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Islands as Playing and Breeding Grounds for Incumbents, Entrepreneurial Technologists, Policymakers, and Engaged Citizens: The Case of Energy Transition on Ameland

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Abstract: Increasingly, discussions on sustainability, in particular in relation to energy transition, are finding their way to the regional and local political arena. Although for analysing transition pathways on these sub-national scales, conceptual frameworks such as the multi-level perspective may be helpful, some issues remain relatively unaddressed: the relevance of citizens and their social networks and the precise interactions between place, the local context, and external conditions. This paper aims to better understand energy transition processes on the local and regional scale by analysing the case of the Dutch island of Ameland. Since 2006, Ameland has been on a sustainability pathway towards self-sufficiency, in particular in terms of reducing CO_2 emissions. In this case study, we conducted in-depth empirical analysis, using a mixed-methods approach, including document analysis and ethnographic techniques. In a five-stage development process, a combination of place-related niche development, regime developments, and the involvement of citizens have created a protective space for several socio-technological innovations to emerge. The unique combination of specific local conditions, in particular political and cultural, and external influences, national policy, and 'enlightened' companies have shaped ideal conditions for Ameland to become an inspiring example of innovation in regional transition processes.

Keywords: regional energy transition; islands; MLP; place-based niche development; citizens' engagement; community involvement

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1. Introduction

The transition from a fossil fuel-based energy system towards a more sustainable low-carbon energy system is seen as one of the major transitions that society must make within the next 20 to 30 years [1–3]. This shift is motivated by the need to reduce the emission of anthropogenic greenhouse gases in order to limit climate change to 1.5 to 2 °C above pre-industrial levels and mitigate the effects of climate change. For this, a drastic transformation of the energy system in required [4,5]. This will have an impact in many domains and sectors and on different spatial scales. While transition pathways are available on the national scale, it is less clear what energy transition will look like on the sub-national, regional, and local scales. However, it is highly relevant to consider these scales for at least four reasons.

First, a large proportion of renewable energy is generated on a decentralised and small scale, resulting in multiple, dispersed production locations, which include individual household units [6,7]. Second, the energy transition has become more institutionalised at the local and regional levels [8,9]. In The Netherlands, for example, 30 identified 'energy regions' must produce regional energy strategies while recently, municipalities have also had to develop plans to phase out heating by natural gas [9]. In Germany and the UK, there is also a strong trend to decentralise responsibility for renewable energy to local governments (municipalities) [10–12]. Third, local and regional communities are becoming increasingly involved in determining which transition pathway is most suitable in their locality or region. Here, we find many bottom-up or grass-roots community energy transition initiatives, often striving for energy autarky, self-sufficiency, or CO_2 neutrality. In The Netherlands, there are more than 600 of these initiatives actively engaging in renewable energy projects, and this number continues to increase [12,13]. As in other countries, the innovative potential of these community energy initiatives is considerable; however, not all of these projects are integrated or aligned with existing energy networks or policies at higher spatial scales [14–17]. Finally, given its decentralised nature, a growing number of people are 'involuntarily' being confronted with the energy transition, with some of them expressing concerns about the potential impacts on their daily lives. Many renewables are highly visible in the landscape; renewable technologies typically take up more space; and they compete with other land uses [18–21]. Because of the scaling up of renewables, municipalities and critical citizens groups are demanding that more attention must be paid to the spatial impact of renewable energy, including better consideration beforehand of the spatial context in determining what technological options can be applied where [22–25].

For these and other reasons, it is not surprising that discussions of energy-related issues on the local and regional scales are increasingly finding their way into the political arena. This makes a consideration of sub-national, regional, and local energy transition urgent. Three related issues have emerged from these discussions: (1) the role and relevance of citizen empowerment; (2) how place-based factors play a role in transitions; and, related to that, (3) the way various places and scales are related.

First, in particular in Europe, it is recognised that in addition to better policy and the willingness of incumbents, the empowerment of citizens and local energy initiatives may be crucial for the implementation of energy transition plans [26,27]. New energy technology systems may influence or even determine the energy transition and can be applied in many contexts; however, adjustments are often required for better local integration [17]. Non-technical factors, such as the entrepreneurial spirit of the locals and the leading role of partnerships with established local organisations, increase the likelihood of community benefit and support [28]. Citizen empowerment thus not only means the involvement of citizens in governance and juridical procedures but also in economic participation and co-design [29]. Second, one of the key challenges in recent transition debates is understanding how and why transitions are similar or different across locations and determining why transition pathways work in one place and not in another [30]. Clearly, regional energy transitions not only depend on technologies and how they are applied but also on the combination of local and regional circumstances, including, for example, the degree of urbanisation; population density; governance structure; and the socio-economic, cultural, and physical characteristics of an area. Some even doubt whether certain renewable energy systems are transferable to different situations and suggest identifying context-dependent potentials and possibilities in each case [31,32]. Third, in the same light, we need to consider spatial relations or the interactions and connections between places with other places across scales [33]. This means that not only local place-related conditions should be considered but also the way external influences and mechanisms affect that specific place and the innovations and transitions that occur there. Nevertheless, while there is general agreement that these issues should be taken into account [8], it is largely unknown how this interplay precisely works in local and regional energy processes.

In this paper, we aim to contribute to a better understanding of local or regional energy transition processes by considering these three issues (empowerment of citizens, place-specific conditions, and relations with other places). We will do this by analysing a regional energy transition process in one particular 'region': the island of Ameland in the Dutch Wadden Sea, which offers us an excellent case to study the importance of place-related, local circumstances and the role of external influences. Islands are generally seen as interesting places for energy innovations because of their unique (bio)-physical, socio-cultural, and economic characteristics [34–38]. Kallis et al. (2021), for example, state that islands often serve as testbeds for new technologies, and even potentially are earmarked as forerunners in the transition to clean energy [36]. In The Netherlands, Ameland is usually considered as a classic case of a local or regional initiative for regional energy transition [39,40] Here, in 2006, members of the local community of Ameland launched their first plans for an energy transition pathway towards self-sufficiency, inspired by and to a certain extent comparable with, for example, the well-known island of Samsø, the Danish island that received worldwide attention as a pioneer community in renewable energy transition. See, for example, Sperling 2017 [33]. These initial plans became part of a larger initiative of the municipality of Ameland and a number of large companies to experiment with various small-scale innovations.

The main objective of this paper is to analyse the development process on Ameland, as an example of a local or regional energy transition process, and to analyse the interaction of this process with the specific local place-specific context and the external challenges and conditions. This leads to the following research questions: what are the characteristics and results of this process in the case of Ameland? How did the energy transition process interact with the local context and external conditions, and what was the role and involvement of local actors, in particular citizens and related social networks, in this?

The structure of this paper is as follows. In Section 2, a brief review of relevant developments in transition theory will be presented. Section 3 presents the conceptual and operational framework for the analysis while Section 4 describes the methods used. In Section 5, the regional transition process on Ameland is analysed. In Section 6, we analyse the internal, local, and external conditions, followed by an analysis of the involvement of local actors in Section 7. In the final Section 8, we discuss and reflect on the results and draw our conclusions.

2. Sustainability Transition Processes, People, and Place

Among approaches to understanding sustainability transition processes, the multi-level perspective (MLP), originating in innovation and science and technology studies, and introduced in the early 2000s, has become one of the leading conceptual frameworks. In addition, it has resulted in many case studies on different historical and geographical contexts [30,41]. For this study, it also appears to be a fruitful starting point.

The MLP enables investigations into fundamental changes in socio-technical systems that provide 'societal functions such as mobility, heat, housing and sustenance' [30,42]. Key in the MLP transition framework is the assumption that transitions are the result of nonlinear processes that interact between three 'levels': 'niche', 'regime', and 'landscape'. At the niche level, individual actors, technologies, and local practices start to interact, developing new ideas and practices in 'protective spaces'. The second level, the socio-technical regime, is the locus of established practices and associated rules that stabilise existing systems. This level refers to dominant actor networks, institutions, and technological configurations that guide decision-making and innovation. Third, the exogenous landscape level refers to the wider socio-technical context of a system, including material infrastructure, demography, political culture, economy, and values, but may also include (bio)physical factors such as geography, climate, and the natural environment. Usually, these 'landscape' elements change slowly but sometimes abruptly, which may accelerate system changes [18,30,43–46].

It is in on the regime level in particular that systems are stabilised by the alignment of technologies, policies, user practices, infrastructures, and cultural discourses that have been developed over previous decades [30]. Systems are stable as they are reproduced, maintained, defended, and improved by groups of actors. The perceptions and actions of incumbents, for example, are shaped by the existing rules and institutions constituting these systems. As they have developed over years and are complex, transitions are difficult, as they have to overturn the status quo or breakthrough these existing stabilised systems [46].

For socio-technical transitions to happen, radical innovations are needed and a better understanding of how they emerge through the activities of multiple social groups (such as firms, consumers, social movements, policy makers, researchers, media, investors), which operate in the context of rules and institutions, including belief systems and norms. According to MLP, niche innovations build momentum and, along with landscape changes, they create pressure on the regime, leading to its destabilisation [30].

MLP has been particularly useful in explaining the temporal dynamics of how some of the major historical transitions have emerged, such as the rise of modern agriculture or the shipping system with engine-powered ships [47–49]. The MLP theory has also contributed considerably to our understanding that sustainability transitions are not merely about technological challenges but also depend on the interaction between social and technical systems. However, although inspiring and well known, many criticisms and suggestions for improvement of MLP have been formulated [30,41,46]. We focus here on two main areas of criticism and the adjustments made to the original concepts that are most relevant to our study of a particular place or region: first, the way niches develop and the role of citizens in that development and, second, the place-related dimensions and relationships.

The first area of criticism to MLP is related to the process of niche development and regime change and how interventions come about, including the role of actors. Because the MLP was developed to understand transitions over the long term—that is, decades at the least—it does not pay much attention to short-term developments, such as the rise and nurturing of niches, the role of social actors at this stage, and the way they influence and may change regimes [50,51]. This could partly be due to MLP's strong emphasis on technological innovation. However, not all innovation starts with technology, and although almost all social innovations have a material counterpart, these social aspects of innovation, such as social movements and social business models, cannot be fully understood in terms of MLP [51,52].

Although MLP scholars mention policy, technology, science, industry, culture, and markets as key elements of a regime, which together form a socio-technological network that should be transformed in times of transition, citizens or civil society are not considered a structural element in MLP, either in niche development or regime change. Based on the work of various scholars and traditions, however, it is known that societal transitions can be grounded in civil society [53]. Social movement organisations such as Friends of the Earth, Greenpeace, and the overarching European organisation for energy cooperatives, RESCOOP, have been found to play a significant role in energy transition, by opposing or promoting certain energy technologies, by cooperating in regional energy platforms, and by stimulating behaviour that saves energy [17].

In addition, citizens may play an important role in energy transitions in many other ways [54]. Most of the literature on citizen participation focuses on formal political procedures and identifies the levels at which citizens have the power to influence, support, or hinder political decision-making, for example, on wind turbines or nuclear energy. Recently, more studies have concentrated on how citizens might play a substantial role in decision-making on large-scale energy projects. They question how public involvement is organised and can be improved in order to facilitate the transition towards a more sustainable energy future [55,56]. 'Social acceptance' or 'social acceptability' are the keywords in many studies, which suggest change to decision-making processes. To identify various levels of influence, Arnstein's ladder of participation that distinguished eight steps in participation, from manipulation (i.e., no influence at all) to complete citizen control, is still in use [57].

However, while important and perhaps key in decision-making processes, the political domain is not the only domain in which citizens can participate in the energy transition [55,58,59]. In Europe, thousands of energy cooperatives have been founded by citizens, reinventing social business models, owning social energy enterprises, and sharing energy production and provision. Moreover, many individual citizens may influence the energy system as producers or by co-designing energy technology, such as area or neighbourhood-specific wind turbines, district heating infrastructure, or solar PV [13,18]. Finally, as consumers, citizens can influence the market share and production of certain energy-saving products. This type of consumer participation is called material participation [54], and as with citizen participation in the political domain, different levels of influence of citizens can be distinguished, varying from a dominant group (such as market leader) to those who may participate as shareholders.

As mentioned, despite the many roles citizens may have in energy transition development, the MLP does not consider civil society, including citizens, as a structural element [58]. At best, citizens are labelled as 'users', as part of the market, or as actors in policymaking. To analyse and better understand the interaction between technology development and social actors, transition management (TM) may be helpful. TM is closely related to MLP but takes insights from governance and policy studies into consideration in a more comprehensive way. TM analyses the dynamics in the relevant social and social-technological subsystems and looks for ways to manage and govern sociotechnical niches to facilitate sustainable development of and change in socio-technical regimes. TM looks for options to stimulate processes of co-evolution between technological and socio-technical elements at various scales of time and space [1,60–62].

According to TM, several rounds or stages can be distinguished, related to learning processes, during which relevant parties exchange experiences, formulate aims, and initiate practices concerning technology, organisation, and interaction [60]. These stages, which do not necessarily occur in a fixed order, are seen as important or even crucial for transition processes (Figure 1): (1) Setting up or designing the 'transition arena', problem structuring, and visioning; (2) developing transition coalitions, a transition agenda, and transition paths derived from this; (3) setting up and executing transition experiments and mobilising the resulting transition networks; (4) monitoring, evaluating, and learning from transition experiments, on the basis of which adjustments can be made regarding vision, agenda, coalitions, and practices [62]. Since its introduction 20 years ago, TM has been widely used and evaluated in practice; as an analytical tool, it is particularly useful in shedding light on the interaction between technology development and social actors [62].

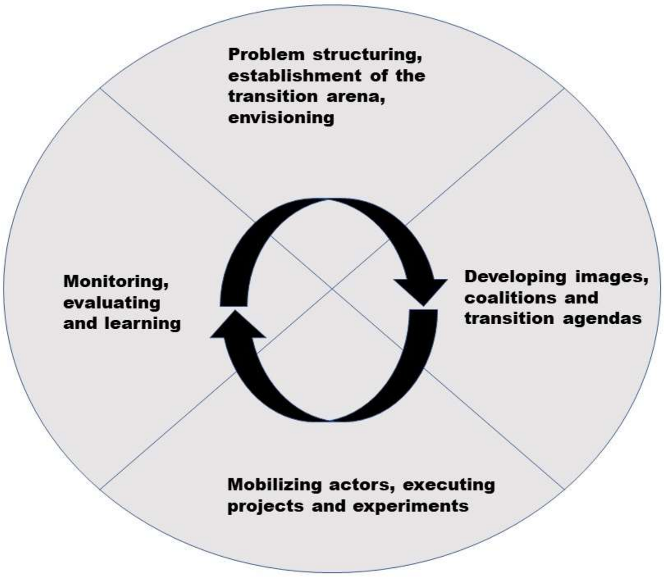

Figure 1. Transition management model (adapted from Loorbach and Rotmans, 2010, [62]).

The second area of critique relevant to our research is the relationship between MLP and place in general and between MLP levels and spatial scales in particular. Efforts to link the niche level to the local scale, the regime level to the regional scale, and the landscape level to the national and international scales have not been convincing [20]. Indeed, although MLP uses geographical metaphors (niche, regime, and landscape) to provide a contextual account of technological change, the MLP framework has been criticised for its *geographic naïveté* as the spatial dimension is not incorporated in a satisfying way [6,7,63–65]. This has led to what Coenen et al. (2021) have labelled a spatial turn in socio-technical literature, leading to many studies over the last decade that have considered the geography of energy transitions [32]. In this, many authors have emphasised the importance of more explicitly including spatial or geographical dimensions in MLP to address the question which, as we mentioned above, is also seen as highly relevant for MLP scholars themselves: Why do transitions occur in one place and not in another [41,66,67]?

Two aspects of place (whether areas, regions, localities) need to be considered in an understanding of it in relation to energy transition. The first aspect is *place particularity* or place itself in an absolute sense, referring, in the case of energy transition, to the distribution of energy-related activities across one particular place and the underlying spatial patterns. The second aspect refers to *place relationality*, the geographical connections and interactions of one place with other places. In the latter, place is considered in a relative and relational sense, with overlapping relationships and networks with other places. Variations in both aspects of place will lead to spatial variety in transition pathways [7,8,43,63,64,66].

At the regional level, these two aspects of place—place particularity and place relationality—are clearly manifested. Regions, including large cities, are at the nexus of different scales of governance and socio-political discourse [20]. One of the key challenges for cities and regions is the extent to which energy systems can be detached from constraining external factors on the national or international scales. Some regions miss out on energy transition opportunities as external developments hinder niche innovations and transition within the region, as is illustrated, for example, by an Australian case study on the failed intervention of demand-side management in the national electricity system [68]. A German case confirms that it is not only the 'natural' place-related technical potential that determines a regional energy transition pathway but also other context variables such as the socio-economic circumstances that are manifest in a certain place, which must also be considered. This study advocates a wide-ranging approach that integrates socio-economic factors and stakeholders into regional energy transition governance [8,9].

In addition, authors in the field of spatial planning emphasise the importance of a comprehensive area or place-based approach for the full integration of energy transition into spatial planning as this links governance with the biophysical landscape and socio-economic landscape or space [6,69–71]. Such an approach, they argue, is able to address the potentials, needs, and interests of areas [6]. These considerations also provide additional geographical meaning and connotation to the key notions of MLP. In this way, niches may be defined spatially as a location with unique environmental surroundings that constrain and enable a context-specific innovation. Although socio-technological niche innovation can occur independently of location, a niche may also be associated with the local scale and setting. The assumption is that niches that are integrated and embedded in their unique setting and that are linked to local actors and artefacts will encourage more acceptance and be less vulnerable [6,18,71–73].

Similarly, taking an area-based approach, a regime is generally interpreted as the socio-technical context in which different (socio-technical, economic, cultural, etc.) subsystems influence a local situation. This refers to external conditions and is associated with the relational aspect and interaction of one place with another place and scales. In MLP discourse, the third level of 'landscape' is usually defined abstractly as the 'placeless' macro level, understood as the wider exogenous environment with deep structures that cannot be changed by actors [6]. This understanding is highly detached from everyday discourse, where 'landscape' refers to the concrete biophysical landscape, the geographical entity, the result of the action and interaction of natural and human factors [71,74]. Both interpretations are important but need to be conceptually 'separated', although both have a temporal and spatial connotation: the MLP landscape—comparable with Braudel's 'longue durée' concept from history—refers to the long-term developments and structures in society while the physical landscape refers to the land, the area, and the spatial manifestation of natural and socio-cultural developments. As previously mentioned, this latter interpretation is increasingly relevant in discussions, given the spatial impact of energy transition-related interventions.

3. Operational Framework

Based on the criticisms and alternatives presented, we propose some additions to and refinements of the MLP framework, concerning the process, the interaction between niche development, local circumstance and external conditions, and the role and involvement of citizens in such processes.

As we are particularly interested in the interaction between the early stages of an energy transition process and the local/regional context or place, we combine concepts from the MLP framework and the TM model with key concepts from geography and spatial planning and the literature on citizen participation. In this, Ameland is considered the case study area—the 'region', locality, or place of the energy initiative. Here, we consider the niche concept primarily in its geographic (area related) connotation, that is, we see Ameland as a location for socio-technological innovations that are connected to the locality. This brings us to our three more specific key research interests.

First, we are interested in the energy transition process itself at the local and regional level, and how this has played out on Ameland. Using the stages of TM, we will study whether various steps in the process—setting the transition arena (problem structuring and visioning), developing transition coalitions and transition paths, executing experiments and mobilising networks, and evaluating/learning and adjusting—can be identified in the Ameland case. We will do this by analysing the transition process as it has developed over time.

Second, to connect to the place discussion and to see how the transition process interacts with place, we use a simple (straightforward) framework that distinguishes between internal (place-specific) context and external (place relational) conditions [33]. We will investigate how the niche innovations that have occurred have interacted with internal place-based local conditions (e.g., biophysical conditions, socio-cultural background), and to what extent the regional energy process was shaped by external (regime)-based factors (e.g., national policy, energy system, external network) and their spatial manifestation and impact [6].

A third research interest concerns the role and involvement of local actors and stakeholders, including citizens and their related social networks, in this energy transition. Based on the different operationalisations of citizen participation as discussed in the previous section, we investigate how local actors were involved in the transition process on Ameland. Based on the literature, we consider four potential roles of local actors and stakeholders: first, as agents in formal and informal policy and decision-making processes; second, as consumers; third, as designers or experimenters; and finally, as shareholders in cooperatives or other economic entities [12,55,58,59].

4. Materials and Methods

4.1. Case Selection

We chose a single case study approach to investigate regional energy transition. This allows for an in-depth empirical analysis of a contemporary phenomenon and in a real-life context [75,76]. For this, we analysed the island of Ameland as an *illustrative* example of local or regional energy transition [9]. This area was selected for a number of reasons. Ameland is often labelled as a 'showcase' for successful regional or local energy transition in The Netherlands [40]. More generally, as mentioned, islands are considered as ideal cases to study regional approaches to the energy transition—as an island is typically a confined area, a clearly demarcated 'region', allowing study of the processes in relative isolation [33,36,77]. Indeed, islands are often earmarked as testbeds for renewable energy deployment [36]. This is motivated by the fact that they are share a number of features, such as being physically and geographically isolated from the mainland. This setting provides a good opportunity to critically analyse how transitions processes work and test the limits of standard practices [36]. However, it is also noted that despite similarities, there are also many variations between islands in terms of physical characteristics, social groups, the role of authorities and developers, etc., making comparison problematic. Moreover, it may be that the distinctive features of islands are so unique that it remains to be seen if this can be replicated to, e.g., the mainland [36]. Indeed, as Kallis et al. (2021) argue, there may be a tension or dilemma between the view of islands as places with distinctive attributes, being well-suited for testing new energy technologies, and the perspective of islands as generic places capable of producing outcomes that can be transferred to the mainland [36].

4.2. Data Collection and Analysis

We adopted a mixed-methods, qualitative research approach, with data collection taking place between 2019 and 2021. We conducted a general in-depth literature review, and a document review related to the Ameland case. A general document analysis was conducted, using project-related internal and public documents, such as reports, a website, and news items. The analysis offered insights into the development, discourses, and issues concerning energy transition on the island covering a period of approximately 15 years. Targeted (document) analysis focused on a number of specific reports such as two evaluation studies (Learning History and Evaluation study) [78–80] and the original data that these documents were based on, in particular the 20 semi-structured interviews that were conducted with the main stakeholders of the Ameland Initiative [78,79]. For these interviews, respondents were selected based on their involvement in the Ameland Initiative, including representatives of the municipality, the Covenant partners, and a number of local entrepreneurs and residents were also interviewed. The interviewers used a semi-structured interview guide to comment on. The interviews were recorded and fully transcribed. A report of the interviews was shared with the respondents for comments before entering the research analysis phase (see [78,79] for details). The questions were specifically aimed a defining critical turning points and events in the process, both positive, enhancing points and negative, obstructing moments. A rudimentary timeline of critical turning points (based on the initial document study) was provided for interviewees to comment on. Moreover, respondents were asked about their involvement in activities; their cooperation with other partners; their reflections on other partners and the process; and their lessons learned.

In addition, we used ethnographic techniques to gain further understanding of the initiative [81]. These ethnographic techniques included participating in, and observing, the project over a period between 2019 and 2021 by attending the regular meetings of the project group and, occasionally, the steering group of the initiative. In addition to fieldwork notes that were made during and shortly after these meetings, the official meeting notes were also considered in the analysis. The employment of these ethnographic techniques was crucial for acquiring a deeper insight into and understanding of the Ameland Initiative, and this generally informed the identification of topics and issues.

Based on the documents, the interview transcripts, and the ethnographic work, a qualitative data analysis was conducted [43]. This analysis was performed using a coding frame that was based on the key concepts of the MLP and the additional frameworks as mentioned in the previous section, and by identifying key moments and events in the policy-making and implementation of the energy plans [9]. Overall, this allowed for a thorough understanding of the transition process on Ameland.

5. The Energy Transition Process on Ameland

In this section, after an introduction of the case study area, we start by identifying and analysing the energy transition process on Ameland so far, based on the TM model and its main stages (see Figure 1).

5.1. Introduction to the Case Study Area

The island of Ameland is situated in the Dutch Wadden Sea, a great part of which, including parts of the islands, are protected. In 1986, the Wadden Sea Area was declared a biosphere reserve by UNESCO and in 2009, the Wadden Sea was placed on the World Heritage list by UNESCO. Ameland has a permanent population of 3752 (2020) living in the

4 historic villages of Nes (1230), Buren (750), Hollum (1275), and Ballum (460). Ameland is connected to the mainland (Holwerd, province of Fryslân) by a regular ferry service. In terms of biophysical landscape, Ameland is a typical Wadden Sea island with sandy beaches, dunes, forest, cultivated land, polder, salt marshes, and dikes, surrounded by the North Sea and the Wadden Sea, which is an intertidal zone. The island is a popular holiday destination, welcoming approximately 600,000 tourists every year, who make up 2.2 million overnight stays. Ameland has a wide variety of holiday accommodation and other tourist facilities. As the main employment sector, tourism is of great importance to the economy of the island. Other employers are the government (municipality, schools, etc.) and industry (gas and oil exploration company NAM).

In terms of the energy system of Ameland, apart from the fact that Ameland has no high-voltage power lines or a high-pressure gas pipeline, as can be found in the rest of The Netherlands [82], Ameland's main energy infrastructure is comparable to and well-integrated into the Dutch energy system. This means that most of its energy is imported from the mainland: electricity is provided by the Wadden Sea electricity cable and further distributed on the island by the electricity network. A gas pipeline from the mainland provides natural gas to households and businesses via a gas network. This is used for heating houses and cooking while the island's main mobility-transportation network, including cars, is based on petrol and diesel. However, there are a few characteristics that make Ameland different to other areas of comparable size in The Netherlands.

First, due to tourism, the total energy demand is higher than would be expected for a population of this size, and due to seasonality, energy demand increases significantly during the summer months, leading to a different energy profile. Second, another major energy user is the ferry, catering both for the local population and visitors. Third, Ameland is home to 'heavy industry': on the north-eastern side of the island, the Dutch Oil Company, NAM, has two operating platforms for the production of gas that is distributed to the national grid. The total energy use of the platforms is a considerable addition to the total energy demand of Ameland (indication of the total energy demand: 1.150 TJ) [80,83–85]. For 2018, the total energy demand on the island, excluding the NAM platform, was estimated to be approximately 485 TJ (Figure 2) [78–80].

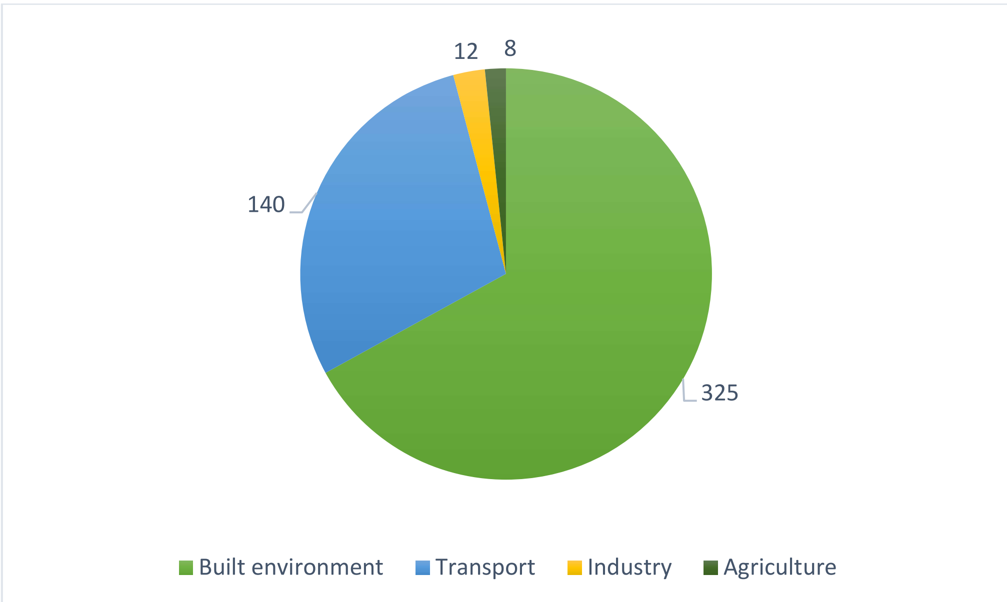

Figure 2. Total energy demand of Ameland in TJ in 2018, excluding the NAM platform (Covenant Duurzaam Ameland).

For the larger part, the energy system of Ameland is based on the input of fossil fuels. The process to transform the current energy system towards a more sustainable and self-sufficient energy system commenced in the mid-2000s. How this process emerged, and what characterised the process, will be analysed in the next sections, using the TM model as an analytic tool.

5.2. Stage 1: Setting Up the Initiative: Creating a Transition Arena for Ameland

The first stage in the TM model is a stage of problem structuring, establishing and organising the transition arena, and envisioning, usually linked to the initial stages of the process. The first traces of the Sustainable Ameland Initiative can be found mid-2000s. Ameland and the other Dutch Wadden islands signed an agreement (Ambitie Manifest Waddeneilanden) in which the islands agreed—among other things—to become energy self-sufficient in 2020 [86]. On Ameland, the transition arena was set when in 2006, the municipality of Ameland initiated and contributed to a number of small-scale local projects directly related to sustainable energy, including a school project to reduce CO_2 emissions. Inspired by the initial positive responses, the then new mayor of Ameland took a remarkable step, asking some CEOs of large companies to work with him on a sustainability initiative for the island. Most of the CEOs and their companies were some of the key players in the Dutch and Ameland energy system: GasTerra (gas trading company), NAM (gas production company with the platforms north of Ameland), and Eneco (energy-producing company). Based on a gentlemen's agreement between the CEOs and the municipality of Ameland, the cooperation started, with the joint ambition to develop renewable energy projects. The group, dubbed the '*Kwajongens Club*' ('bad boys club'), worked without a formal structure or strict rules, although, in practice, it acted as a steering group. The intention was to '... cooperate and experiment with sustainable energy innovations on Ameland' [78]. The individual members of the group agreed that while taking their own business interests into account, they would always consider the common and shared interests of the island.

The parties formalised the gentlemen's agreement and their activities in a covenant—a joint agreement named the Convenant Duurzaam Ameland (Covenant Sustainable Ameland referred to further as the Covenant), which remains the common denominator under which the cooperation operates today. Three of these Covenants have been signed thus far (see Table 1), with some new partners joining later: Philips, Liander (the grid operator/DSO), EnTranCe (institute for higher education and research, part of Hanze University of Applied Sciences), and TNO (applied science research organisation).

Table 1. The three signed covenants, including partners and new partners, and the aims and ambition of each covenant.

Covenants	Partners	Main Aims and Ambitions
1st Covenant (2007–2012)	Original partners: Municipality of Ameland NAM Gasterra Eneco Solar	Cooperate and experiment with energy innovations, resulting in sustainable and energy autarky for Ameland and significant reduction in CO_2
2nd Covenant (2012–2017)	New partners: Phillips Lightning	Cooperate and experiment with energy innovations, resulting in sustainable and energy autarky for Ameland and significant reduction in CO_2
3rd Covenant (2017–2023)	New partners: Liander TNO EnTranCe (Hanze University of Applied Sciences)	Cooperate on developing an integrated sustainable energy system and become a frontrunner in energy transition, 15 years ahead of the rest of The Netherlands, in effect: 95% CO_2 reduction by 2035.

5.3. Stage 2: Developing a Transition Agenda, Images of Sustainability (Visions), and Derive Necessary Transition Paths

The second stage in the TM model is developing a transition agenda, images of sustainability (visions), and derive necessary transition paths. Right at the start of the Ameland cooperation in 2007, the ambition was set and with that images or visions for the future. The ambition was to transform the island into a sustainable (used in the broad interpretation of people, planet, profit) and energy-autonomous region and to literally cut the 'Wad cable' that links Ameland to the Dutch main grid. Energy self-sufficiency became the 'leitmotiv' for the initiative, which was very powerful as it is grounded in existing cultural and historical narratives. These narratives refer to Ameland's history as a free state with its own laws and regulations; and to its people identifying themselves as self-reliant seafaring people, beachcombers ('strandjutters') and poachers [84]. The idea of becoming energy self-sufficient (again) clearly appealed to the Amelanders and their cultural identity as independent people, who are used to doing things on their own, without help and interference from outside. Other traits such as entrepreneurial spirit and social cohesion are associated with this ('we islanders can pull it together; we depend on each other').

In addition to the main ambitions, several related ambitions were formulated such as to develop Ameland as a show case for other islands and regions, and to deliberately create 'space' for innovation and experiments on a small, manageable island scale. Moreover, according to the Covenant, the partners agreed to develop knowledge on how transition processes work. Given the nature of the private partners, they were particularly interested in learning what the changing role of their companies—as incumbents—might be in such a transition process, including in relation to globally important issues such as socially responsible entrepreneurship and corporate social responsibility. Overall, there were also clear links with the broader sustainability agenda; that is, the energy transition should lead to sustainable economic growth on Ameland and the entire Wadden Sea area, contributing to a stronger local economy, increased employment, and a stronger and sustainable tourist sector, among other aims [78,82].

However, despite these high ambitions, no clear targets or transition pathways were set. Rather the parties of the Covenant agreed to develop and invest in at least one concrete project a year, and thereby develop and invest in sustainable energy and energy savings to reduce the CO_2 emissions of Ameland [80]. In this respect, Ameland's transition process is rather atypical: the Covenant operated without a clear plan, programme, or agenda. Those involved were motivated by the shared aim to create a sustainable Ameland by linking the Ameland local context with the external resources (knowledge and (human) capital) of the companies involved.

5.4. Stage 3: Niche Development: Cultivating the Experimental Space of Ameland

The third stage of the TM model covers the establishment and implementation of transition experiments, and the mobilisation of networks. On Ameland, the partnership started a number of innovative projects, varying in size and complexity. As there was no blueprint or master plan, most of the projects were initiated and driven by ideas coming from the companies but often responding to concrete issues and opportunities that emerged. Some of these projects became permanent additions to the energy system of Ameland while others were only experiments and, after testing, the original technologies were put back in place (see Table 2 for an overview).

One of the first experiments or projects to take off was the construction of a natural gas station on the island, facilitating the planned replacement of diesel buses with natural gas buses (in 2017, electricity replaced natural gas in the buses). This was soon followed the Greenlight project, in which Philips Lighting (now called: Signify) successfully tested green-blue lighting on the NAM production platform due to such light being less disturbing for migratory birds. The lights were extended to the Ferry Dam and other parts of the island (2007–2016) motivated by a reduction in energy requirements. In addition, a number of smaller projects related to the built environment were initiated: a mix of 20% hydrogen in the local natural gas network by Eneco, a heat generation project by GasTerra using the residual heat of swimming pools and holiday homes, and an experiment with 100 HRe boilers by Eneco. GasTerra initiated a project in 2016 to install 1000 hybrid heat pumps, a technology that was framed as the logical step in the transition process. Paid for by a national subsidy scheme, GasTerra started with 'kitchen table talks' to assess whether the technology would be suitable for homes, and in cooperation with local installers.

Table 2. Overview of the main innovative projects of the Covenant Duurzaam Ameland cooperation. Source: Evaluation Study (Geerdink et al., 2020 [81]).

Project	Location	Covenant Partners Involved
Natural gas station, including 4 buses	Several locations on the island	Municipality of Ameland, Eneco, GasTerra, NAM
Green light	Ferry Dam and island	Municipality of Ameland, Philips, NAM
Mixing hydrogen in natural gas grid	Apartments	Municipality of Ameland, GasTerra, Stedin
HRe boilers (100)	Distributed on the island	Municipality of Ameland, Eneco
Heat power co-generator	Holiday parks	Municipality of Ameland, GasTerra
Methane fuel cells	Distributed on the island	Municipality of Ameland, GasTerra
Solar park	Ballum, airport	Municipality of Ameland, Eneco, Ameland Energy Cooperative
Hybrid heat pumps	Several locations on the island	Municipality of Ameland, GasTerra

One of the most iconic experiments or projects of the Initiative was the development of a solar park on municipal grounds, near the local airstrip. When this park opened in 2016, it was the first solar park of this scale in The Netherlands (23,000 solar panels on a 10 ha field, with a maximum capacity of 6 MW), producing sufficient energy to cover the total electricity use by the islanders (1500 households). Besides being technically innovative, the business case was also quite innovative at the time as it included the participation of the local cooperative, the Ameland Energy Cooperative (AEC). This cooperative was founded in 2009 by a group of engaged citizens, and it can be seen as one of the frontrunners in the Dutch energy cooperative movements that emerged around the turn of the century. The aim of the AEC was to realise community self-sufficiency through the reduction in energy use on the island (focusing on the implementation of energy-saving solutions) and to provide locally generated renewable energy derived from diverse energy sources, including solar, wind, tidal, and geothermal [85]. This was effectuated in a practical sense by their contribution to the development and construction of the solar park, which turned out to be an important milestone in the transition process on Ameland.

The solar park made the energy transition clearly visible on the island and appealed to the local sense of self-sufficiency [78]. In addition, the impact of the solar park transcended its core business as it turned out to be a focal point for other innovations to follow. For example, it stimulated the *Slimme stroom* (smart electricity) Ameland project, an experiment with fuel cells (BlueGen) that transform methane (natural gas) into electricity and heat for greater flexibility in energy generation on the island; thus, if the solar park could not produce sufficient electricity, the fuel cells would contribute. It also put emphasis on the question of how to ensure the balance of demand and supply of energy, and the efficient organisation of heat. The solar park turned out to be a prelude to a new stage in socio-technological innovation on Ameland by integrating several projects, offering new perspectives and attracting new partners.

5.5. Stage 4: Evaluation: New Insights

The next stage in the TM model is monitoring, evaluating, and learning lessons from the transition experiments, and—if necessary—making adjustments to the vision, agenda, and coalitions. On Ameland, this stage can clearly be distinguished, both induced by insights gained in the process itself and by a formal evaluation that was commissioned.

In the mid-2010s, the perspective of the Ameland initiative began to change as external pressures started to interfere and hinder project activities on the island. A first trace of these external challenges is related to the electrification of the NAM platform. This electrification was required as the indirect outcome of the implementation of strict nitrogen emissions regulations in The Netherlands. In the processing of gas at the NAM production site of Westgat, nitrogen ($NO_{x)}$ is emitted. Under new national legislation, these emissions had to be reduced. Two options were considered by NAM: installing a filter to directly meet the regulations or replacing the platform with an electrical mechanism; this would not comply instantly with nitrogen regulation, but if implemented it would not only reduce nitrogen but also CO_2 emissions. To argue their case, Covenant Ameland successfully appealed to an executive law in place at the time (Crisis en Herstelwet 2010), which was designed to avoid overly rigid legal determinations that would potentially hinder the development of practical solutions that contribute to the energy transition. In effect, although this was a decision to be taken by NAM, the full electrification of the platform became an integrated part of the work of the Initiative in particular in the context of exploring the impact on the electricity network on the island [78,79].

A second, partly related, illustration of the changing perspective is the Energienet project, which explored the notion of a single local grid for the island. Until then, the Initiative had focused on separate projects, but awareness grew that a future energy system based on renewable energy would require a mix of sustainable green sources, a balanced supply and demand, and flexibility and storage capacity. The Covenant partners became increasingly aware that the challenge for the local energy network was to link and optimise demand and supply, including the storage of abundant production and to optimise the use of the existing network. The Energienet project foresaw the development of innovative infrastructure in which energy demand and supply would be linked through smart technology. The project considered a number of different extreme energy scenarios (all electric, fuel cells, and heat network) for the entire island, including the electrification of the NAM platform. Consideration of these extremes was meant to provide insight into the consequences of certain choices; in reality, a combination of these scenarios was expected to be used on Ameland. In practical terms, this led to new projects being developed such as a new solar park with hydrogen conversion, and a high-pressure biodigester at Ballumer Bocht. It also led to important new insights: it became clear that all the separate parts of Ameland's energy system were connected; the limits of the local energy system were manifested; and it also became clear that it was very unlikely that the 2020 ambition of energy self-sufficiency would be met.

These insights were confirmed by the three new organisations that had joined the Covenant (TNO, EnTranCe, and DSO Alliander) for the third Covenant (in 2015–2017). They initiated an analysis of the current energy system, leading to the first rough calculations concerning the island's energy system by TNO, for example, on the amount of CO_2 reductions that had thus far been realised. A first conclusion was that the existing and planned projects had led to reduction of CO_2 emissions; however, the reductions would not be sufficient to meet the 2020 ambitions. More and more, the Covenant partners started to realise that they were working with an integrated system, in which all projects would be linked to the same system. Indirectly, the focus gradually shifted from separate (single solution) experimental projects to an approach that would consider Ameland's energy system as an integrated system that is based on multiple options.

In addition to these internal reflections, a more structured evaluation was also commissioned using the method of 'Learning History' developed by MIT [78,79,87]. This evaluation started in 2019 and was carried out by independent researchers from two new Covenant partners, TNO and EnTranCe. The focus of this study was the collaboration between the main parties, the participation of citizens, and the results achieved. The researchers interviewed all relevant parties and discussed their findings and 'lessons learned' with these parties. The main conclusions of this study were rather positive on the overall initiative and Covenant, but with respect to results and participation, the study was more critical. The study positively appraised the uniqueness of the innovation projects, the willingness of the private companies to invest and to contribute to the local energy transition, and the strong leadership of the municipality, in particular its mayor, the use of covenants, and the results in terms of a reduction in CO_2 emissions. At the same time, it was critical of the results because Ameland was certainly not yet an energy-neutral island, there was a lack of transparency in the process and the participation of local citizens had been limited.

On this last issue, the level of involvement of local citizens, the evaluation study was particularly critical. At the start of the project, the pioneer mentality of the bad boys club had led to a deliberate top-down approach, certainly from the residents' perspective. Apart from the municipality and AEC not being a formal partner, no other local organisations were included in the formal arrangement of the Covenant. It was noted, also based on previous studies [82,88], that local participation and involvement of Amelanders was not so much the outcome of a deliberate strategy but rather it was incidental, random, or reactive, in response to ideas already developed or initiated, mainly attracting frontrunners [82,88]. While this practice seemed to have worked well to enable decisive action and speed in the early years of the initiative, the evaluation report clearly indicated taking the further inclusion of the Ameland population and facilitating a bottom-up process as crucial next steps in the transition process [78,79]. In addition to this, the evaluation study also recommended that the initiative be transformed into a programme with a director; that an integral approach based on integral system knowledge be taken; that concrete reduction ambitions for CO_2 reductions be formulated; and, last but not least, the ambitions of the initiative be reformulated. Most of the recommendations were well received by the partners involved as the formal evaluation made already existing thoughts and doubts more explicit. In doing so, the evaluation study contributed to an internal reflection of the Ameland Initiative itself while providing important lessons learned to share with other transition initiatives in The Netherlands.

5.6. Adjustment: New Ambitions

According to the TM model, after a phase of evaluation a new phase enters, characterised by the adjustment of process, vision, agenda, coalitions, and practices. Indeed, in the Ameland case, the formal evaluation process resulted in some significant shifts in the approach of the Covenant partners.

First of all, the partners agreed that more realistic ambitions should be set. It was quite evident that the original ambition of becoming energy self-sufficient by 2020 would not be met. The ambition was, therefore, reframed: the new aim formulated is that Ameland becomes a frontrunner in the energy transition in The Netherlands by reducing CO_2 emissions by 95–98% in 2035, meeting the national-set climate targets 10 to 15 years ahead of the rest of The Netherlands. On the new timeline, the year 2020 transformed into an important milestone. Although reality had sunk in that self-sufficiency would be difficult to achieve, the self-sufficiency narrative did not disappear completely.

A second adjustment is related to the involvement of local Amelanders in the transition process and in decision-making. Clearly, the local networks of Ameland, in particular the municipality and AEC, were instrumental in setting up the Initiative. In line with the findings of the Learning History study, the Covenant partners underlined the importance of further intensifying participation activities and a more structured approach to participation. The first deliberate effort to increase participation had already started by the organisation of a series of community workshops on energy ('charrettes'). The aim of these workshops was to link the energy transition and the activities of the Covenant to the people of Ameland, to create awareness and to increase involvement and support for the energy transition, in general, and the activities of the Covenant and municipality, in particular. These community workshops were shaped according to the principle of the charrette: creative design workshops or ateliers, usually inviting a combination of energy experts, designers, and local people, and guided by the principle of 'under high pressure great things develop'. The results of the charrettes were presented to the Covenant parties and the council of Ameland and published in a popular format [89]. Generally speaking, the response to the two series of charrettes was positive, both by the Covenant partners and the local participants. For the first time, the latter felt that they had a say in matters. However, there were also some critical notes, as only 'interested people' participated, no concrete plans were delivered, and the charrettes themselves were not part of a formal decision-making process.

Since then, engagement activities have become more central. The Covenant partners agreed that all future initiatives are to start with local support and participation. In this respect, a distinction was made between large energy generation projects in which citizens can participate financially, for example, and activities in the built environment, where citizens are by definition 'problem-owners', as this concerns their homes, which need to be transformed to CO_2-neutral dwellings within the next 15 years. Here, facilitated by the municipality of Ameland, the Hanze University of Applied Sciences, and village associations, a participatory trajectory is being developed that aims to assist citizens to make this transition. In fact, for the municipality of Ameland, connecting to the existing local networks, such as village associations and business networks, is defined as one of the new guiding principles in what has been coined the 'Amelander Approach'. The Covenant is attempting to make citizen involvement more visible and substantial and to formulate an agenda for the transition based on closer cooperation between all parties.

A last significant adjustment to the process is that a more systematic approach has become the technical foundation of the Initiative, confirming earlier findings that rather than considering the distinct components and projects, a more integrated approach of the energy system is needed. The project team of the Covenant produced a baseline document that explores the current energy system of Ameland in an integrated way, considering demand, supply, and flexibility. Although this baseline document is not a blueprint or formal policy plan, it is the first time that ambitions are formulated in this way. Importantly, to underline the importance of a more integrated approach that is to include all aspects of the energy transition, the programme starts with considering the participation and involvement of the local citizens of Ameland, confirming the future direction the Initiative is to take. This is also reflected in the successful bid for the Horizon 2020 project IANOS. In this project, too, citizen engagement is directly linked to a number of the technical so-called use cases, underpinning the idea that local involvement is a core component of an integrated energy system approach [39].

All in all, although the Ameland Covenant partners did not deliberately implement TM as a governance policy, we were able to clearly identify five stages of the TM in the transition process, each of them characterised by different aims, different actors, and different relationships. After the initial stage, in which the transition arena was organised, and ambitions were formulated, there was a period of experiments guided by the CEOs and the municipality; a more formal evaluation of the approach to date; leading to a stage in which ambitions changed, the role of the citizens was emphasised, and the need for more steering and integration was acknowledged; and leading to adjustments of the process.

The result so far is that Ameland, after 15 years on the transition pathway, is often portrayed as a living lab or test bed ('The Netherlands in small') to develop and test new technologies that can be introduced elsewhere. Indeed, the Ameland experience has been an example for other places not only to learn from niche (technology) developments as such but also to learn from the transition process. One of the main lessons learned is the fact that the Covenant partners deliberately created space on Ameland for experimentation, metaphorically, but also in concrete terms, as, in particular, in the initial phases of the process, the island was quite literally a protected space (place) in which technological niche innovations could emerge and develop. The island Ameland was the physical place enabling these niche developments to happen. As such, this case demonstrates the benefits of what De Boer et al. (2018) have labelled 'area-based niche development' [3]. However, this does not mean that we can see Ameland in isolation. While many of Ameland's local conditions explain why the process emerged as it did, we have also seen that external conditions interfere with the local situation.

To shed some more light on this, we will further integrate and discuss these main findings in the following two sections, zooming in on the last two research questions: in the transition process of Ameland, how is the interaction and role of internal (place-based) and external (regime) conditions in relation to area-based niche development? Second, what are the different roles and involvement of Amelanders in this?

6. Area-Based Niche Development: The Role of Internal and External Conditions

In this section, we will focus on the niche development, and the question of how this development was related to internal area-based and external conditions. Based on the analysis of the transition process, we see that, in particular, in the initial stages of the transition process on Ameland, a number of local conditions were important in order to develop a 'protected space for niche development' on the island. First, the local policy and governance context has been instrumental in shaping and constructing this protective space or 'transition arena' on Ameland. In particular, the ambitions and the natural and visionary leadership of the mayor with his link to the CEOs of large companies and the 'bad boys club' played a pivotal role in this. Local government officials, too, were important in coordinating and facilitating the activities of the Covenant partners, acting as a link to local sustainability networks on the island. Similar to the mayor, they were motivated individuals with many connections to the community of Ameland of which they were also a part of [80]. Second, the local energy cooperative, the AEC, is a crucial component of the local network. Inspired by Samsø and the Dutch island Texel (that already had a cooperative), a group of local initiators started the Ameland Energy Cooperative to increase the support and participation of local citizens. Through the organisation of meetings, surveys, and interviews, they were able to active many islanders, and involve them in some of the energy projects that were developed on the island. In particular, the involvement of the AEC in the flagship project of the Ameland Initiative—the solar park—was an important milestone as it secured local ownership. Currently, the AEC has 300 members and 1000 customers while the linked company (*Zonnepark Ameland BV*) has 80 bondholders. As mentioned, so far, the AEC until now is not a formal partner of the Covenant, but besides the solar park, the AEC and its members are involved in a number of (future) technological projects of the Initiative, such as, for example, the development of a second solar park at *Ballumer Bocht*. Third, in relation to these technological innovations, small sustainability networks emerged, with people participating in sustainability sessions and practices, for example, related to house renovations. Fourth, all of the networks mentioned above connected to another important condition in the socio-cultural context: the ambition of self-sufficiency that has guided the initiative from the beginning. This ambition appeals to a local shared sense of independence held by the people of the island. In particular, in the early years of the Covenant, the self-sufficiency narrative connected the initiative to the island culture and islanders as it utilised feelings of autarky and of being independent from the mainland [79,82]. As we have seen, this did not automatically mean that all Amelanders were involved in the activities: in fact, in particular, at the start of the transition process, there was limited direct involvement of citizens. Nevertheless, the strong local networks, the local ambition to become the leading place in energy transition, combined with island-related demand for self-sufficiency, and the associated entrepreneurial mentality allowed for these experiments to happen.

The fact that the initiative occurred on an island, with clear boundaries, a small population, short lines of communication, etc., all worked in its favour. Other presumed local (physical) island conditions seem to have played a more modest role than perhaps expected on the forehand. Indeed, some of the technological innovations are directly connected to the island's biophysical characteristics, utilising the 'natural' potential of the island. For example, the expected high solar potential on the Wadden islands has led to the development of the solar park: this is a clear example of optimising the 'natural' energy potential of the island. Moreover, the greenlight project was clearly inspired by the natural environment (migratory birds). However, most of the other technical projects were not directly linked to the advantages of the biophysical environment, as many of them were implemented in the built environment, i.e., in people's homes. Taken together, despite playing the strong 'island trump card', the local physical conditions of Ameland seem to have been less prominent in the transition pathway so far. In the same line, the technological niche innovations themselves were also less connected or developed to fit local conditions than perhaps would be expected. Indeed, many of the experiments were already developed to a certain level before they were implemented on Ameland. It was the aforementioned protected space that was created—basically creating a place that enabled testing—that was attractive, less so the concrete physical (island) conditions.

We conclude then that, in particular in the first years, local or internal conditions that played a role are mainly to be found in the social-cultural and governance domain, in particular, the strong local actors and their networks. They are at the base of the long-term and ambitious project to make the island self-sufficient. Linking up to external partners, without a clear vision, agenda, or transition pathway, they undertook a wide range of social and technical innovation experiments, smaller projects that could develop relatively undisturbed.

In the previous section, we have seen that over time, in the later stages of the transition process, external conditions, or challenges, became more prominent on Ameland. We are able to identify at least two important external conditions or regime challenges: new national rules and regulations and external pressures derived from the (national) energy system. First, an illustrative example of national policy, laws, and regulations that have interfered with the activities and process on Ameland is the electrification of the NAM platform as required by nitrogen legislation as explained in Section 5. Changing nitrogen legislation required NAM to electrify the platform, leading to additional demand for electricity on the island. The investment decision was not made on the island but in the boardrooms of NAM and DSO Alliander elsewhere in the country. Such grid-related decisions on energy supply and demand, and the related technological, economic, and political decisions are clear external or regime-related constraints. Second, related to this, the limits of the (national) energy system increasingly challenged the project. This was first indicated by some of the newer parties such as Liander, emphasising the need to integrate the projects in order to build a more balanced energy system. The experiences of the electrification of the NAM platform in conjunction with the EnergieNet project made the Covenant partners increasingly aware of the fact that instead of the cable being cut, as was originally the idea of the initiative in becoming self-sufficient, it turned out that the island actually needed additional electricity capacity through (at least) one additional cable, needed for the NAM platform until 2035 when the platform will be decommissioned, but also after 2035, given the assumption that future electricity generation and demand for grid capacity is expected to increase on Ameland [86]. In any case, energy generated on the island continues to feed into the main electricity network that is connected to the national grid, and is expected, despite plans for a local virtual power plant that will manage demand and supply on the island, to be crucial for future flexibility of the energy system. Moreover, the gas used for heating is still supplied via the national gas grid. In this respect, it is expected that Ameland will continue to be dependent on the mainland. Thus, instead of being self-sufficient and autonomous, in reality, Ameland has remained part of the larger energy system. The strong narrative to 'cut the cable' used in the early years of the Covenant in reality contrasted sharply with what actually happened.

We conclude that, in particular, in the later stages of the transition process, external conditions such as national laws and policy and the national energy system started to interfere with the local situation and process on Ameland. Ameland's changed ambitions and the reorientation in the Initiative that followed were clear results of the external challenges and pressures of the existing regime.

Taken together, the case on Ameland illustrates what and how favourable place-related local conditions (governance, network, self-sufficiency narrative) contributed to the transition process on Ameland. Indeed, Ameland can be distinguished as '... a location where context-specific (local and policy) innovation occurs, with links to actors and artefacts in the surroundings and to the socio-cultural as well as socio-economic and biophysical local conditions' as De Boer defines it, albeit the latter less so than perhaps expected [6]. However, we have also seen the role that external factors or regime challenges play, in particular, in the later stages of the transition process. From the island perspective, the connections between the island and the mainland turned out to be stronger than probably initially expected. In that respect, it is comparable with how technological niche innovations usually work: from the perspective of the place Ameland, we see a gradual shift from relatively undistributed internal-orientated protected space to more interaction with and interventions from the external outside world. Or in other words, Ameland functioned as an 'area-based niche', where the transition process is linked to the local level but also clearly connected to the external systems and processes. It is in the unique interaction between place-related local conditions, such as local government and local network, and external regime conditions that the 'protected space' is created.

7. Involvement and Participation of Community and Local People in the Process

In this section, we zoom in on the involvement of the community and local population. In the previous section, we have seen that the local socio-cultural context has been important for the transition process on Ameland. This finding confirms that for niche innovation to happen, it is crucial that it is supported by and embedded in social networks, such as in this case, the local municipality, the energy cooperative, and related networks [46,51,55,90]. Strong local actors and their networks have been instrumental in the Initiative, leading—for one—to the general perception of the Ameland project as a clear example of a local community project. In this section, we will further investigate this as this not does not automatically mean that—as we have also seen—all citizens of Ameland have been involved in the transition process. The Ameland case illustrates the complexity and changing roles of citizens in the transition process, and the different roles they may take in this process: as consumers; as actors in formal planning procedures or in decision-making in large-scale energy projects; or as owners, designers, and producers of projects. To further discuss this, we concentrate on some of these different roles local actors and citizens have had in the different stages of the transition process on Ameland.

In the beginning of the transition process, the Ameland initiative had all the characteristics of a top-down approach with little involvement of local citizens and stakeholders. In particular, the mayor who initiated the Initiative deliberately and consciously excluded local parties from the decision-making process for the technical projects on the island. His argument was that this would speed up the transition, enabling decisive decision-making by himself and the CEOs of the companies in the steering committee of the Covenant [79]. The implication of this top-down approach was that, generally, local people were not involved in formal decision-making of the signatories to the Covenant and were only involved on an ad hoc basis in informal procedures. There were no signs of significant opposition by citizens to the Covenant projects, except for some issues with the solar park that were easily resolved (some Amelanders feared that the solar panels would negatively influence tourism. Therefore, a dike was constructed near the solar park to remove the dike from sight. This dike actually now functions as a place that allows interested visitors to see the solar park). In any case, with respect to the involvement of local citizens in the decision-making of the Covenant itself, in the beginning of the initiative, the inclusion of local people was rather limited.

That is not to say that local people were not involved. In fact, looking beyond formal procedures and decision-making, the people of Ameland have over the years been involved in many activities related to the Initiative. Indeed, the Covenant was surrounded by a diverse set of local networks. Partly, these networks were existing networks (e.g., village interest groups) that were deliberately activated (by the municipality) to involve the people of Ameland; partly, these were new networks that emerged when people became involved as active practitioners in some of the technical projects such as the boiler project or methane fuel cells project. Other Amelanders were involved through kitchen table conversations that were organised in conjunction with the introduction of hybrid heat pumps [84]. Moreover, over time, several general public information sessions on sustainable energy have been held, including the charrette workshops. The most fundamental engagement and empowerment of the citizens of Ameland, however, is related to the foundation of the energy cooperative, the AEC. The cooperative functioned as a new driver of a large, visible, and iconic solar park project, in which citizens became co-designers and co-owners of an energy production plant. Citizens participated in a financial-economic way as well. At the time of the creation of the cooperative and its solar plant, Ameland was a frontrunner in citizen engagement in The Netherlands. Indeed, although strictly speaking not a member of the Covenant, one could argue that AEC and the solar plant functioned as a legitimation of the Covenant as a whole. With its creation, new networks were mobilised and citizens started to play a more significant role: through their membership of AEC, they were involved in the co-design of the solar park.

In all of this, the municipality of Ameland, as the only formal local partner in the Covenant, acted as liaison between the Covenant partners and the local population. For example, as mentioned, they activated the local social networks for the Initiative's technical projects. The energy transition team of the municipality also collaborated with other sustainability initiatives and projects that developed parallel to the Initiative [79]. This includes, for example, projects promoting the installation of PV panels and the building of an energy neutral school; interventions directed towards the municipal organisation itself; and supporting a wide range of other activities such as awareness campaigns, educational programmes, and a transition film [79]. Through these activities, too, many local people and stakeholders of Ameland were mobilised and involved in sustainability practices, aimed at reducing CO_2 emissions on the island. Indeed, it is now estimated that more than half of the households on Ameland have been connected in some way to the Covenant and other sustainability schemes, either by being part of a project, a member of the AEC, taking part in a charrette, or through one of the 'kitchen table conversations' [83].

That being the case, a few things have become clear in relation to this engagement of local actors, in particular in the later stages of the transition process. Specifically, for the Covenant, the evaluation study tabled that more transparency, more integration, and more participation were required in the next stage of the transition and implementation of the Covenant [78,79]. This was taken aboard, as is demonstrated by the fact that citizen engagement is now a leading principle in the evolving programme of the Covenant Initiative for the years to come. In this, and at the same time, the role of the local municipality has become more prominent, particularly in relation to citizen engagement. As generally the transition process is accelerating and new national policy is being implemented (e.g., on heat transition), the municipality, as the responsible local authority, is taking the lead in further intensifying the involvement and participation of local citizens. Their ambition to be inclusive as with the transition of increasing moving to the built environment and into homes of people, everyone needs to be involved.

In conclusion then, we see that over time, the involvement of citizens in the Initiative has increased and—related to that—their role in the transition process has changed. This 'engagement transition pathway' has transitioned from citizens being more or less invisible in the decision-making process during the first years of the Covenant to more active participation of a group of frontrunners in later stages, involved as co-developers or users of the new technologies. Still, further in the process, efforts are increasingly directed towards securing a more general and inclusive involvement of local people. All in all, it is a clear and further demonstration of the significance of including social and cultural factors in energy transition processes.

8. Discussion

The purpose of this paper was to understand a regional energy transition process by analysing the case of Ameland. The choice for Ameland was—among other things—motivated by the fact that in The Netherlands, Ameland is one of the few areas that has applied a more or less structured approach to enhance the energy transition. Against the backdrop of the MLP and the transition management framework, which both primarily focus on how transitions come about in the long term, we focussed on the early stages of this transition process by addressing short-term niche development and emphasising the role of place and people in this. In this section, we will briefly discuss and integrate the results along the lines of the three parts the paper: the transition process itself (in terms of TM); the place dimension; and the role of and citizens, compared to other stakeholders.

To start with, we have seen that in Ameland's energy transition process, the stages of the transition management model are clearly recognisable [60–62]. Ameland shares a number of general findings of other well-known (regional) case studies from The Netherlands (Parkstad Limburg; Rotterdam), such as, for example, those discussed by [62,91]: the frontrunner approach used, the interference by regime conditions, and the context specificity. However, there are also a number of important differences. In the aforementioned cases, TM was introduced as a planned approach or strategy whereas on Ameland, the TM model was not implemented as a deliberate strategy on the forehand. The Ameland Initiative also has a number of other unique features that deviate from other case studies: the informal start-up phase, the unusual actors involved, the deliberate space that was created for several niche innovations, and the adjustments and interventions that were implemented based on some important lesson learned. Although it is tempting to explain these deviations by the fact that Ameland is an island—as both the initiators themselves (the Covenant partners) and many observers (e.g., evaluation study) often do—we argue that while there is truth in it, there is a broader explanation to this: any geographical context matters, leading to smaller or larger deviations from generic processes. As such, our case study illustrates one of the key contributions of the recent spatial turn in the energy debate that emphasises the importance of context dependency [32,62].

From another perspective, we found a clear connection between place and the MLP framework. According to our analysis, in terms of the MLP framework and niche development, the trajectory of the *place* Ameland shows remarkable similarities with how socio-technological innovation trajectories usually work: locally implemented innovations could emerge in a protected space, leading to a relatively undisturbed development of the place, followed by these local developments being challenged by external or regime conditions, including incumbents, until a window of opportunity is found for a breakthrough. On Ameland, regime challenges or external conditions (new policies, regulations) in combination with macro-level ('landscape') developments (e.g., the Climate Agreement of 2015) had to be overcome before things could happen 'on the ground'. Some of these challenges hindered development, but they have also led to breakthroughs, in particular in the case of the electrification of the NAM platform. Considering both place itself as the interaction of place with what happens elsewhere (in the system) is crucial for understanding the many dimensions of the energy transition, confirming the findings of, for example, [6,18,19,22,32,71]. This underlines the importance of the regional context, and a place-based perspective.

Empirically, similarly to Sperling's study on Samsø [33], we used the internal and external conditions as the main analytical framework for investigating the spatial or geographical dimension. Comparing Ameland to Samsø, we found evidence of clear similarities, but there are also some eminent differences. Similarities are, for example, the strong local government support, the connection to local culture and tradition, and the role and relevance of using existing networks. Clear differences are, for example, Samsø's more planned approach (starting with a Master Plan), and their deliberate use of the natural potentials of the area, in particular in their focus on wind energy. Despite these differences, both cases have made significant steps in terms of increasing the uptake of renewable energy and reducing CO_2 emissions. However, although it was beyond our study's main focus, and it is generally difficult to make a real comparison due to a lack of standardised data, most data we found suggests that Samsø has so far been more successful on these indicators [33]. For example, while the renewable energy share on Samsø increased from 13% in 1997 to 75–80% in 2013, Ameland, which defined its ambitions in terms of CO_2 reduction (95–98% reduction in 2035), is currently still a long way from this target [33,80]. Nevertheless, a number of general patterns learned from Ameland can be used in other cases. In any case, this again underlines the importance of the spatial or geographical context.

In terms of the analytical frame itself, we found that while it was useful for its simplicity, it also has a number of drawbacks. For example, the internal and external conditions that were identified for the Samsø case were not directly applicable to the Ameland case and vice versa. This suggests that a more robust structure or framework is needed in order to perform better comparisons. In this respect, the framework proposed by [32] offers some new leads on further theorising and conceptualisation that can shed more light on some of the key spatial questions: what are the foundations of regional energy transitions, how do energy transitions unfold across space, and to what effect? As with the accelerating speed of the energy transition, the number of empirical (regional and local) cases is also rapidly increasing, more standardised research frameworks and methods would allow for more meaningful comparisons across place and time.

Finally, our analysis also underlines the importance and the role of both internal and external actors and the interaction between them. Often, when the energy potential of a particular area is discussed, technologies in relation to the physical aspects of places are considered; however, the Ameland case shows that, in particular, the social factors present in an area are crucial for energy transitions to take off. This is in line with other findings by, for example, [29,36,92] and others. We have also seen that not just internal actors or stakeholders are important in the process: in fact, we have found that a unique combination of local and external actors and factors made the transition process on Ameland a successful enterprise. This unique combination is what Amelanders call the 'Ameland approach', in which local parties managed to link the potential, needs, and interests of Ameland to external parties. While emphasising independence, the fact that Ameland did not act as if it was a completely isolated island but was able to affirm that it has always been open and welcoming to 'outsiders' is one of the key traits of the Ameland approach. As on Samsø, this kind of external expert assistance and external networks, in alignment with internal actors and networks, is key to the progress made so far. Zooming in on the involvement of local citizens in the process, we have seen that, after a period of focussing mainly on frontrunners, the participation rates of Ameland's population have increased over time. In our research, we were able to only touch the surface of this, e.g., by exploring the different roles people may take. Still, our empirical findings are generally in line with other studies that indicate that island communities can be important arenas for issues relating to community engagement such as, for example, [35]. In this respect, as the daily practice of the Ameland Initiative itself shows, there are many research gaps yet to be filled, for example, in relation to the engagement of all citizens of Ameland in the transition process, the differentiation of different groups, and the roles that citizens may have [36].

9. Conclusions

Overall, we conclude that despite the uniqueness of its circumstances Ameland, similar to the Danish Island Samsø in Denmark, may function as an inspiring example of innovation in transition processes on islands and other remote areas. Indeed, many insights born and nurtured on Ameland have been used in other places in The Netherlands, such as the management of solar parks by energy cooperatives, or they have been the basis of further innovation, such as the addition of hydrogen to the natural gas grid. In addition, some more general lessons for other successful niche developments and regional transitions can also be drawn.

First, substantial input from a large number of dedicated parties, local and non-local, private and public alike, and including incumbents, is a prerequisite for experiments that lead to serious and long-term solutions. This input includes financial and technological resources and psychological and mental support. Tapping into feelings for a place (or the region) and a local commitment may be important factors to ensure that the involvement of relative outsiders is successful.

Second, the Ameland Initiative was not linked explicitly to a formal energy transition planning procedure upfront, and this led to informal decision-making processes, especially at the beginning of the initiative. There are advantages but also limitations to these informal decision-making processes, as the case clearly showed. A variety of innovative projects, such as heat pumps and environmentally friendly buses, may appeal to various actors and increase the chance of success, but they are not necessarily optimal results. Eventually, a broader plan is required to guarantee that efficient systems are designed to bring sustainability goals within reach. Linked to that, it appears that the incorporation of informal decision-making steps in the overall process may be very fruitful because they stimulate creativity and freedom. However, these should be followed or accompanied by a more comprehensive and planned approach, including the processes of citizen involvement, to ensure broader engagement and acceptance.

Third, the Ameland case underlines that these socio-technological transition processes require the meaningful involvement of citizens. We found that a small group of dedicated local actors have been important to create the transition arena in the first place. At later stages, however, we witnessed the growing involvement of citizens in many different roles, varying from consumers to co-designers and owners of innovative technologies. As such, the case shows the various ways and the necessity of including citizens in all stages of the process. This requires engaged citizens who can be consciously mobilised, as happened on Ameland with the charrettes, for example. Good practice on Ameland also shows that informal contacts and existing networks make it possible to align activities occurring on a local neighbourhood scale to the larger-scale geographical unit, such as the island as a whole. In this, linking activities to local traditions and the 'local ways of getting thing done usually' is particularly helpful. On Ameland, as on other islands, the self-sufficiency narrative that was used appealed to the sense of locality and responsibility of Amelanders [33]. However, it did not immediately result in all Amelanders [wishing to] taking action to become self-sufficient; in this respect, the narrative of self-sufficiency was mainly used to psychologically link the people of Ameland to the initiative (see also [36]).

Fourth, local energy transition processes interact with external regime conditions and the specific local conditions in various and multiple ways. Complete autarky and self-sufficiency of an area, even in the case of an island such as Ameland, is very difficult because of the strong interaction with other areas and spatial units, such as through economic connections with large-scale industries and national economies. Only in a situation where there is balanced supply and demand in a given area would more autarky be possible. For most regions, however, this will be hard to realise.

Fifth, evaluation and reflection processes enable the rethinking and adjustment of activities and aims, as the Ameland case clearly showed. Adding an inherent evaluation and reflection procedure may help to identify region-specific and general hurdles and options in the regional transition.

Finally, in terms of a contribution to the further development of the MLP and TM theory, we think our case study showed that the niche concept can, and even should, be seen as a place-related concept. As a place-related experimental niche, Ameland functioned as a breeding ground in various ways. Some socio-technological innovations started in Ameland because of its specific circumstances, others were nurtured there for the same reasons: its specific locality and its specific culture. In addition, citizen participation can and should be added to transition frameworks, not only by seeing citizens as part of the market as end users but as a crucial element in networks around or related to new niches and regimes, as co-developers, end users, and co-governance stakeholders. Both the place-related niche concept and forms of citizen participation in niche networks should be further elaborated based on other case studies, keeping in mind the need for conceptual integration into TM theory, other frameworks in the spatial sciences, and traditions concerning public and citizen involvement.

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