibility to involve commercial actors as in some cases in the Netherlands (for example, those owning the land) should not be ruled out a priori. They could be interested in investing in the social part of the MFEG, as they might want to enhance public acceptance.

An open question refers to the type of RES and conversion technologies to be chosen, which, however, depends again on the location. In the Netherlands, ground-mounted PV panels are so far the dominant technology in the MFEGs. Thuringia could, however, also consider embedding biogas plants (e.g., using residues from landscape management or energy grasses) in such projects or perhaps (small or medium-sized) wind turbines and combine them with the installation of electricity storage facilities to showcase the different possibilities of RES technologies. This approach is especially suitable for energy gardens with an educational focus. In terms of total energy production, PV might remain the dominant form of energy production. An additional issue is, therefore, which RES technology can be used in addition to PV, as well as whether this is even feasible. A feasibility study in which the potential of the site, including its suitability for renewable energy production is assessed together with potential environmental impacts and any potential risks should provide adequate answers. Overall, it is also necessary to develop a "social" business model and a general plan that outlines the project's goals, objectives, and timeline. The design of the layout of the garden, including the type of plants and any other elements to include in the garden, is also part of it.

The social aspects have a high priority and need to be answered in the short term as well: Major issues concern which forms of dialogue and participation are necessary and how the local community can be engaged already in the initial phase [83]. In this regard, the case of the Energy Garden De Langenberg could represent a model to transfer with minor modification to Thuringia. For example, the number of solar panels is determined in consultation with residents and other stakeholders. In particular, value mapping as a participatory method that records how residents, companies, and other parties view the area and value it seems to be a suitable method for organising participation in Thuringia. Values are not only about nature and the landscape, but also about cultural history and the use of the area, for example for recreation, sports, and leisure.

4.4. Perceptions and Motivations of the Stakeholders and Transfer Team

Our research also focused on identifying the motives and interests of different parties becoming involved in the transfer process. In particular, we analysed the motivation of both mentoring actors from the Netherlands and "learning" actors from Thuringia. In general, we observed that the motivation to become involved in the transfer process is similar to the motivations indicated by van den Berg and Tempels [58], who analysed the motives for the provision of community benefits, even though such grounds differ per case and per stakeholder within the cases. They pointed out that, in the case of the solar park De Kwekerij, one of the first multi-functional solar parks in the Netherlands, although not an official energy garden, the multiple functions and benefits were provided because this was the ambition of the developer, as well as a wish of the municipality and a committed civil servant, to make the solar farm a "pleasure" for the community and, thereby, gaining more support for the development.

We asked the Dutch actors in the transfer process to reveal the main motivation for their engagement. The organisation, NMF Gelderland, did not expect material benefits, but the driver was the ambition of seeing the diffusion of the Dutch MFEG concept internationally and to make public what kind of benefits such initiatives can generate. They declared that the energy transition can only succeed if there are strong forms of participation (design, ownership, use) and if the energy projects are well integrated into the landscape and also provide benefits for nature. However, in spite of the good reception, they see many challenges. Currently, the concept of MFEGs encounters problems in the Netherlands, partly because of the high land prices and long development time of energy projects, in which the market situation may change considerably.

Concerning the possibilities to engage in mentoring, e.g., with advice for a Thuringian MFEG concept and its initial implementation steps, the Dutch mentoring organisation mentioned that no clear impetus for the project in Thuringia was detected. This is due mostly to the open question concerning the financing. Once that has been resolved and suitable locations for MFEGs found, they see much scope in cooperating and sharing expertise.

The Thuringian experts of the transfer team explained that their motivation to join the transfer process was to learn about new means to implement locally acceptable energy projects, as well as the transfer of successful international models to the local context. They stated that the MFEG concept has the potential to strengthen the awareness of citizens for the connection between landscape and energy production and that it is not only about large-scale parks operated by large investors, but also a bottom–up project that empowers local citizens. Energy gardens would offer a good opportunity to combine the sensitive issue of energy production and biodiversity. In addition, they could raise society's awareness of energy production and its nature-friendly expansion, thus increasing local acceptance. Energy gardens could, thus, make a major contribution to society and nature. They also emphasised that, through this transfer process, the awareness of the population for RESs and local acceptance could be enhanced. However, they considered the identification of suitable areas for an MFEG and its acquisition as the most-difficult challenges. The transfer process has also provided insight into Dutch structures and, thus, offered a new perspective for Thuringian solutions. Support from Dutch mentors in the implementation of the first energy gardens is much appreciated and is considered very useful, especially in the planning phase, as initial mistakes can already be avoided in an earlier stage.

4.5. Major Elements of a Viable Business Model for Thuringia as a Learning Region

Although profitability is not the primary target of an REC, economic viability still represents a basic prerequisite of any collective project [82]. Therefore, it is advisable for any MFEG project in Thuringia to be designed according to economic viability criteria, especially regarding its size. This is, however, not problematic as energy cooperatives and other forms of energy communities have usually lower expectations regarding financial returns than commercial market actors. This is in line with the literature. Herbes et al. [84] stated that RECs usually have a weakness in the management of a business model; hence, it is advisable to improve their knowledge in order to design an economically viable REC.

The key components of a business model include (cf. [85]): (1) a design and installation tailored to the actors' goals and needs. This includes determining how the energy garden will be powered, the layout of the energy garden, the type of renewable energy sources to be used, the materials needed, and the installation process; (2) maintenance: of the energy garden, including cleaning, repairs, and replacements of components; (3) financing: options to afford the installation and maintenance costs associated with the energy garden. This can include leasing, financing options, and other payment plans; (4) marketing: strategies to promote the energy garden and attract visitors; (5) customer service: e.g., providing technical support; (6) utilisation of technology to monitor and optimise the performance of the energy garden. This includes software tools to track energy production and energy consumption.

The stakeholders/shareholders necessary for a business model for energy gardens include: (1) end users of the energy produced, utilities, aggregators, businesses, and public facilities members of the energy community (in case of energy sharing), private households, homeowners, and condominiums in the vicinity; (2) investors to provide equity capital to finance the project; (3) suppliers/installers of the necessary facilities/components and materials, such as solar panels, wind turbines, batteries, etc.; (4) contractors to carry out the planning, development, and maintenance of the energy garden; (5) local, state, and regulators to ensure compliance with relevant laws and regulations; (6) financing institutions such as banks and other lenders to provide the necessary debt capital for the project; (7) local/regional government authorities/agencies to provide incentives or permits in order to make the energy garden feasible; (8) NGOs, local grass-roots initiatives.

4.6. Challenges Involved in the Transfer Process and in Future Implementation of the Project

While ecological issues may have perhaps a lower priority for the business model of a traditional solar park, which is usually based on energy conversion and sales, the general business model of an MFEG needs to address the ecological co-benefits. Moreover, currently, even in commercial solar parks, ecological aspects gain increasing importance for developers. They need to comply with the increasing legal demands in this field and also to master acceptance problems among local communities, as well as nature conservation organisations.

From a technical perspective, energy communities are traditionally focused on electricity generation, mostly based on PV, which presents less technical challenges, and sometimes wind power, which is more difficult to implement because of financial, technical, and local acceptance reasons. However, there are signs of the diversification of sources that include heat generation based on renewables, electricity storage, and energy efficiency. Moreover, the transformation from large-scale, mainly centralised electricity systems into a decentralised configuration poses technical challenges, as well as changes to the energy landscape [86]. Thus, for example, microgrids based on renewable energy sources require optimisation-based control techniques necessary for power quality improvement in these microgrids [87]. From a techno-economic perspective, an energy management system will require also for an REC optimisation processes "to manage generation and consumption and minimize the costs (or maximize the profit) on the consumer (or the community) side" [88] (p. 3).

Energy sharing, i.e., sharing of energy produced by a (renewable) energy community among the members/shareholders, can help to facilitate the engagement and activation of local residents and community members and enhance support for such a project. However, neither in the Netherlands nor in Germany is there an enabling framework in place that would help to implement energy sharing. Such regulations have not been foreseen in the recent amendments to the Renewable Energy Sources Act (EEG 2023), but might be expected for the future [89]. Against this background, factors such as the optimal spatial scale of the project in Thuringia will be relevant to enable economic viability without necessarily having to resort to energy sharing.

As participatory projects tend to have higher investments costs and longer realisation times, it is necessary to consider the economic viability of the project in detail: depending on the local demand structure and size of the site, open-space PV can satisfy a certain amount of energy demand, but the integration of additional RES plants and storage systems may help to improve the economic viability of MFEGs. Whilst small- to medium-sized wind power plants might generally also be an option, the lack of economic feasibility could be in the way. Moreover, acceptability and administrative barriers still represent key challenges in Thuringia.

Another challenge that can also determine the economic viability of the project is the combination of actors involved in the initial and operational phase of the project, as the project needs to balance different interests to be successful. A further challenge to be mastered is that, although Thuringia is a comparatively sparsely populated federal state, the availability of space is an already contested issue. Such issues require consideration as the direct engagement of residents can play a major role in enhancing the local acceptance of the project.

4.7. Opportunities in the Cooperation with Mentoring Organisations and Identification of Implementation Steps

In addressing these issues, we analysed first the potential benefits of transferring the energy gardens concept and the motivation of the stakeholders in the learning region to partake in a transfer process. We addressed the benefits of such initiatives in the previous section. They provide an additional source of clean energy, which is renewable and sustainable, and improve air quality. Additionally, MFEGs can provide habitats for wildlife, contribute to landscape preservation, and provide green spaces for recreation.

From a social perspective, MFEGs can help promote community engagement and education and provide opportunities for local residents to learn more about renewable energy and how it can be used to reduce energy costs. The transfer team developed and discussed with the stakeholders in the frame of the transfer workshops the major steps for an ideal implementation roadmap, which consisted of a number of consecutive activities (see Figure 3).

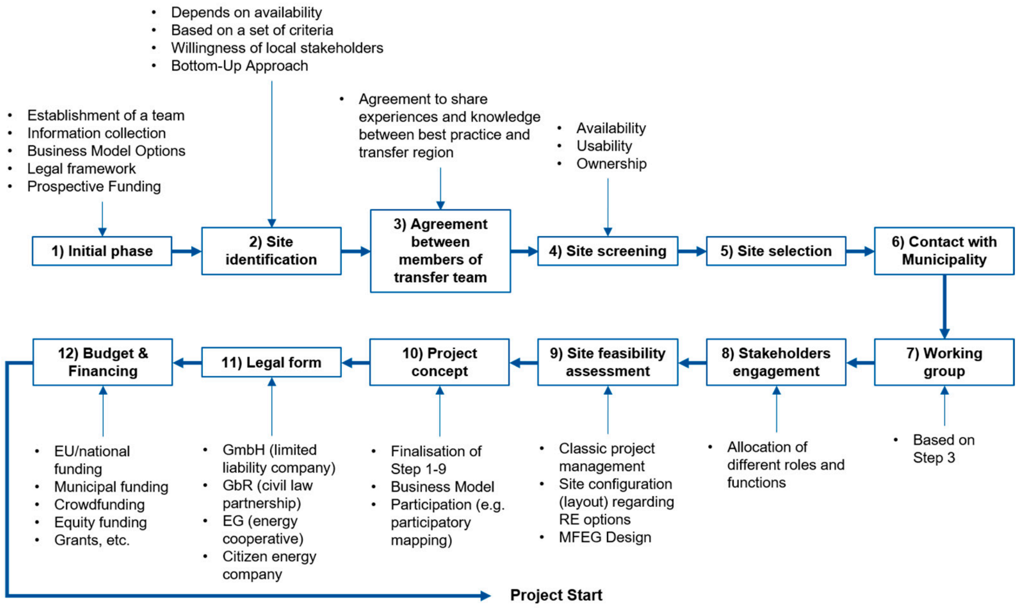

Figure 3. Implementation roadmap (own elaboration).

These are: (1) establish a team by putting together citizens, community leaders, and energy experts who can provide input and make decisions about the project; (2/3) research and gather information: research existing energy gardens, the local environment, and the needs of the community; (4/5) identify a suitable location: determine the best location for the energy garden, taking into account factors such as solar radiation, available space, and local regulations; (6–8) establish contact with the municipality and relevant stakeholders; (9) conduct a feasibility study: assess the potential of the site, including its suitability for renewable energy production, potential environmental impacts, and any potential risks; (10/11) develop a final project concept, and outline a plan including the project's goals, objectives, and timeline; design the layout of the garden, including the type of plants and any other elements to be included in the garden; (12) clarify financing and budget needs by determining the cost of technical components, materials, labour, and other expenses associated with the project; secure funding: identify potential sources of funding for the project, including grants, donations, loans, etc.

Following the official project start, additional steps are required: submit applications for any necessary permits and wait for approval; design the energy garden; outline the activities necessary for the implementation of the MFEG; develop the spatial concept of the MFEG; work with the community and other stakeholders to execute the implementation plan; set up a monitoring system to track performance and ensure the MFEG meets its goals and make adjustments to ensure it is functioning as expected; finally, educate the public.

5. Conclusions

As our research has shown, MFEGs as public spaces that combine renewable energy production with nature conservation, recreation, and education represent a suitable model to achieve a fair distribution of costs and benefits and are designed to be visually integrated into existing landscapes and provide a source of shared renewable energy.

We presented several arguments why the Dutch MFEG concept can be regarded as transferable to Thuringia, especially because important prerequisites can be met. These are institutional support, a variety of potentially interested stakeholders, the potential availability of sites in areas to be renaturated, the accessibility of operational, investment and pre-investment support, experience with community energy projects, the existence of biodiverse solar parks in Thuringia and neighbouring regions, and the presence in Thuringia of (multi-functional) landscape parks as trailblazers.

We also indicated some determinant factors for a successful transfer process, amongst which the commitment and active engagement by key local actors including mayors, municipal councils and administrations, local citizens and communities, SMEs, energy cooperatives, etc. However, we showed also that the socio-economic conditions for community investments in community energy projects are less favourable in Thuringia than in Gelderland or the Netherlands in general. The institutional framework and actor constellation are relatively favourable for such a transfer. In both countries, municipalities enjoy a relatively high degree of fiscal and planning autonomy and scope of action. They have important local planning and permitting functions, particularly with regard to the planning of open-space PV projects. Energy cooperatives and related umbrella organisations exist, and energy cooperatives and other energy communities are increasingly investing in open-space PV projects. Moreover, the activities carried out within the COME RES project promoted awareness raising and the diffusion of the general concept of energy gardens in Thuringia among key stakeholders.

Crucial for the economic viability of MFEG projects is financial support. Various funding mechanisms work differently and have disparate aims and prerequisites. These need to be considered to gain insights into which mechanisms work best and are in line with the project aims (e.g., social acceptability and renaturation). The new citizen energy fund in Thuringia provides pre-investment support in the form of start-up finance for energy cooperatives. Under certain conditions, operational support is available as well. Although, under current conditions (high electricity prices), it becomes increasingly attractive to refinance investments of solar farms without operational support, the specific characteristics of energy gardens imply that such projects will require financial backing also in the future. Ultimately, the funding of the project is strongly connected to the choice of the legal form, as this determines how capital can be acquired and how participation can be organised. We showed that the legal form depends on the combination of actors that participate in the project. Municipalities, residents, SMEs, municipal multi-utility companies, and environmental NGOs are suitable stakeholders for a Thuringian MFEG.

A core aspect of a prospective MFRG in Thuringia is a proper participation format to enable locals to be actively engaged in the project. Many wind energy and open-space PV projects show that local actors have the potential to stop or hinder the realisation of a venture. As REC projects are typically bottom–up projects, they are best implemented by relying on the local population and by empowering them to decide how they want to realise them. Following the Dutch example, all local stakeholders should be involved already in the early planning stage in the design process and development of the project. The Dutch case has shown that "value mapping" and co-design are trustworthy formats and are suitable to empower local residents. These procedures can be transferred to Thuringia. How local stakeholders react to those methods remains to be seen, tested, and (if necessary) adjusted.

Concluding, the following lessons can be drawn when implementing the transfer of the Dutch MFEG concept: (1) Establishing clear and achievable goals and objectives is key to any successful community energy project. This helps to ensure that all stakeholders are on the same side and that the project is well planned and organised. (2) Collaboration between stakeholders is essential for successful community MFEG projects. This includes collaborating with local governments and other organisations, as well as engaging with the local community. (3) Involving local stakeholders in the planning and implementation of the project is key for success. This includes engaging with the local community and other local organisations who can contribute to the MFEG in a meaningful way. (4) Measuring the success of the project is important for tracking progress and showing that the project is heading in the right direction to achieve its goals and objectives. (5) Educating the community about the benefits of MFEGs and how they work is essential for long-term success, as it is a means to ensure that the project is well-understood and supported by the local community. (6) Sustainability is crucial to ensuring that the project is successful in the long term. (7) Finally, the business model of an MFEG is directly linked to its ownership. Bastiani et al. [55] recommend that a suitable site should preferably be owned by a municipality and could be constructed on a degraded or contaminated site to be best integrated into the local land use concept.

On the operational side, the willingness of the involved transfer partners to cooperate has been underlined by signing a "Memorandum of Understanding" This is an agreement shared among the participants of the COME-RES learning and mentoring regions, whose purpose is to outline the measures to be exchanged and actions to be performed to share knowledge/expertise across the involved regions beyond the end of the project. It represents a strong signal of the disposition of working together and marks the initiation of such a project, which can have a model character not only in Thuringia, but also in Germany. The Dutch cases illustrate that MFEGs can be realised also without energy sharing, although energy sharing can facilitate the implementation and proper functioning of an MFEG and can help to enhance local support and acceptance. Nonetheless, for the implementation of the concept, the introduction of an enabling framework for energy sharing represents a plus for any REC to fulfil properly its purpose of initiating local value creation and societal advantages, including mitigating energy poverty [90].

Finally, we showed how the transfer of best practices in the community energy field is a two-way process in which both parties are expected to receive something of value in exchange for the transfer (e.g., costs such as time, effort, or energy spent in the process of exchange offset by intangible benefits such as praise, approval, and recognition). This two-way exchange of information and resources has already helped the involved stakeholders to foster mutual understanding and cooperation, leading to a promising transfer process. We also indicated how the process of sharing and transfer can be structured to promote the development of collective action, but at the end, the real implementation of the best practices will depend on a number of elements of an institutional, political, governance, and economic nature. As remarked by van den Berg and Tempels [58], a fair and open decision-making process fosters trust in the stakeholders and gives citizens the opportunity to discuss the type and amount of community benefits. Indeed, the installation of MFEGs in a local area can improve the infrastructure and provide a green space for citizens to enjoy, but most of all it activates community engagement and offers citizens an opportunity to come together and work on a common goal, thus increasing community engagement and promoting a sense of place and of social cohesion. This, at the end, means that the selected best practices not only can be transferred, but also implemented in a sustainable and equitable way.

Overall, it is our contention that transferring the energy garden concept to other EU regions could offer a unique opportunity to create sustainable energy systems while promoting a broad range of ecosystem services such as landscape preservation, biodiversity, and social inclusion. Future research could, therefore, fruitfully investigate how such transfer cases can lead to an improved evidence-based policy-making on the energy challenges ahead. The authors are aware that across Europe, there are enormous differences in political culture, civic participation, civil society organisation, and trusted cooperative dialogue practice, but still believe that the approach presented is widely transferable and replicable. Further research could, therefore, focus on the transferability of the energy garden concept to other EU regions and analyse the different contexts and prerequisites of the various EU regions to ascertain which regions could easily accommodate the energy garden concept without facing significant cultural, economic, and social barriers. Additionally, future research could explore the impact of advanced technologies and innovative finance models in leveraging the full potential of the energy gardens.

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