Transition Talks: Islands as Hotbed for Innovation, Entrepreneurial Stakeholders and Strong Community Bonds

A case study on Ameland's transition dynamics and the learning capacity of a network

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Transition Talks: Islands as Hotbed for Innovation, Entrepreneurial Stakeholders and Strong Community Bonds

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"There are those who choose the swampy lowlands. They deliberately involve themselves in messy but crucially important problems and, when asked to describe their methods of inquiry, they speak of experience, trial and error, intuition, and muddling through."

Schön (1983: p. 42-43)

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As I am finalising this thesis, I stumbled upon a quote, displayed on the previous page, by Schön (1983) that I feel perfectly sums up the transition efforts of Ameland as a learning community. A mix of trial and error, gaining experience, but also sometimes a little bit of muddling through. I think that with the 'swampy lowlands', Schön (1983) is trying to hint at ingenuity and in a sense being bold to take on the wicked problems faced by society. But if I am being honest, writing a thesis sometimes also felt a bit like the combination of the three: try something new, but then finding out this completely misses the point of what I am trying to say. Organising a focus group and visiting Ameland as new experiences. And lastly, a bit of muddling through, but hey, small changes or additions combined eventually add up to a big result.

All this adjustment, trialling and muddling through all boils down to what can you learn from all of this? Personally, the circular economy presented a novel experience for me. But once I heard there was a topic for a coastal community in the Dutch Wadden Islands, I was sold and I have not regretted taking this road for a moment. This shows that the combination of interest and new concepts are the key ingredients to starting this learning journey, because that is what a thesis really is. Generally, I strongly believe that learning is a continuous effort in life and never stops. Again, this topic is a testament to that.

Laslty, doing research is truly a team effort. Therefore, the following groups and individuals must be duly acknowledged. First and foremost, I would like to thank my supervisor Marlies for providing me with guidance throughout the thesis. Each and every comment truly provided a gentle nudge in the right direction. Visiting Ameland was great fun and most definitely presented the highlight of this thesis! Also, for providing me with the opportunity to present this thesis at the Congress in Copenhagen. I am already looking forward to that experience! Secondly, thank you to all participants of this thesis. Without your contributions, it would not have been possible to gain the insights and documents needed to complete this research. A special shout-out to Ruud who served as a main point of contact on Ameland and for providing me with suggestions along the way. Third, I would like to thank all my co-workers at the Writing Lab and Aisling in particular. The coffee machine led to some invaluable conversations and new topics. Unfortunately, these cannot all be included in this thesis. Finally, I would also like to thank my mom and brother for always always showing their unconditional support for me.

ABSTRACT

Worldwide, islands are renowned for forming concerted social-cultural networks and their strong drive towards self-sufficiency. In addition, island communities often take up a frontrunner position in sustainability transitions. Yet, despite their perceived remoteness, islands should not be viewed as separate entities because they are often connected to the mainland for resources such as materials and expertise to give a few examples.

This thesis takes a special focus on Ameland as one of the five Dutch Wadden islands. Ameland has been considered a pioneering community with regards to the energy transition and has recently shared the ambition to take up a similar status for the circular economy. Therefore, this thesis aims to explore the learning capacity of a small-scale island community *across* multiple successive sustainability transitions. In the literature, learning in transition studies remains an underexplored topic.

In order to empirically explore this connection, this thesis made use of the learning history evaluative tool as a basis for structuring the semi-structured interviews. Statements from the interviews were validated by conducting a focus group with local stakeholders. This allowed to simultanously reflect upon, generate an overview of the critical moments and to pinpoint key lessons learned from Ameland's transition trajectory.

The findings reveal that a transition can benefit from having an initiator. Furthermore, collaboration is also found to drive a transition process. Collaboration itself is also reasoned to gain from making use of the existing community ties and relations with external stakeholders. Important to note is that collaborative partners should be intrinsically motivated. Another benefit includes breaking down a transition into manageable steps and create pilots per theme. But also, featuring the pilot in the media turned out to have a successful outcome on generating awareness for transitions.

Key words: Sustainability transitions, Ameland, critical moments, learning capacity, Multi-level perspective, multi-loop learning

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LIST OF ABBREVIATIONS

Term	Abbreviation used
Ameland Energy Cooperative (*Amelander Energie Coöperatie*)	AEC
Circular Economy	CE
European Union	EU
Massachussets Institute of Technology	MIT
Multi-level perspective	MLP
National Oil Association (*Nationale Aardolie Maatschappij*)	NAM
Entrepreneur's Platform Ameland (*Ondernemersplatform Ameland*)	OPA
Regional Energy Strategy (Regionale Energie Strategie)	RES
Sustainability transition	ST
Dutch Organisation for Applied Scientific Research (*Nederlands organisatie voor toegepast natuurwetenschappelijk onderzoek*)	TNO
Tourist office (*Vereniging voor Vreemdelingenverkeer*)	VVV

1. INTRODUCTION

1.1. ON THE VERGE OF SUSTAINABLE TRANSITIONS

Currently, society is facing a multitude of persistent problems pertaining climate change, whose impacts can be attributed to increasing resource consumption and other human industrial activities (Beamer et al., 2023; Gottschamer and Walters, 2023). Therefore, the idea of rethinking our approach to raw material use (Beamer et al., 2023) and increasing renewable energy production (Gottschamer and Walters, 2023) is gaining increasing traction. These set of challenges present wicked problems given that there are no straightforward solutions. Instead, these call for grand societal shifts that will affect will affect the way socio-technical structures are organised (Gottschamer and Walters, 2023; PBL, 2023; Braams et al., 2021). Faced with such grand shifts, this gives rise to the notion of sustainability transitions (STs). A transition here proposes a radical and structural departure from the persistent issues towards a stainable society (Svare et al., 2023; Plummer & Van Poeck, 2020). In the Netherlands, STs enable to respond to the ongoing challenges of sustainable agricultural practice, efficient raw material use, scarcity of space and decarbonising energy production (Government of the Netherlands, 2019). In addition, STs also facilitate embedding these change dynamics within a long-term framework mapping out the overall direction to a sustainable living environment. Currently, transitions are mainly revolving around climate & energy, agriculture & food production as well as the transition to the circular economy (CE) receive most attention (Rijksoverheid, 2023a; PBL, 2023; Rijksoverheid, 2021).

The transition towards CE will present one of the biggest transitions faced by Dutch society in the upcoming years. More specifically, the Netherlands has set itself the target to be completely circular by 2050 (Lucas et al., 2022). This transition entails a balance that strives for a future-proof economy while simultaneously committing to reducing dependency on fossil fuel use and greenhouse gas emissions, biodiversity loss, improve air, water and soil quality (Government of the Netherlands, 2019). This approach calls for less extraction of raw materials and creating a closed-loop system. By default, this creates a resilient system were materials are endlessly circulated through processes of re-using, recovery and recycling. This minimises the waste output, thereby reducing pollution (Beamer et al., 2023; Kirchherr et al., 2017; Ellen MacArthur Foundation, 2013). Ultimately, a CE offers an alternative to the linear economy as it moves away from the current processes of acquiring raw materials, transforming them into consumables that can be purchased and subsequently discarded after having served their purpose.

More recently, the Dutch Wadden Islands municipalities have announced CE to be one of the main pillars in the Wadden Islands Programme, or *Programma Waddeneilanden* (Samenwerkingsverband de Waddeneilanden, 2022). Important here is that this the fundamental principles of the CE theme still have to be grounded into the island municipalities. One of the Wadden islands that has proclaimed ambition to fulfil the role of pioneering community with regards to circular developments is Ameland (Metabolic, n.d.). This is not unreasonable given the fact that the island municipality has also taken up the frontrunner position with regards to the energy transition (TNO, 2021). This sense of urgency related to STs can be grounded in the need to become as self-sufficient as possible. Generally, from a cultural and social point of view, island communities show a strong tendency towards self-sufficiency as they are, to varying degrees, isolated from the mainland (Beamer et al., 2023; TNO, 2021). Beamer et al. (2023) explain that remoteness from the mainland forces island communities to engage in a more efficient way with their building materials and space as resources. This mutual emphasis on self-sufficiency is embedded in the islander's mentality and contributes to creating a concerted network. In such networks, communities form strong ties based on shared socio-cultural pillars (Beamer et al., 2023). In return, this allows to create wider societal support for collective efforts in innovation and

generates overall trust (Metabolic, n.d.). Thus, this shows a certain willingness to experiment with innovations leading up to a CE.

Interestingly, the focus on pioneering island communities such as Ameland reveals lessons learned that can speed up transitions elsewhere (Beamer et al., 2023; Sperling, 2017). Although initially projects seem to be context-bound, lessons learned can manifest themselves in other projects. For example, TNO (2021) concluded that on Ameland the construction of a solar park exposed several issues relevant for other renewable energy projects in the Netherlands. These problem areas included congestion of the electricity grid, public engagement in the planning process and final implementation phase and overall complexity associated with transitions in general. Furthermore, the lessons learned from the energy transition also provided relevant input for Ameland's future transitions. This suggests that learning plays a vital role in bringing about STs.

Ultimately, the literature acknowledges the driving capacity of learning in STs (Van Mierlo and Beers, 2020; Plummer & Van Poeck, 2020; Van Mierlo et al., 2020; Sol et al., 2018). More specifically, learning in transitions has often been associated with creative solutions to unsustainable practices, promote legitimacy of decision-making, expanding awareness among members of society and exploration of future possibilities (Van Poeck et al., 2020). However, there exists an unfortunate disconnection between learning processes and transition trajectories and attempts to theoretically underpin both notions remain ambiguous (Stam et al., 2023; Svare et al., 2023; Plummer & Van Poeck, 2020; Van Poeck et al., 2020; Van Mierlo et al., 2020). Learning is simply assumed to occur naturally in transition research, meaning no critical reflection takes place on who learns, what is exactly learned and why learning takes place (Van Mierlo et al., 2020). Interestingly, a review by Van Mierlo and co-authors revealed that when learning is included in transition studies, it is perceived to be most relevant in the starting phase of a transition. This signals that learning throughout a transition, let alone across transitions, remains an underexplored topic. Indeed, relatively few studies have systematically evaluated a long-term transition trajectory spanning multiple STs (Stam et al., 2023; TNO, 2021; Van Poeck et al., 2020; Van Mierlo and Beers, 2020; Trimble and Plummer, 2019; Vangansbeke et al., 2015). As a consequence, STs are mostly approached as a linear rather than an iterative process in which lessons learned from a previous transition can serve as a foundation to continue the future transition. Hence, further exploration of what small-scale island communities can learn across STs presents the knowledge gap that will be addressed in this thesis.

1.2. PROBLEM DESCRIPTION

In response to the knowledge gap, the problem that this study addresses is the lacking connection between learning processes and long-term transition trajectories. So far, research projects studying learning processes cover a relatively short time span, meaning that the study only reflects a fragment of a transition period. Yet, before learning to be deemed truly transformative, assessing this requires a years-long examination of different phases, trials for innovation, the continuous adjustments made to the learning system and the learning context (Engeström, 2015). Indeed, learning processes are shown to be continuously evolving over time as a result of feedback on and evaluation of actions and their outcomes (Van Mierlo and Beers, 2020). Focusing on a limited timeframe removes the opportunity to investigate the course of action after realisation of a certain measures, whether initial objectives were met and learned from (Plummer & Van Poeck, 2020). The reason for adopting a short-term project are mainly the result of the funding (Stam et al., 2023). This is at odds with transitions as these often take generations before being fully completed (Van Mierlo and Beers, 2020). The following sections will describe the academic (see section 1.2.1.) and societal relevance (see section 1.2.2.) of this study.

1.2.1. Academic relevance

As the previous paragraph suggests, it becomes pertinent to develop a better understanding of the role of learning processes in STS. From an academic perspective, making this connection explicit is necessary to expand the scope of transition studies beyond a single transition. Although scholars agree on the importance of learning in STs, establishing such a connection in the literature has not been made yet as a result of shifting conceptualisations (Stam et al., 2023; Van Mierlo et al., 2020; Plummer & Van Poeck, 2020; Van Poeck et al., 2020) and weak empirical knowledge base surrounding learning in STs (Stam et al., 2023; Svare et al., 2023; Van Poeck et al., 2020; Plummer and Van Poeck, 2020; Ingram, 2018).

Even though the importance of learning is frequently addressed, little attention has been paid to conceptualisation of learning in the ST field (Stam et al., 2023; Van Mierlo et al., 2020; Plummer & Van Poeck, 2020; Van Poeck et al., 2020). Instead, learning is typically assumed to just take place (Van Mierlo et a., 2020). Stam and co-authors (2023) note that lacking conceptual clarity in the research is the result of insufficient explanation on the selected learning theories or loose application of such theories. As a consequence, this makes learning an ambiguous process that complicates assessing outcomes, who has learned, what is learned, why learning is relevant and how learning is defined (Stam et al., 2023; Armitage et al., 2008). Due to these many applications of varying learning theories, there is a lack of consensus about what actually constitutes learning and what the outcome should look like. For instance, while one scholar may describe learning as a change in understanding, another may view it as a reflexive activity (Stam et al., 2023). Eventually, this lack of consensus may inhibit deeper learning and cause a 'learning lock-in'. But failing to establish a connection between learning and ST may also obstruct upscaling of innovations, improving awareness, fostering creativity and encourage dialogue (Van Poeck et al., 2020). Hence, there is a need to make explicit what learning is and what it does in relation to STs. This remains a relevant task, because proper conceptualisation of learning contributes to monitoring of outcomes and helps determine whether the outcome of a solution is desired in the context of STs (Van Mierlo and Beers, 2020).

Another major problem in progressing learning in transitions is the weak empirical knowledge base (Stam et al., 2023; Svare et al., 2023; Plummer & Van Poeck, 2020; Van Poeck et al., 2020). These authors concluded that the connection between learning and change involved with STs is insufficiently addressed in the literature. Stam et al. (2023) warn that as a consequence of a lacking empirical evidence, false and unsubstantiated claims can be made about learning in transitions. In most cases, concretising reality in relation to theoretical underpinning is at most fragmented and scattered (Van Mierlo et al., 2020).

Generally, learning is inherently dependent on institutional and developments in society (Van Mierlo et al., 2020; Van Mierlo and Beers, 2020; Plummer & Van Poeck, 2020. These societal changes deserve greater attention as well (Friant et al., 2020). More specifically, social interactions are prone to power plays in which dominant stakeholders may control the discourse, meaning they have the potential to block progress (Stam et al., 2023; Friant et al., 2020). Moreover, the learning by such powerful stakeholders is underexplored in literature (Stam et al., 2023; Van Mierlo et al., 2020).

1.2.2. Societal relevance

As described in the recent Regio Deal, the Wadden islands are ambitious in their energy and circular transition efforts (Rijksoverheid, 2023b; Metabolic, n.d.). This is partly driven by the fact that on islands, the 'grand societal' challenges such as sea level rise, adapting to climate change effects, housing crisis, etc. all come together on a couple of squared kilometres (Beamer et al., 2023). This has instilled a sense of urgency among the islands to become as independent as possible in terms of energy supply and

materials. An added complexity to realise these sustainability ambitions is tourism. More specifically, meeting the energy demand and consumption of visitors to the island imply that the climate neutral ambitions also has to incorporate these needs (Rijksoverheid, 2023b; Van Dam and Van der Windt, 2022). This give rise to the question how to accommodate these needs, while at the same time working on the goals. Hence, this thesis will contribute to this question by reflecting on the past transition events in order to identify lessons for future transitions.

Furthermore, another relevant question posed in the wider transition debate is why transitions work in one context, but not in the other (Van Dam & Windt, 2022; Geels, 2019). This presents a relevant question given that sustainability challenges will most certainly be found at a regional and local level as well (TNO, 2021a). This debate highlights a tension posed by Kallis et al. (2021) who points towards a potential tension between viewing islands as testbeds for innovation and the extent to which outcomes can be transferred to other contexts. Key to addressing this tension is to demonstrate that transitions are not solely a technical endeavour, but also depend on socio-cultural factors, governance structure and physical characteristics of an area (Van Dam & Windt, 2022; Friant et al., 2020; Sperling, 2017). This calls for new types of collaboration between (local) government, residents and entrepreneurs (TNO, 2021b). Therefore, this thesis also contributes to the understanding of transition processes within a local community. Studying the island municipality of Ameland in this case will enhance understanding of how a community can take up a leading role and respond to the transition challenge and subsequently learns from this endeavour.

1.2.3. Synthesis problem statement

Based on the academic and societal relevance described above, this research will address the integration of learning processes by expanding the scope beyond a single transition. To the researcher's knowledge, this will one of the few studies to undertake longitudinal analysis of learning in STs (Stam et al., 2023). In doing so, this thesis makes use of the learning history tool that facilitates studying a long-term transition trajectory that exceeds the time horizon of a typical transition research project (Stam et al., 2023; Vangansbeke et al., 2015; Roth and Kleiner, 1995). In this thesis, the learning history tool is used to reconstruct the transition trajectory of Ameland by drawing on experiences from the Amelander community. Particularly experiences pertaining critical moments and lessons learned. In addition to documentation, the tool also provides the opportunity for a community to engage in mutual reflection and rethink approaches to their transition process (Roth and Kleiner, 1995; Geerdink et al., 2019). Using the learning history, this study will contribute to enhancing to the understanding of learning processes across transitions.

1.3. RESEARCH OBJECTIVE & QUESTION

Judging from the problem description, there is a need to provide an understanding of learning across STs. This requires examining learning processes from earlier transitions. In doing so, the island context of Ameland will add another dimension to this study and will provide insights in how a relatively small island community collectively takes up a challenge and subsequently learns from this endeavour. Hence, in order to advance learning in the field of STs, this thesis aims to *study the learning capacity of a concerted network of actors on Ameland across sustainability transitions by evaluating the learning history of the island's transition trajectory to date.* The learning history evaluation contributes to distilling critical moments and lessons learned. In fact, the objective is twofold as the learning history also serves a purpose of mutual reflection on applicability of lessons learned from the energy transition on Ameland to the currently unfolding circularity transition. This translates to the following main research question:

What is the learning capacity of a small-scale island community across sustainability transitions, using Ameland as a case study?

This is accompanied by the following sub-questions:

1. How is the actor network constituted with respect to sustainability transitions on Ameland?
2. Which events from Ameland's transition trajectory can be marked as critical moments?
3. What do Ameland's sustainability initiatives to date reveal about the learning history?
4. How do actors in the Ameland network respond to the lessons learned from the energy transition in light of shaping the circular economy?

1.4. READING GUIDE

Now that the relevance of learning across sustainability transitions is explained, *chapter 2* will proceed with clarifying the main theories and definitions underlying this thesis research. This chapter will also develop a conceptual model that displays how core theories are related to one another. The subsequent chapter (*chapter 3*), will present the methodological approach of this research. This section argues for the use of a single-case study on Ameland and will describe the data acquisition tools. Furthermore, this section will also elaborate why this thesis benefits from a learning history approach with a long-term timespan. Lastly, this chapter will also describe the ethical considerations of the study. *Chapter 4* dives deeper into the case study Ameland and will portray a wider context of the island as well as a preliminary historical overview of the transition process completed thus far. *Chapter 5* will present the findings in which critical moments and key lessons learned will be pinpointed. It will also present a collective reflection with regards to the applicability of lessons learned for the future circular transition. In the following chapter (*Chapter 6*), the contextual factors on Ameland will be placed in a wider context of the Netherlands. In addition, key moments of change and lessons learned will be clarified using literature. The chapter will also reflect on the methods used. The final *chapter 7* will draw conclusions on the learning capacity of the Amelander community and will address the scientific contribution of this study. Lastly, recommendations will be provided for future sustainability transitions and will suggest avenues for further research.

2. THEORETICAL BACKGROUND

Before going into the methodological approach, this chapter will explain the theoretical foundations of learning processes across STs. Section 2.1. begins with introducing sustainability transitions with the help of the Multi-level Perspective framework. This is necessary because there are numerous pathways in transition processes and within each pathway there are learning processes that can be analysed. The following section (2.2.) will more thoroughly explain multi-loop learning to further understand the values guiding actions and how learning can be harnessed and applied in STs. The third section, 2.3. will focus on critical moments in order to explain when learning takes place. In doing so, the notion of critical moments is based on elements of the institutional change model created by Buitelaar et al. (2007). The subsequent section 2.4. will elaborate on the island scale where learning is expected to take place. Within this section, special attention is also paid to the role of actor networks because islands have shown to form distinct networks (Beamer et al., 2023). In section 2.5., the notion of learning capacity is explained. This is followed by section 2.6. that will operationalise the concepts used in this thesis in order to facilitate later analysis of the results. Lastly, section 2.7., will develop a conceptual model that will establish the interconnections between the theoretical components addressed above.

2.1. SUSTAINABILITY TRANSITIONS

In understanding the challenge that is involved with transformational change, the term 'transition' is often coined. Typically, the wider literature describes (sustainability) transitions as long-term, systemic changes spanning across multiple actors and their respective sectors that occur as response to persistent issues (Svare et al., 2023; Kelly et al., 2018; Geels, 2011). Transitions present a 'radical' and structural departure from current practice and culture towards a more sustainable society (Plummer & Van Poeck, 2020; Kelly et al., 2018). Radical, because such transitions invoke change in the deeply embedded practices and structures of our culture, technological aspects (e.g. energy, infrastructure and agricultural systems), legislation, stakeholders and their relationships. This shows that transitions are multi-dimensional as fundamental change spans across multiple layers and domains.

A commonly deployed framework in studying STs is the Multi-level Perspective (MLP) framework (Braams et al., 2021; Köhler et al., 2019). This framework describes transitions as a social processes of innovation influenced by network dynamics and hindering factors that keep systems in the status quo (Köhler et al., 2019; Geels, 2011). This is also referred to as dynamic stability and mainly focuses on the question how interactive processes instigate change. The MLP framework, as displayed in figure 1, analyses transitions using three analytical levels, 'niches', 'regimes' and the 'landscape'. Niches are described as a small-scale network of actor groups and are referred to as the micro-level. This analytical level represents the 'sphere of innovation' and therefore departs from the status quo in other existing regimes. Though learning is not considered central to the MLP framework, this connotation with innovation is the reason why many scholars consider this as the level where learning takes place (Stam et al., 2023; Kelly et al., 2018). Eventually, innovations emerging from niches are hoped to become rooted in a regime, which presents the meso-level. This is a complicated process due to the nested large-scale actor groups that cause a lock-in of the regime. Nevertheless, visions and expectations guiding activities, expanding social networks and learning processes are key in promoting innovation beyond niches (Geels, 2011). Regimes contain deeply embedded habits, norms and values as well as the legislation that keep a system in a steady state. This level is accompanied by a set of rules intended to coordinate actor activities. These rules shape routines, the actors' ideals, skillset and practices. Changes within this level follow an incremental pathway, implying slight modifications towards a certain stable state. Though considered a generally stable level, regimes can be destabilised by internal tensions like failed technologies, changing rules of the game or societal pressures (Gottschamer and Walters, 2023).

These two analytical levels are situated within a landscape level that represents the external or macro-environment (Gottschamer and Walters, 2023; Plummer & Van Poeck, 2020; Geels, 2011). This level displays larger trends within populations, political streams and economic developments. The macro-level is characterised by slow progress due to the embeddedness of developments in relative rigid norms and values. Therefore, a change in this level, implies a change in worldview, norms and the lenses through which people interpret their surroundings (Rotmans et al., 2001). However, the macro-landscape level can also be shown to be dynamic. This level can respond to sudden shocks in the form of a crisis, war or other catastrophic events, of which the implications can cascade on to the regime and niche levels. This suggests a more sudden change or challenging of the dominant worldview. In reality, Rotmans et al. (2001) often see a combination of influence of gradual change stemming from developments occurring in the 'undercurrents', being the regime and niche level and sudden shocks that may lead to accelerated rearticulation of the worldview. The elongated arrows in figure 1 portray this dynamic as well as rigid state.

Overall, the landscape level is considered to be the highest level. Generally, the higher up a level one goes, the more stability in terms of actor alignment. Most commonly, research focuses on the regime level as this has been pointed out as the level at which transitions take place. In the end, the ability of a novel technology to move beyond the niche level and become embedded within a landscape level depends on the extent of 'locking-in' of a regime and the magnitude of landscape development implications exerting pressure on the regime level (Gottschamer and Walters, 2023).

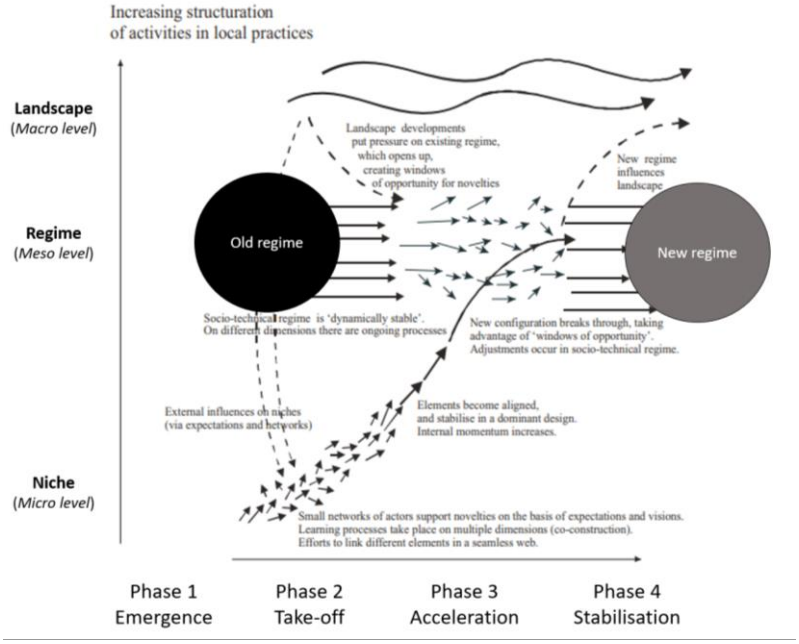

Figure 1. Multi-level perspective framework, including temporal dimension against the three analytical dimensions. Interactions occur between the 'landscape', 'regime' and 'niche' opening up a change potential (Adapted from Geels, 2011; Rotmans et al., 2001).

Given the dominating role of a regime in the MLP framework, it is necessary for an old regime to develop into a new regime (Avelino, 2011). At first, this change may be slow but as more pressure is exerted from a micro and/or macro level a regime can be destabilised. This trajectory of a regimes' destabilisation resembles an S-curve consisting of four stages (Rotmans et al., 2001). It shows the emergence of a novel idea, followed by take-off, acceleration and eventually a stabilisation phase. Kanger (2021) further explains that the model starts with an overall change in the landscape, which sets in motion rethinking strategies of how to fix the issue. After the start-up phase, acceleration takes place as changes rapidly follow up on one another, which gradually replaces the former structures and patterns associated with the old regime. Subsequently, scaling up of the original idea takes place. In the final stabilisation phase, the shift is complete and the initially novel idea becomes embedded into the wider system. Representing transitions along this path demonstrates the ongoing nature of transition processes as they do not have a clearly definable end state. Additionally, these gradual, but continuous efforts consist of slow periods which are alternated by faster-paced periods of progress (Rotmans et al., 2001). Hence, transitions also involve periods of inertia and stability.

A critical sidenote to the MLP framework as described by Rotmans et al. (2001) and Geels (2011) is that it refers to transitions as 'malleable'. The dominant perspective of transition thinking is that developments will progress in a certain direction (Duineveld et al., 2007). In the model in figure 1, this direction is portrayed as linear. Geels (2011) portrays this linearity in the following way. Emerging innovations eventually are expected to progress to a regime and ultimately advance to the final socio-technical landscape where the innovation becomes embedded. But in order for an innovation to

proceed to the next level, a window of opportunity needs to occur in which alignment of developments take place. This way of thinking presents transitions to follow a logical chain of events interactions between the three analytical levels are required for a transition to occur (Sorrell, 2018). This inadvertently leads to believe that advancing transitions is simply a matter of 'pressing the right buttons' (Duineveld et al., 2007). In addition, this linear understanding undermines the strategies deployed by actors who have the power to defuse or accelerate innovations (Pierick and Van Mil, 2009). In reality, it proves difficult for an innovation to advance to a subsequent level. This requires a destabilisation to occur in the regime level and for that a certain amount of pressure has to be exerted from the landscape level. Likewise, Shove and Walker (2007) argue that transition paths between niches and regimes are not necessarily clear from the beginning as Geels (2011) suggests. Instead, pathways are plagued by uncertainties in developments, which in return destabilise the interaction between regimes and niches (Gottschamer and Walters, 2023).

Another feature pointing towards malleability is that transition management still falls short of incorporating power and politics (Avelino et al., 2016; Shove and Walker, 2007; Duineveld et al. 2007). For example, the mere settling on a problem definition, proposing policies or who is included and who is not for that matter is a political exercise demonstrating that transition management is inherently political (Shove and Walker, 2007; Duineveld et al., 2007). Moreover, elements of power and politics, according Avelino et al. (2016), are not concentrated within one analytical layer per se nor is it focussed in one actor. Instead, power is rather dispersed across multiple levels and actors. This is contrary to Geels (2011) who positions power in the regime analytical level. Hence, this can be seen as one of the major flaw of the MLP framework as this places greater emphasis on the structural context, which in return takes away power from actors and local networks (Walwyn, 2020). In other words, the framework predominantly focuses on the meso-level (regime level), but largely neglects to incorporate the micro- and macro-level in the broader context. As a result, the role of agency and socio-political processes instigating change is often overlooked (Genus and Coles, 2008). Agency in this case is located in the niche level where it refers to a learning environment for the stakeholders involved. Therefore, transition management requires locating the actors that can exercise power and who can be classified as the agents of change. Duineveld et al. (2007) add that socio-political processes do not follow rigid patterns, but instead are the result of a continuously changing dynamic. More specifically, with each transition pathway, the power in transition arenas may shift, problem definitions may change, new actors can enter the arena and other resources may be required.

Responding to these claims, Geels (2020; 2019) recognised the lacking political dimension and role of agency in STs in his later works. Innovation therefore was addressed as a relational social process influenced by actors ranging from market parties, governments and academia. This implies that whenever innovations emerge, actors engage in processes of interpretation and sense-making (Geels, 2020). This essentially supports mutual learning, alignment of perspectives and expectations. At the same time, Geels (2020) indicates that this involvement of actors also resembles an arena in which interests are negotiated and constant jockeying for positions occurs. Within this negotiation process, powerful actors influence and mobilise others to shape the institutions to their liking. Particularly through articulating discourses that align with their vision (Geels, 2019).

Overall, the absence of socio-political dynamics and linear direction remain important concerns that need to be addressed in the MLP framework. This thesis will address these points of criticism in multi-loop learning from Argyris and Schön (1978). More specifically, the multi-loop learning specifically focuses on how actors within a social network seek to improve current action strategies. In doing so, multi-loop learning suggests that actors may start to question claims, existing power structures and wider worldviews (Medema et al., 2014; Pahl-Wostl, 2009; Armitage et al., 2008). As a result of this

built-in reflection mechanism, multi-loop learning is considered an adequate response to MLP's lacking political dimension and linear approach to ST. This elements will now be described to greater detail in the following section (2.2.).

2.2. MULTI-LOOP LEARNING

According to Rotmans et al. (2001), learning is essential in order to successfully complete a transition. However, as stated earlier in section 1.2.1., learning remains a rather ambiguous concept. Not only in academia, but in daily practice and policy-making as well (Armitage et al., 2008). According to the Oxford Dictionary, learning can be defined as: 'to acquire knowledge of (a subject) or skill in (an art, etc.) as a result of study, experience, or teaching.' (Oxford English Dictionary, n.d.). Similarly, Van Mierlo and Beers (2020) also refer to gaining of new skills and knowledge as defining characteristics of learning. Other authors place greater emphasis on learning as a process that includes reflective observation, abstract conceptualisation, experiential learning and conducting experiments (Kolb, 2015). Generally, authors in the field agree upon the fact that learning takes place through experiences, or via a learning-by-doing approach (Svare et al., 2023). As such, learning in itself is a process revolving around change, be it in terms of a behaviour or changing perspectives (Medema et al., 2014).

In positioning learning within the context of STs and to stimulate learning across STs, it is important to denote learning as an iterative, non-linear process (Stam et al., 2023; Armitage et al., 2008). More specifically, learning processes follow a continuous cycle in which new insights from previous experiences are exchanged and eventually become translated into future steps. These are then again subjected to evaluation. This constant reflection aligns with the theory of organisational learning established by Argyris and Schön (1978). In their work, Argyris and Schön (1978) introduced multi-loop learning (see figure 2). Multi-loop learning is often described using single-, double- and triple-loop learning cycles that target a change in behaviour and allow to study extensively the levels of depth and reflexivity of that what has been learned (Von Schönfeld and Tan, 2021; Argyris and Schön, 1978).

In this thesis, triple-loop learning poses a valuable addition to the ST literature. Particularly in inspiring reflection across multi-levels from actors in the niche all the way towards learning at a wider societal level (Stam et al., 2023; Medema et al., 2014). This departs from the assumption made by Geels (2011) in which learning is largely restricted to the niche level (Van Mierlo et al., 2020). More specifically, triple-loop learning tends to focus on longer timeframes encompassing wider transformational reflexivity of the existing rule set, norms protocols and wider governance structures (Medema et al., 2014; Armitage et al., 2008). This clarifies the coordination of learning at multiple levels within a transition. Therefore, triple-loop learning can be considered as a valuable step to take learning processes beyond a single ST.

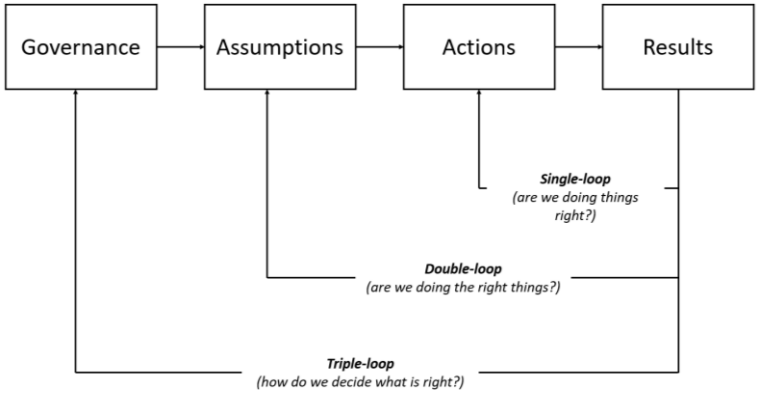

Figure 2. Sequence of multi-loop learning (adapted from Argyris and Schön, 1978; Armitage et al., 2008; Medema et al., 2014)

2.2.1. Single-loop learning – 'Are we doing things right?'

According to Argyris and Schön (1978), single-loop learning starts with identifying an error and subsequently correcting it. In fact, as a result of this constant engagement in corrective action is why many scholarly papers refer to single-loop learning to follow an incremental pathway (Stam et al., 2023). On its own, single-loop learning cannot instigate actual radical change required for a ST as it does not involve further examination of the factors subconsciously driving action (Stam et al., 2023; Van Mierlo and Beers, 2020; Van Poeck et al., 2020; Medema et al., 2014). In a broader context, single-loop learning can be distinguished by means of reflecting on the following question: 'are we doing things right?' (Medema et al., 2014; Pahl-Wostl, 2009). Describing learning this way places emphasis on following the rules while also making an attempt at correcting undesired outcomes by responding with immediate fixes (Medema et al., 2014). As an example of single-loop, Pahl-Wostl (2009) refers to increasing the height of the dikes as a response to increasing water levels. However, this neglects the underlying causes of the rising water levels.

2.2.2. Double-loop learning – 'Are we doing the right things?'

In the subsequent double-loop, deeper reflection takes place on the cause of the problem which encourages questioning of assumptions rather than solely focussing on fixing a mistake (Argyris and Schön, 1978). This critical reflection is especially relevant for STs as this loop opens up the discussion to considering potential solutions required for transformation to more sustainable practices (Van Mierlo and Beers, 2020; Van Poeck et al., 2020). In the context of double-loop learning the question is casted of 'are we doing the right things?'. In answering this question, reflection mostly focuses on whether the current set of rules should be altered. To continue the example by Pahl-Wostl (2009), this equates to considering other options besides increasing the dike height (e.g. dike relocation, adding a floodplain, etc.).

This type of learning is supported by the process of reframing. The act of reframing entails rethinking of the underlying belief system, values, ideas and assumptions on how goals can be achieved. This can result in an overall change of rules in policy-making or behavioural shift (Argyris and Schön, 1978). Sol et al. (2018: p. 1388) defined framing in the following way:

"The emergence of new, shared perceptions on the issues faced by a relatively heterogeneous group exploring a mutually perceived but somewhat ill-defined challenge."

This definition refers to reframing as a process by which actors transform their perspectives, provide new meaning to problems and reconsider ways of doing. This definition also implies reframing is an interactive and dynamic process. This aligns with Yanow's (2014) understanding of how actors make an attempt at making sense of the world around them. According to her philosophy, participants are constantly engaged in processes of sense-making and are intertwined in a process of interpreting and reconstructing perspectives. Likewise, it positions (re)framing within a broader historical context, subjecting one's understanding to the moment in time their statements were recorded. Therefore, identifying instances of reframing in thesis is considered through the lens of participants' reflection and re-interpretation of past actions and experiences of events over the course of transformations (Van Hulst et al., 2024; Yanow, 2014). Referring to reframing this way points towards reflection on the sense-making process. But also explores to what extent frames are implicitly or strategically put forward in order to influence decisions (Van Hulst et al., 2024). Altogether, double-loop learning will therefore most likely occur after feedback on an event or project that transpired in the past.

Furthermore, exploring the time and space dimensions as described with Yanow (2014), aligns with the learning history approach. Especially with its focus on capturing key narrative ingredients of

participants in the learning process (Roth & Kleiner, 1995). In addition, the learning history also focuses on the role of storytelling in constructing meaning. Viewing the role of storytelling as complementary to reframing allows to understand how anticipated experience may influence the already lived experience (Van Hulst et al., 2024). Both narrative and reframing make use of storylines as a way to make sense of the world around them. Therefore, the combination is a useful approach given the emphasis on identifying transcending experiences to advance transitions. It is exactly this way of recollection of experiences and potential reshaping of such events that is important to the researcher in determining whether double-loop learning has taken place.

2.2.3. Triple-loop learning – 'How do we decide what is right?'

Complementary to these two loops is triple-loop learning, which addresses change on a larger organisational level of the regime (Stam et al., 2023; Armitage et al., 2008). Hence, this offers greater opportunity to reflect on the issues involved in STs and the alternatives proposed (Costa et al., 2022). In Buitelaar et al. (2007: p. 895), this aligns with the second factor contributing to transformative capacity referring to the capacity of a system for institutional reflection. Understanding learning this way puts it at a cross-roads where learning either keeps the system in check, thus stable, or presents the ability to break away from the status quo.

As the header suggests, triple-loop learning revolves around posing the question of 'how do we decide what is right?' (Medema et al., 2014). This question is associated with reflecting on the rightness and applicability of rules. To remain in Pahl-Wostl's (2009) analogy of the dikes, this would imply to reconsider practices in risk management. Therefore, triple-loop learning is often denoted as learning about learning (Stam et al., 2023) that operates on the meta-level. Hence, this type of learning goes even one step further than determining whether rules should be altered as it also centres around reconfiguration of governance structures, protocols and what dominant paradigms guide learning processes (Medema et al., 2014). Viewing reflection and action in this light underlines the process of institutionalisation. As part of this process, triple-loop learning explains how transformative outcomes become gradually embedded within policy frameworks in the form of protocols. Therefore, triple-loop learning provides space for change in a governance context as well (Stam et al., 2023). Governments are considered the agents of implementation and therefore tasked with resolving society's problems (Schön, 1973). Therefore, a change in governments involves re-organisation of political structure and promote systems for learning. This also implies a shift from government at the forefront of learning to government as facilitator of learning. Overall, the expected outcome of the multi-loop learning process can be viewed as a fundamental shift in systems thinking.

2.3. CRITICAL MOMENTS

As transitions call for drastic change in order to create a more sustainable future, it is important to be aware of particular moments in time that affect learning in STs. For instance, changes can occur rather swiftly without requiring too much time or can be the result of enduring processes of evaluation and revision (Sorensen, 2023). This implies that change can occur through incremental alterations or a so-called shock event. Key to understanding this trajectory of change, is to look at the historicity of events through the lens of path dependency (Hernandez, 2014). Or to borrow North's words (1990: p. vii): "History matters. It matters not just because we can learn from the past, but because the present and future are connected to the past by the continuity of a society's institutions." This implies that there are multiple alternative routes present in decision-making, both in the past, present and for the future. As demonstrated in figure 3, there are numerous events marked by crosses. Each of these crosses resembles a decision being made, eventually mimicking a trajectory towards certain realisation of a

development. Along this trajectory, each decision made, positively reinforces the existing processes of development. This is symbolised in figure 3 by means of a perpetuating sequence of decisions and/or events that are denoted as 'lock-in'. At this point, there is little to no room for change given the high transaction costs associated once lock-in occurs (North, 1990). Hence, there seems to be a self-reinforcing mechanism at play in path dependent trajectories (Sorensen, 2023; Hernandez, 2014). A critical note to this approach is that trajectories do not necessarily 'break away' from an existing arrangement, but they may also reproduce a similar outcome that favours the status quo.

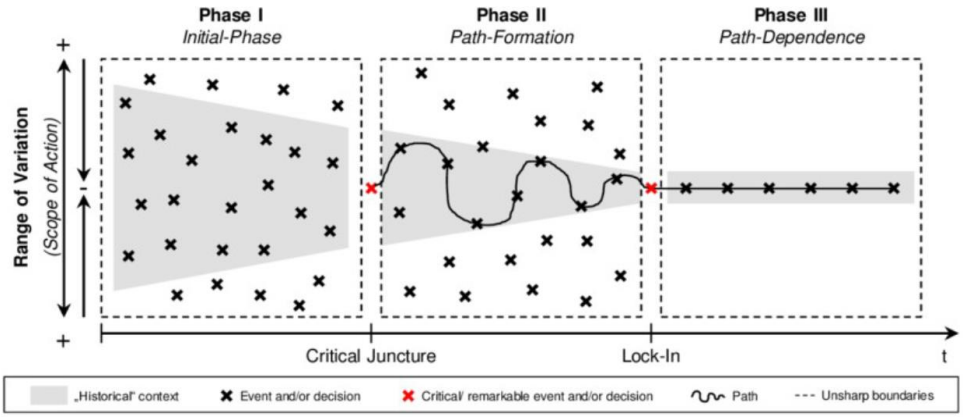

Figure 3. Visualisation of a path dependent trajectory over time (Hernandez, 2014)

This thesis takes an interest in examining the pivotal moments in time at which there is potential for change. This is denoted by a red cross in figure 3 encompassing a critical remarkable event and/or decision (Hernandez, 2014). Figure 3 also portrays that the first red cross marks a critical juncture. A critical juncture shows signs of producing a long-lasting legacy essentially also perpetuating a self-reinforcing mechanism as referred to earlier (Collier and Munck, 2017: p. 2). This coincides with the finding by Von Schönfeld and Tan (2021) who also relate critical junctures to path-dependent trajectories. These authors define critical junctures as events in time that produce a significant outcome as a result of their large-scale and visibility of implications. Their connection to path dependency can be found in the fact that critical juncture may reproduce an already existing scenario as it imposes an enormous cost to divert from the path set in motion. Therefore, Von Schönfeld and Tan (2021) also remain cautious in propagating the change potential of critical junctures.

A further description of critical junctures is offered in the model of institutional change created by Buitelaar et al. (2007). This model, as displayed in figure 4, combines the potential of internal and external triggers in driving change by Burch et al. (2003) and the convergence of a political, social and policy stream as suggested by Kingdon. As presented in figure 4, Buitelaar et al. (2007) portray institutional change as a staged approach in which the starting point of change is driven by pressures from external societal developments and institutional reflection. As a result of this exerted pressure, institutional arrangement are scrutinised and the dominant set of discourses are challenged (Buitelaar et al., 2007). This pressure builds up until a certain point where a sufficiently large enough trigger appears that allows to open up a first window of opportunity, which is referred to as a critical moment. Within this window, problems and issues become incompatible with the current arrangement and actors, both internal and external, will engage in creating ideas and solutions to address this incompatibility. Another activity taking place within this window is that actors will start to look for new positions.

However, a critical moment does not automatically effectuate change. In order for that to happen, Buitelaar et al. (2007) propose that opportunity needs to be actively utilised. This requires a break with

past patterns and existing set of discourses (Hajer, 2009; Buitelaar et al., 2007). Especially this overhaul of discourses plays a significant role in explaining how transformations happen and sets aside the critical moment from a critical juncture. At this stage, Buitelaar et al. (2007) proposes to include Kingdon's condition for policy transformation. Kingdon characterises transformation as a parallel flow where three streams meet: 1) problems stream that depends on how problems are perceived by wider society, 2) availability of (policy) solutions such suggestions for new institutional designs and 3) political backing. According to Buitelaar et al. (2007), convergence these three streams is necessary in order to create a second window of opportunity that presents the critical juncture (Von Schönfeld and Tan, 2021; Buitelaar et al., 2007).

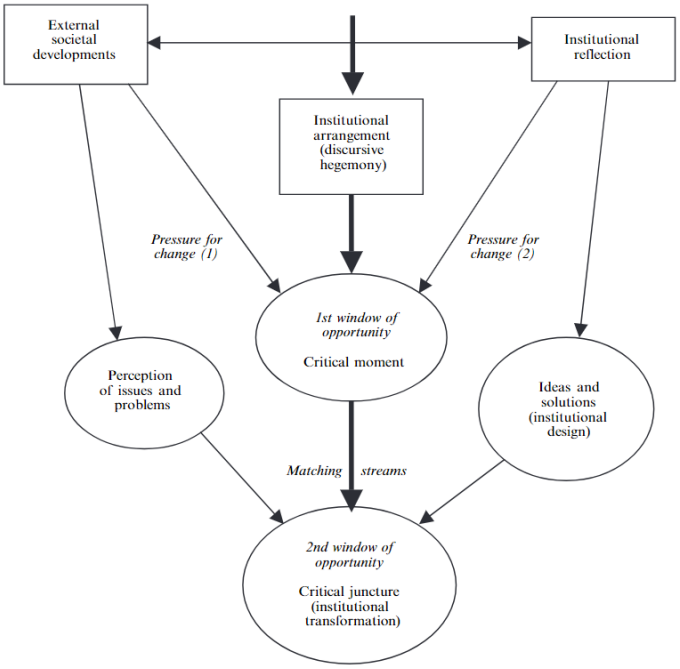

Figure 4. Model of institutional change denoting critical moments as the first window of opportunity and critical junctures as a second window of opportunity (Buitelaar et al., 2007)

2.4. LEARNING AT ISLAND SCALE

Having clarified when there openings for change, and thus potential for learning, the following section will go on to discuss where learning takes place. This thesis focuses on a small-scale island level because in the literature islands are often characterised as living labs to test new technologies and often take up frontrunner positions in STs (Beamer et al., 2023; Kallis et al., 2021). In addition, island communities generally show closer and more intense forms of interactions among themselves as well as their immediate surroundings (Beamer et al., 2023; Sperling, 2017; Kueffer & Kinney, 2017). This is demonstrative of the interconnected nature of networks in which no single actor possess the skills or resources needed to execute the function on their own (Schön, 1973). On an island scale, this is expressed by the formation of strong interpersonal ties, a strong sense of self-reliance and motivation to organise themselves to tackle pressing issues (Kallis et al., 2021; Sperling, 2017). This mentality is also reflected in the governance systems (Deschenes & Chertow, 2004). These pressing issues revolve around the finity of resources, freshwater supply, waste management stream, climate change events and other sudden disruptions (Nel et al., 2021). Overall, this shows signs of what Schön (1973) refers to as a 'concerted network'. In such networks, multiple actors are present that negotiate terms and harmonise actions.

In addition to the social dynamics, islands also have a physical metabolism of their own. In the broadest sense, an island can be described as a landmass that can be completely or partially surrounded by water (Deschenes & Chertow, 2004: p. 202). Referring to islands this way emphasises that these remotely located ecosystem form a bounded setting. Their separation from the mainland often imposes an additional cost of transportation, which contributes to perceived sense of isolation. In the same way, isolation also restricts the resource availability, making islands resource-dependent. Islands are also easily demarcated due to their size. This points towards a delicate situation in which core needs and values from the communities as well as the island's carrying capacity have to be considered (Kallis et al., 2021).

All things considered, islands form a distinctive learning network that facilitates addressing sustainability challenges. In fact, the smaller and bound networks found on islands resemble to what Sperling (2017) defines as the *internal context*. However, the internal context should not be viewed in isolation as there is a strong interlinkage with the so-called *external context*. This represents the wider societal setting and aligns with the macro-level as described earlier in the landscape level (Geels, 2011; Rotmans et al., 2001). The conditions of the external context mostly revolve around governmental support to community projects and the arenas at which visions are constructed that guide implementation at lower levels (Sperling, 2017). Within the internal context, Sperling (2017) formulated a subset of factors that can help determine whether a community project can be deemed successful.

In total Sperling (2017: p. 886) identified six factors, including 'community spirit', 'local traditions and history of cooperative projects', 'sense of locality and responsibility', 'entrepreneurship', 'networks', 'guiding visions and plans'. A summary of each factor is provided in table 1 below. With regards to community spirit, Sperling (2017) has described it as the collective sense of belonging to a group of people that share a particular interest or issue. This definition implies that community spirit is inherently tied to establishing strong interpersonal bonds. The sense of locality and responsibility refers to the attachment residents have to their immediate surroundings. This increases stewardship over the place and results in targeted efforts to ensure a certain level of quality of the landscape and improve its quality. Thus, policies and projects should offer sufficient flexibility in order to comply with local identity. The third point of local traditions describes to the presence or absence of experience of the community involved in projects. Sperling (2017) mention that experience hinges on the other two factors of spirit and sense of locality. The fourth factor of entrepreneurship revolves around the notion of change agents in local settings. These are the individuals that drive projects and are willing to explore new opportunities. The fifth factor signifies visions that help determine a projects overall direction. Visions are considered key in setting the stage for a common departure point. Important to note here is that this point can bridge the internal island scale to including external actors and funding bodies, which improves the credibility of the community project. These two factors then lead to the final network factor. According to Sperling (2017), networks can contribute to building long-lasting relationships established both on and outside the island scale. In this case, success in a network is determined by the capacities of this very network. Examples of capacities include time available, expertise of the network and the ability to involve parties from the external for wider support with respect to knowledge and funding.

Table 1. Overview of Sperling's (2017) success factors sub-divided per dimension including explanation

Dimension	Factor	Explanation
Internal	Community spirit	*Sense of togetherness & open stance*
	Local traditions and history of cooperative projects	*Community experience in planning and communication processes (either forming organisations or not)*
	Sense of locality and responsibility	*Sense of belonging creating ownership over a place & swift responses*
	Entrepreneurial individuals	*Pro-active individuals driving projects & their sphere of influence in community*
	Networks	*Formal and informal established partnerships*
	Guiding visions and plans	*Common platform providing direction for community development & formulating guidelines.*
External	Guiding visions and plans	*Direction's credibility may be improved by linking up to national guidelines or when it is recognised by an award*
	Government technology support	*Support in terms of providing economic incentives like subsidies and taxing*
	Government process support	*Dissemination of information in plan process & building local capacity through help of legislation*
	Expert assistance	*Expert input from outside the network*

2.4.1. Who learns? The role of actor networks

As suggested in the previous section, learning also represents a social activity relying on the interactions between actors. Indeed, learning can be pursued on multiple levels: individually or collectively, at an organisation or societal level (Von Schönfeld et al., 2020). Learning allows to expand one's knowledge, which implies to obtain new skills or experiences through exchanging perspectives. This contributes to the negotiation process and enables the ability to reflect. Events which have been growing in importance as stakeholders are more and more engaged throughout the planning process (Von Schönfeld et al., 2020). As a result of the inclusion of a wide variety of actors, learning has also become multi-dimensional (Costa et al., 2022). In advancing transitions, it is common for people to interact with governments, industrial parties, academic institutions, NGOs and wider civil society (Stam et al., 2023). Each of these actors may have a different background and can fulfil different functions during the planning process (Von Schönfeld et al., 2020). This creates a multi-actor setting in which new information is acquired through sharing of perspectives and discussion of goals. Therefore, learning heavily relies on the interactions that may occur in social networks.

In his work on learning processes in a changing society, Donald Schön (1973) refers to the significance of learning within networks. At the time, positioning learning in organisations, governmental bodies and civil society was considered groundbreaking. According to Schön (1973: p. 178), a network is characterised by its components (e.g. the type of actor or organisations involved), the channels by which these components interact (e.g. formal or informal communication channels) and the nature of their transactions (e.g. resource exchange). Schön's (1973) interpretation of networks underlines the importance of interconnections between these three elements in order to acquire new knowledge. Referring to networks this way, demonstrates that transformations rely on networks' capacity to learn.

Moreover, Schön's (1973) definition also distinguishes between formal or informal channels of networks present within or outside an organisation. Whereas the formal networks operate more on the forefront, the informal networks are formed 'underground' based on interpersonal relationships.

Using the 'underground', Schön (1973) refers to the relationships between people or groups of actors and even organisations that will act as a substitute or complementary to a formal network whenever these type of networks 'failed' to accomplish a certain goal. Eventually, informal networks may gradually develop to become more formal and thus become institutionalised. This is the result of patterns, routines and actions being grounded in the rule system (Schön, 1973).

In the current day and age, communication channels of networks have become more digitalised. As a result of this online connectivity, learning processes will occur more through, for example, blogs, podcasts, videos and other online settings (Medema et al., 2014). These digital platforms have made knowledge increasingly accessible and more easily transferable (Goldie, 2016). Subsequently, this rise of the virtual environment has made it easier for people to share their perspectives and opinions with a wide range of actors. This aligns well with 'meta-learning' as learning communities are claimed to be part of a bigger network traversing individual backgrounds and places (Goldie, 2016). Hence, distinguishing networks this way emphasises the contribution of digital surroundings in transmitting information, sharing experiences and overall interactions outside the island scale.

2.5. LEARNING CAPACITY

Having established that learning in STs is a social activity, this section will now move on to address how an island community learns as a social system. This requires taking a closer look at the learning capacity of networks. In general, learning can be considered an integral part of capacity (Innes and Booher, 2003). In clarifying this link, Innes and Booher (2003: p.8) associate capacity with the capability of a community to learn (and engage in constant learning) about the implications of their actions as well as respond to changing circumstances. Central to this conceptualisation of capacity is the close interaction between a diverse group of actors. This can be among individuals, groups of people or organisations (Von Schönfeld et al., 2020; Innes and Booher, 2003). Throughout the planning process. interactions between a mixed group of actors have proven key in initiating projects or have acted as sources of inspiration to solve societal issues by working together to form new ideas (Von Schönfeld and Tan, 2021; Rinscheid et al., 2019). Examples of the interactions that enable this production can appear in the form of informal dialogues, phone calls, mail conversations or formal meetings (Svare et al., 2023; Von Schönfeld et al., 2020). According to Sol et al. (2018) high quality interaction can be distinguished via regular communication to maintain active engagement, formation of new relationships and capacity-building initiatives. Thus, leveraging interactions presents a key component of learning capacity.

While leveraging interactions indeed plays a substantial role in the very process of adopting new knowledge and competencies, one should not overlook the importance of reflection on actions (Svare et al., 2023; Von Schönfeld et al., 2020; Trasser et al., 2019; Sol et al., 2018). Reflecting on actions in this thesis can be understood using the concept of reflexivity. Reflexivity is the capacity of individuals, organisations or a system to critically reflect on performance, practices and reconsider core values (Pickering, 2018). As a result of reflexivity, new perspectives enter the scene that can alter the course of action (Sol et al., 2018). Learning thus involves a continuous process of evaluation of experiences and re-orientating activities (Van Mierlo and Beers, 2020). This resonates with double- and triple-loop learning as formulated by Argyris and Schön (1978). More specifically, reflexivity can be tied to double-loop learning as it may lead to challenging of actions, scrutiny of practices and personal performance in the network (Svare et al., 2023; Sol et al., 2018; Pickering, 2018). Reflexivity's connection to triple-loop learning can be found in the ability to open up the discussion to questioning of governance structures and the ability to reconfigure these structures and modify existing practices (Pickering, 2018). Similarly, in their model towards institutional change, Buitelaar et al. (2007: p. 895) relate the

capacity to institutional reflection to the wider capacity of a system to learn and act upon this learning. In doing so, Buitelaar et al. (2007) present that the capacity for triple-loop learning is an important factor for realising institutional change.

A final component of learning capacity of a network is knowledge production. Developing knowledge refers to the creation of new knowledge or expansion of an existing skillset (Von Schönfeld et al., 2020). Again, interaction forms a key component of knowledge production because the collaborative effort by a wide variety of stakeholders is essential to exchanging skills and knowledge (Innes and Booher, 2003). Important to note in this process of knowledge acquisition does not always necessarily involve knowledge production. Learning is also about confirming or debunking of already existing knowledge. Determining whether new competences were acquired requires asking questions about whether the participants of the network have gained familiarity with how to organise the planning process or new understanding of certain principles. To give an example, a person can learn how to make use of software to communicate findings, budgeting, navigating stressful situations or gaining expertise with technological innovations. These examples characterise what Von Schönfeld et al. (2020) refer to as process-oriented knowledge in planning practice. Similarly, learning also refers to a collection of facts and gathering the materials necessary to accomplish a feat in a timely manner (Von Schönfeld et al., 2020). Content knowledge also implies soft skills such as how to operate in a group setting. Likewise, learning this way can also be about indexing who knows what in a technological problem. This means that examining actor connections is also an important part of expanding knowledge.

2.6. UNDERSTANDING LEARNING ACROSS TRANSITIONS

To address the relation between learning processes and STs, this section will operationalise the main concepts used in this thesis that support analysing learning across STs (see table 2 below). As the literature shows, there is a wide variety of definitions and concepts pertaining learning processes (Armitage et al., 2008). However, learning is mostly approached as experiential and reflective activity involving multiple stakeholders (Svare et al., 2023; Sol et al., 2018; Armitage et al., 2008). Taken this into consideration, this thesis takes a focus is on how learning occurs when a group of people work together to realise an ambition and how lessons learned can act as a catalyst for future transitions. This requires making learning processes more explicit in terms of what they do in relation to change dynamics and how it can be measured from a community's transition efforts. In doing so, this thesis reasons from a constructivist perspective to study learning across ST (Geels, 2020; Yanow, 2014). Based on this perspective, learning is perceived as process in which members of the island network actively construct and exchange knowledge as well as presents an interpretative process in which actors engage in collective sense-making of events and decisions. This process also encourages reflection on practices and co-determines whether lessons learned may or may not become embedded into institutions. As such, this view provides the opportunity to examine a plurality of opinions and interpretations of reality without compressing them as a single reality. Important to note is that this thesis also interested in the moments in time where there is heightened potential for change and thus provides opportunity for learning. In this light, studies come up with various definitions to distinguish between critical moments and critical junctures (Von Schönfeld and Tan, 2021; Buitelaar et al., 2007).

Table 2. Overview of the notions, definitions and their operationalisation in this thesis

Notion	Definition	Operationalisation
Learning capacity	Quality of interactions (Von Schönfeld et al., 2020), reflexivity (Pickering, 2018) and capacity to learn new things (Von Schönfeld et al., 2020)	1) Investment in high-quality interactions (also with actors external to the island context) 2) Ability of individuals, groups of individuals and organisations to reflect on actions and

		act upon the lessons learned. For instance, through adopting new practices 3) Ability to collectively produce knowledge and/or to expand on existing knowledge. E.g. experimentation via pilot projects or through social interaction with other (local) stakeholders 4) Ability to transfer knowledge and/or experiences through the island network
Island scale	Community spirit, local traditions & history of cooperative projects, sense of locality & responsibility, entrepreneurship, networks, guiding visions & plans (Sperling, 2017)	1) See (in)formal network 2) Sense of ownership 3) Experience with innovation projects 4) Agency and/or internal drive to accomplish an innovation project 5) Articulating ambition and vision (either intentional or unintentional)
Informal network	Channels of communication (co-)existing next to the formal network in which actors involved form interpersonal bonds (Schön, 1973)	Interpersonal relationships between island actors
Formal network	Tradition channels of communication along 'formal' lines of authority, information or decisions (Schön, 1973)	Engagement of island and external actors through guidelines, agreements, standards and policies
Critical moment	Internal or externally driven pressure opening up a first window of opportunity in which existing actor roles are reconfigurated (Burch et al., 2003: In Buitelaar et al., 2007)	Events that open the first window of opportunity occurs as a result of: 1) External developments or shock events (e.g. crises, natural disasters or war) 2) Introduction of new laws/policies and stakeholders, disposition of new resources 3) Challenging of dominant discourses
Critical juncture	May closely follow a critical moment when a second window of opportunity appears in which a political, problem and solution stream converge ensuing a break with past patterns and challenging the prevailing discourses. This enhances the potential for institutional transformation (Buitelaar et al., 2007).	Opening of second window of opportunity occurs after aligning of: 1) Formulation of tangible solutions to a sustainability problem 2) Mutual agreement on problem definition of sustainability challenge 3) Mobilisation of political support (e.g. through subsidies) or push factor (e.g. through taxes or legislation)
Path dependency	Self-reinforcing mechanism in which each decision contributes to (re-)producing a certain outcome, eventually forming a path directing institutional developments (Hernandez, 2014; North, 1990)	1) Continuation of current practice 2) Past events and decisions influence the decisions made today and eventually affect future options
Single-loop learning	Adjustments made to an identified error (Stam et al., 2023; Argyris and Schön, 1978)	1) Action(s) taken in response to a problem 2) Learning-by-doing approach
Double-loop learning	Challenging underlying assumptions (Argyris and Schön, 1978)	1) Revisiting of existing perspectives, practices or previously set goals and ambitions in light of feedback on past events of projects
Triple-loop learning	Deeper reflection on values and ability for institutional reformation (Stam et al., 2023)	1) Shifting paradigms and behavioural routines 2) Adoption of practice in institutional frameworks (e.g. rules)
Multi-level perspective	Positions transformative change in the wider system by describing transitions as a process as a result of interactions within and in between niches, regimes and a	Learning takes place at multiple levels: 1) Bottom-up initiatives of small groups or individuals at the island scale driving innovation projects

	landscape as analytical levels (Geels, 2011) and temporal phases (Rotmans et al., 2001)	2) Dynamic interaction between island and regional scale 3) Outside pressures (for example in the form of disasters or wars)
Sustainability transitions	Long-term and systemic changes to address pressing societal issues (Svare et al., 2023; Kelly et al., 2018; Geels et al.,, 2011)	Structural departure from current practice (e.g. behavioural or institutional), with the help of innovation projects, towards sustainable practice

2.7. CONCEPTUAL FRAMEWORK

Based on the theories presented above, this section attempts to demonstrate the interconnections between theories applied and visualise these into a comprehensive model (see figure 5). Central to this model is the understanding that transitions do not progress in a linear fashion, but involve constant reflection and action. Essentially, this suggests complementing the linear model (see figure 1 in section 2.1.) with subsequent transition trajectories to better account for incorporating lessons learned from previous STs. Hence, this challenges the linear MLP framework of spatial diffusion as portrayed by Geels (2011).

As a starting point, figure 5 places the transitions within an island scale that is shown to be in interaction with the external scale. This interaction shows a bi-directional relationship, represented with one arrow pointing downward into the island scale which denotes the pressure to change. This can be both a pressure from wider society as well as pressure to change from institutional reflection as theorised by Buitelaar et al. (2007). There is also an arrow pointing into the other direction from internal island to the external scale. This points towards adoption of practices and policies into the wider landscape level, that is the Netherlands. It is worth acknowledging that this relationship incorporates elements from the MLP framework as suggested by Geels (2011). Here, the interplay between the 'niche', 'regime' and 'landscape' analytic levels offer a way to understand this process of innovation and their potential to become embedded in routines and governance structures (Geels, 2011; Rotmans et al., 2001).

Diving deeper into the island scale, one can see a transition trajectory consisting of multiple STs. Within each ST a multi-learning loop is displayed. This is especially valuable in understanding the learning capacity of an island community. It is worth noting that the way multi-loop learning is portrayed in figure 5 assumes that triple-loop reflection is needed for an innovation to get embedded in the wider landscape level. However, it may not necessarily be the case that in order for a transition to progress, all three loops have to be crossed. In reality, transitions and subsequent learning processes may also be restricted to either a single- or double-loop. In addition, the conceptual model also shows that the multi-loop learning process is influenced by critical moments. Each transition is connected by the transition trajectory that shows the overall development over time.

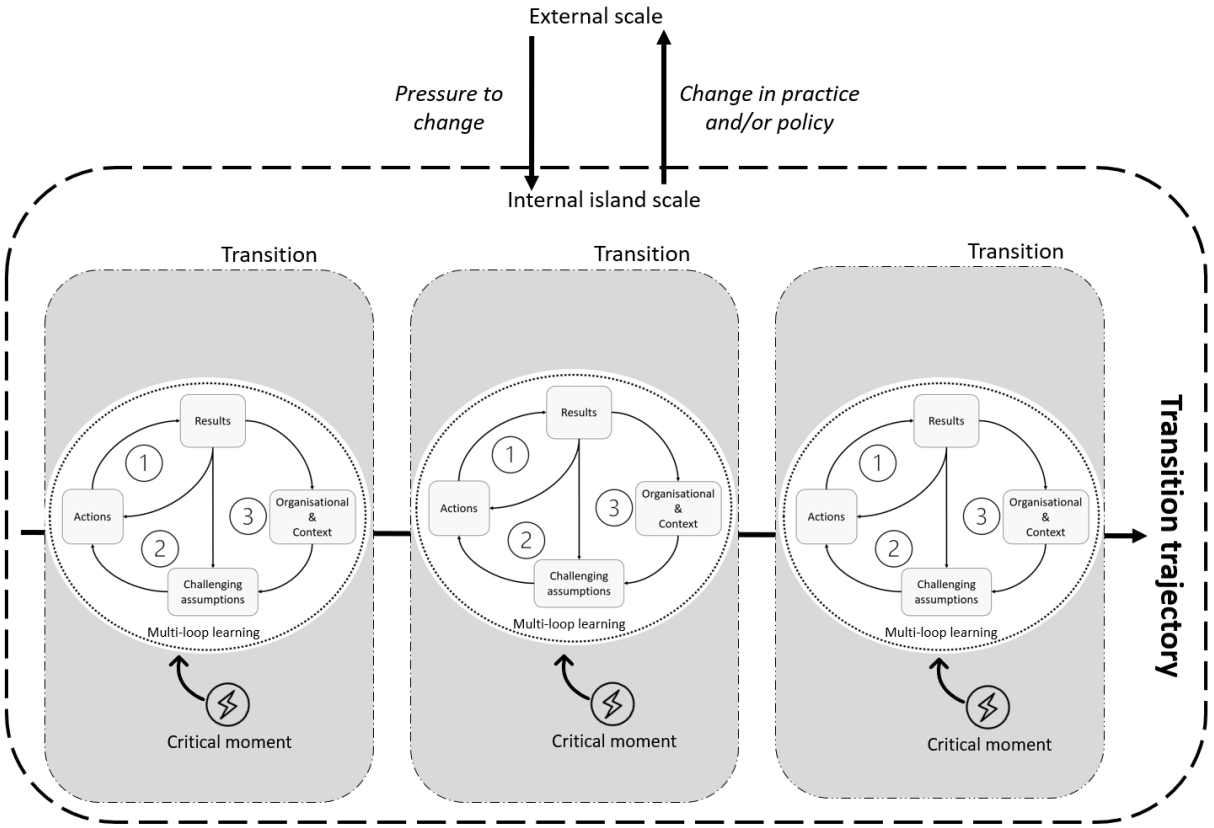

Figure 5. Conceptual model visualising the relationships between multi-loop leaning (1= single-loop learning, 2= double-loop learning and 3= triple-loop learning) across sustainability transitions over time on an island scale that is in connection with the external scale

3. RESEARCH METHODOLOGY

This thesis intends to study the learning processes across STs as they take place in a pioneering island community. In this chapter, the research design will be explained to investigate how the topic of learning has been examined on the island. Given the exploratory nature of this thesis and focus on how social actors construct meaning, qualitative methods are best-suited for this study (Sovacool et al., 2018). This chapter will start with embedding the learning history evaluative tool as a way to guide how learning processes on Ameland are examined (3.1.). This will be followed by section 3.2. that will focus on the considerations supporting the choice for conducting a case study on Ameland. Thirdly, section 3.3., will describe the data collection process. This consists of a sampling strategy, semi-structured interviews and a focus group. The subsequent section 3.4. will explain the data analysis to greater detail. The final part of the methodology (see section 3.5.), will discuss the ethical considerations, validity and reliability measures of the study.

3.1. LEARNING HISTORY

As described earlier, there are many ideas on what learning should entail, but there are no clear forms of assessment. This complicates proving whether learning has taken place and to transfer lessons learned to other settings (Roth and Kleiner, 1995). In response to this need for assessment of learning processes, Roth and Kleiner (1995) developed a learning history. This is a qualitative assessment tool that applies a systematic approach to evaluating and monitoring the learning effort (Roth and Kleiner, 1995). Additional information on the learning history approach is displayed in text box 1 below.

In order to study learning processes across transition trajectories, this thesis selected the learning history and fitted the tool to the objective of this study. Traditionally, a learning history focuses on revealing how organisations learn from change within their organisation (Roth and Kleiner, 1995). But, this thesis required a wider focus on evaluation and reconstruction of the transition trajectory. In doing so, this modification helped to capture the entirety of the transition as a process. This includes lessons learned in a community, rather than focusing on individual accounts. As mentioned in text box 1, presenting a learning history is commonly done by capturing developments and experiences of challenges in a narrative format. Regaining the transition process in a narrative format enabled to retrieve successful and lesser successful developments and how these came to be. This enabled to distinguish between factual events and how these were interpreted by participants. Important to note is that the learning history does not just document actions and their outcomes, but also how people respond to the learning effort (Roth and Kleiner, 1995). This is necessary to also form an understanding of the underlying norms and values driving action. This made the learning history an appropriate tool to be combined with multi-loop learning. Therefore, assessment on how learning took place in this thesis also meant engaging participants in their own inquiries to identify key lessons learned and critical moments.

Text box 1. A guide to learning history - why history matters

The learning history evaluative method originates from Roth and Kleiner (1995), two researchers from the 'Massachusetts Institute of Technology' (MIT). These authors rejected the idea of quantitatively assessing learning and therefore devised the method as a way to both reflect on and document critical learning moments occurring within an organisation. Though originally intended as a tool enabling intra-organisational learning, learning history now also serves to mediate between disputes, acts as an innovation guide and to structure knowledge (Geerdink et al., 2020). As a result, complementary to its narrative potential, it can also imply a process intervention or projection of barriers that need to be tackled.

A learning history can mostly be characterised as a written document, or a series of documents that analyse factual events, stakeholder perceptions and their experiences regarding innovation and transition processes as well as reflections by researchers and other experts (TNO, 2021; Geerdink et al., 2020; Roth and Kleiner, 1995). Often through narration and storytelling, an image of the overall performance of a transition or innovation process is formed. Usually with the help of stakeholders considered to be outside the study domain. This helps distinguishing the more successful from the lesser successful developments, exposes valuable lessons and potential barriers to implementation in the process. More recently, the learning history has also been deployed as an evaluative method in reconstructing change events (TNO, 2021; Geerdink et al., 2020; Vangansbeke et al., 2015).

In short, the learning history in this thesis was approached in the following way:

1. Timeline – the researcher constructed a preliminary outline of events throughout a period from 2006 up until now (2024). This was based on policy documents, visions and other documents
2. Individual storylines – created by conducting semi-structured interviews (see section 3.3.2.) in order to capture the key narrative ingredients of the transition. This presented the individual reflection part.
3. Bundling storylines – after the interviews were conducted, the researcher combined the individual bits and pieces of information to identify shared lessons and critical moments. These were presented in a timeline.
4. Confirmation storyline – this final step was intended to provide feedback to the local stakeholders on Ameland. Subsequently, the present stakeholders discuss this storyline and collectively reflect upon the transition trajectory thus far. This was done by means of a focus group (see section 3.3.3.).

3.2. CASE STUDY APPROACH & SELECTION: AMELAND

In gathering the data, this thesis deploys a case study approach as described by Yin (2009). Generally, a case study approach is deemed appropriate for exploratory cases in which the research poses a 'how' or 'why' question about contemporary events where it is nearly impossible for the researcher to exercise a degree of control over said events (Yin, 2019: p. 13). In such instances, opting for a case study method enabled the researcher to a) grasp complex social phenomena and b) explore people's experiences in relation to real-life events and processes.

In this thesis, the Dutch Wadden Island Ameland was selected to be the case study area. More specifically, the case can be characterised as a single case study with embedded units. Here, the embedded units refer to examining the actor groups making up the community on the island (e.g. local government, residents, local entrepreneurs, cooperative, etc.). The decision for a single case study was justified using the following two rationales. Firstly, islands are frequently viewed as model systems or 'living labs' in the wider literature (Beamer et al., 2023; Deschenes & Chertow, 2004; Kueffer & Kinney, 2017). Ameland can in fact be viewed as such a model system as it was found to take up a frontrunner position in the energy transition (Gemeente Ameland, 2023). Therefore, this role as frontrunner makes for an interesting case to study the future transition to a CE. Likewise, the long-standing history with the energy transition will facilitate conducting a learning history evaluation of how learning outcomes potentially manifest themselves in practice and policy-making.

A second rationale for selecting Ameland as case study is because studying island systems offer ample insights into a unique set of challenges associated with small and closed systems (Deschenes & Chertow, 2004). For example, the realities of sea level rise and resource pressure become more clear when studying islands (Beamer et al., 2023). In addition, the island's contexts are more easily demarcated due to their size, which offers a manageable study environment compared to their terrestrial counterparts. This scale also makes Ameland a more manageable study environment with respect to the local actors involved. Islands are known for their closely-knit community fabric, which contribute to understanding how a community takes up the challenge of shaping a transition.

3.3. DATA COLLECTION

In order to gain an in-depth understanding of the learning effort of the Ameland island community, semi-structured interviews (see section 3.3.1.) and a focus group (see section 3.3.2.) were chosen. This thesis started with conducting semi-structured interviews to generate an overview on perspectives on transition developments, underlying assumptions and will pinpoint critical moments deemed important by the interviewees. This was followed by a focus group which served as validation of statements made and encouraged collective reflection on lessons learned. In this section, the sampling strategy for selection of participants will be discussed in 3.3.1. Next, the semi-structured interview (3.3.2.) and focus group (3.3.3.) will be further explained.

3.3.1. Sampling strategy

The research methods for this thesis involved semi-structured interviews and conducting a focus group. The main sampling strategy used in this research is referred to as 'purposive' sampling (Hennink et al., 2011; Yin, 2009). This meant that sampling deliberately sought out stakeholders that had experience with STs and that were found representative of their sub-group. Potential candidates were mapped using a preliminary stakeholder analysis of which the outcomes are displayed in Appendix A. Thus, candidates targeted included Covenant, local and/or regional government representatives (e.g. the province of Friesland and municipality), community representatives, local entrepreneurs, knowledge institutions (e.g. Waddencampus, TNO, EnTranCe, etc.) and energy representatives (e.g. Amelander Energy Cooperative, NAM, etc.). Candidates were then invited to partake in the study through mail or telephone. An attachment containing a flyer (see Appendix E), was only done for the focus group. Additionally, snowballing was also applied in this thesis for the interviews (Hennink et al., 2011; Yin, 2009). In this light, interviewees were asked if they knew any other individuals or organisations that he or she would consider to be of interest for the study (see interview guide in Appendix B). This proved especially helpful in obtaining the contact information of harder to reach islanders that the researcher did not have access to. However, it is important to be aware of the potential bias this brings into the study as snowballing mostly suggests candidates from people's personal social network (Hennink et al., 2011).

Moreover, this thesis received help from the Waddencampus that acted as a local gatekeeper in gaining access to the field (Hennink et al., 2011). The gatekeeper supplied local contact information, advocated on behalf of the researcher in the wider community and offered insights in local island dynamics. Especially in the focus group, the gatekeeper aided in contacting candidates, set out reminders to his personal contact list and supplied the venue for hosting the focus group. However, in order to overcome the drawback of selection bias on behalf of the advocate as mentioned by Hennink et al. (2011), the researcher, along with the supervisor and the local advocate, set up a meeting prior to conducting the focus group. As part of this meeting, it was discussed which actor groups were considered representative of their respective category.

3.3.2. Semi-structured interviews

In order to draw up a learning history, this thesis started with conducting semi-structured interviews. This type of interview enabled to in-depth understanding of people's experiences with transition events, perspectives, meanings, etc. (Sovacool et al., 2018). There are multiple styles of interviewing, but this thesis followed a semi-structured format. The semi-structured format required creating an interview guide containing a set of guiding questions before conducting the interview (see Appendix B). The questions asked revolved around critical moments, lessons learned, the island network and the future of transitions. These topics of conversation were formulated into open-ended questions that

facilitated obtaining collecting the opinions and perspectives of the participants. The same interview guide was applied for all of the interviewees. At the same time, this format also allowed to diverge from the predetermined set of questions (MacCallum et al., 2019). This enabled greater flexibility to ask follow-up questions on a process and gain better understanding of the interviewee's viewpoint.

In total, 14 interviews were conducted through the use of Microsoft Teams or via phone call. The list of interviewees partaking in the study is displayed in table 3 below. The duration of the interviews ranged from 38 minutes to just under 1 hour and 30 minutes, depending on the availability of the interviewees. The recordings were fully transcribed at a later stage in order to facilitate analysis. The interview duration containing the asterisk was not fully transcribed. In this case, the introduction was more extensive compared to other interviews. This part was not recorded, but bullet points were jotted down. These are included as summary in addition to the respective transcription. In one other case, the recording failed, so here, the researcher mainly had to rely on the notes made.

Table 3. List of interviewees

	Actor category	Role	Date	Duration	Location
✸	Municipality	Sustainable development policy officer	22-11-2023	00:52:43	MS Teams
	Knowledge institution	Project leader	28-11-2023	01:21:31 (00:49:17)*	MS Teams
	Municipality	Communication advisor	29-11-2023	00:54:14	MS Teams
✸	Energy cooperative	Manager	30-11-2023	00:54:48	MS Teams
	Community Association	Secretary	6-12-2023	01:04:09	MS Teams
	Entrepreneur	Owner	8-12-2023	00:44:32	MS Teams
	Entrepreneur & municipality	Owner & council member	13-12-2023	00:38:43	MS Teams
✸	Museum	Educational staff	19-12-2023	00:41:23	MS Teams
	Regional partnership	Island inhabitant & Programme Manager	20-12-2023	00:53:34	Phone**
	Association circular Friesland	Programme Manager governments	4-01-2024	00:50:51	MS Teams
	Province of Friesland	Programme Manager Sustainable Innovation	12-01-2024	00:49:32	MS Teams
✸	Municipality	Alderman	15-1-2024	00:40:36	MS Teams
	Knowledge institution	Consultant Strategy and Policy	16-01-2024	00:55:08	MS Teams
	Nature organisation	Forest ranger	6-02-2024	00:40:05	MS Teams

**Extended introductory conversation that was not recorded, but interview notes were made*
***Recording failed, only a summary of the interview notes was analysed in Atlas.ti*

✸ included in focus group

3.3.3. Focus group

Complementary to the semi-structured interviews, a focus group discussion was organised to validate lessons learned and events. This validation helped to recognise the similarities and differences with statements made from the interviews. The benefit of a focus group is that this method allowed to collectively explore experience and negotiate meaning, while interviews generally elicit individual experiences (Sovacool et al., 2018). Typically, focus groups largely deploy a group of participants to

engage in an open discussion on a specific theme and/or issue (MacCallum et al., 2019; Bryman, 2012). In addition, focus groups have been proven to effectively tone down extreme opinions held by individual actors. Therefore, this is an appropriate method in uncovering collectively shared norms, views and behaviour (Hennink et al., 2011). For this thesis, one focus group discussion was conducted on Ameland. The purpose of the focus group discussion was to see how a group of local stakeholders responded to critical moments and lessons learned, but also to challenge them to expand their scope towards the future of transitions.

In the focus group, 9 local stakeholders participated in the discussion that lasted just under two hours. For the focus group meeting, the researcher specifically tried to create a mixed group of stakeholders in order to generate a more complete overview of the perceptions. Participating panel members consisted of representatives from the municipality, local knowledge institution, community association, energy cooperative and entrepreneurs. For an overview of participating panel members, table 4 below provides an overview of the composition. Again, the recordings from focus group were fully transcribed, except for the poster exercise, where bullet points of key themes were found to suffice.

Table 4. List of focus group participants (Ameland, Nes)

Date & duration	Actor category	Function
1-2-2024 *01:53:04*	Municipality Ameland	Sustainable development policy officer
	Municipality Ameland	Alderman
	Waddencampus	Coordinator
	Waddencampus	Project leader
	Community association	Secretary
	Amelander Energy Cooperative	Manager
	Entrepreneur	Owner
	Amelander Musea	Educational staff
	Entrepreneur	Manager

The focus group discussion was structured using a script and topic list (see Appendix F). This script shows a distinct sub-division of the focus group into two parts. Part one centred around an introductory presentation containing the critical moments and lessons learned extracted from the interviews. This introduction acted as a conversation starter and challenged participants to add and/or remove critical moments and lessons. Figure 6 shows the outcome of this exercise in which the blue post-its present additional lessons and yellow are additional critical moments. The validation process in this first part presented the starting point of the second part. In this second part, the panel was encouraged to consider which of the lessons learned are applicable for a future transition. To facilitate this discussion, the researcher generated guiding questions targeting reflection on key lessons, what to repeat in a future transition and external influences. To end the conversation, the moderator summarised the events discussed and asked the participants to place final remarks that added to the insights whether the summary accurately reflects the content of the discussion.

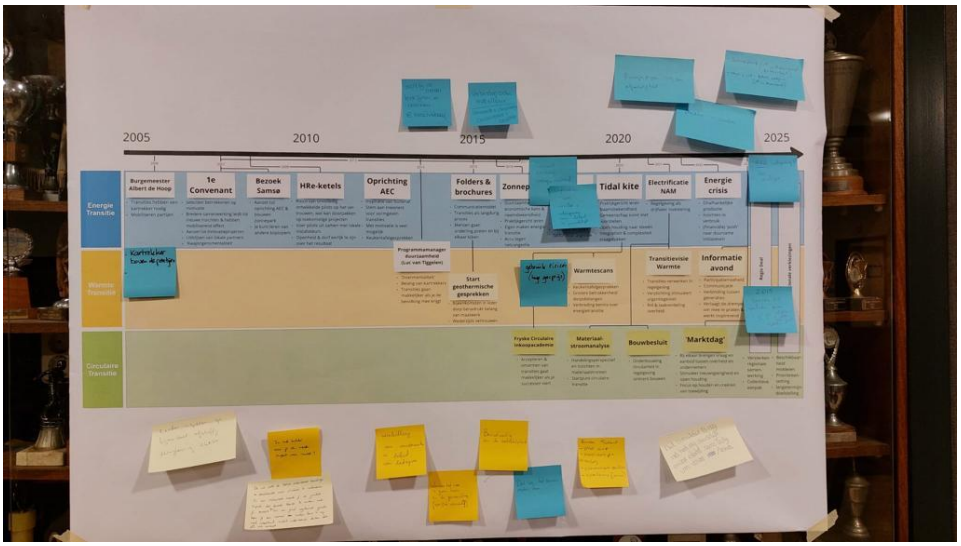

Figure 6. Post-it assignment including contributions
Photo: supervisor

The discussion itself was guided by the researcher and supervisor. During the meeting the researcher took up a moderating role and was joined by the supervisor who assisted as co-moderator. The moderating role consisted of guiding the conversation and only steering the group when the discussion ventured off-topic. The co-moderator could also ask follow-up questions whenever the moderator failed to continue. On top of that, the co-moderator also acted as a gatekeeper of time. Furthermore, this role division allowed to pay close attention to group dynamics and how participants responded to other participants' opinions. This is considered an added benefit over the interviews as in the focus groups, the researcher could also consider which individuals contributed most opinions as well as how they proclaim their argument (Bryman, 2012). A schematic overview of the interactions are displayed in Appendix G. The mostly unstructured format provided the option to dive deeper into the underlying motivations driving action and issue perceptions (Bryman, 2012). This will have as added benefit that emphasis will be placed on issues that mostly concern the participants and that participants can challenge each other's viewpoints.

3.4. DATA ANALYSIS

After having conducted the interviews and focus group, the transcripts will be analysed predominantly using content analysis. However, it also incorporates elements of narrative analysis in order to comply with the learning history evaluative method. This type of analysis placed greater emphasis on documenting participants' experiences (MacCallum et al., 2019; Bulkens et al., 2015). It is based on the fact that every individual reasons from a particular frame that may be supportive or contesting a viewpoint. Focussing on personal or collective narratives presented the researcher with key transition moments in time, but also the meaning behind those key moments (Bulkens et al., 2015).

In order to facilitate analysis of the interviews and focus group, transcripts were analysed using the software from Atlas.ti. This computer software enabled to generate a comprehensible overview of the data by labelling key themes and responses (MacCallum et al., 2019). The labelling, or coding of responses was done both inductively and deductively. Deductive codes were established prior to conducting the interviews and were based on the concepts found in the literature, policy documents, visions and other documents. Subsequently, inductive coding was applied in order to expand the existing coding scheme. These type of codes are concepts that emerge from the findings. In this thesis, inductive coding was structured as a three-stage process. The interview excerpts were first read and

comments were inserted manually into a word document. Table 5 shows a sample excerpt in which a provisional code was applied including a remark with a note to the researcher. When found to be recurring themes across all interviews, they were included into the coding scheme (see Appendix C). The combination of inductive and deductive coding allowed for continuous revision of the code set.

Table 5. Excerpt transcript (Dutch) containing provisional codes and remarks to the researcher

Excerpt transcript	Codes	Remark
En dat werd in boekjes gezet. En dan konden mensen, die zagen een boekje en dan wisten ze van hé, die woont bij ons in het dorp, oh daar zal ik eens even naartoe gaan naar die dat gedaan heeft. Dus dat werkte op die manier. Bij ons werkten boekjes heel goed. Dat hebben we zelf ook niet bedacht, dat kwam van het dorpsbelang, die zeiden dat van goh, zo'n boekje werkt heel goed denken wij. Maar als dat dan een goed voorbeeld is, dat wordt bewaard en dan kijken ze wel als ze eraan toe zijn. Oh, die heeft dat. Dan ga ik daar eens kijken.	*Capacity-building* *Driving factor*	Indicator of information provisioning residents
Dus, een hele belangrijke is dat we altijd heel erg goed geluisterd hebben naar onze inwoners. Van wat zij belangrijk vinden en wat zij wilden. En je zeiden bijvoorbeeld in 2015, jullie moeten iets doen voor die energie op te zetten. Een zonnepark is mooi, maar eigenlijk moet je iets doen met dat water om ons heen. Daar zit ook energie in; dat stroomt, daar moet je iets mee doen	*Opportunity;* *Local engagement*	Suggests open attitude to new ideas; also shared by community
Dus nu zijn we bezig met een partij, die gaan een onderwatervlieger neerzetten onder Ameland.	*Pilot*	Room for projects

After an initial exploring of the data in word, analysis continued in Atlas.ti. Using this software programme, the researcher could assign codes to multiple transcripts. This software programme also allowed to keep track of codes between interviewees and a focus group (the code count) and within each interview and focus group document (groundedness of codes). More specifically, the count refers to the amount of interviewees (and focus group participants) made reference to a certain code. In total, this count can be attributed a maximum of 15 times. The groundedness refers to the frequency with which a code was assigned. This category has unlimited amount of times a code can be referred to. Especially the code groundedness provided an indication to the relevance of a theme, lesson or critical moment. In the final round, the set of codes were reviewed and combined in a code group. Redundant codes were removed. MacCallum et al. (2019) note that proper coding conduct will increase the thoroughness and rigor of the research. This resulted in a final set of codes (n=54) that are displayed in table 9 (see Appendix C), which also contains the code count and groundedness.

3.5. ETHICS, VALIDITY AND RELIABILITY

The use of qualitative methods in this study also requires addressing ethical considerations as well as validity and reliability (Yin, 2009). This section starts with explaining the ethical considerations involved with this study. This is followed by an explanation on the measures that this study has taken in order to comply with validity and reliability requirements.

Yin (2009) proposes the following conditions with regards to ethical considerations. Firstly, in designing an ethically responsible study, it is imperative that participants are informed about the process and nature of the study. That includes providing information on how their responses will be dealt with and what happens to the data upon completion of the thesis. In order to comply with this condition, an informed consent form was created to notify participants and was signed prior to conducting the interviews. A template of this consent form is provided in Appendix D.

Another important condition is maintaining a level of anonymity and confidentiality. To this end, responses are anonymised by referring to the actor role instead of the name. Whenever the researcher intends to use a quote for illustration, the researcher will contact the participant again to ask for permission. Also, the interviewees and focus group participants received a digital copy of their respective transcript for further review and provide feedback. In this case, two interviewees provided feedback, which has been included in red writing of their respective transcript. As in line with the policy by Wageningen University and Research, the recordings obtained from the interviews/focus groups will be sent to the supervisor after the end of the thesis. The data will then be stored anonymously in the university's servers for a maximum duration of 10 years.

Furthermore, Yin (2009) also includes criteria with respect to validity and reliability for judging the quality of research designs. An important component of qualitative methods is the question of validity, which consists of an internal and external part. Internal validity refers to the use of input from multiple data sources, also known as 'triangulation'. This thesis does so by cross-checking the information received from the semi-structured interviews by organising a focus group to pinpoint any irregularities. External validity in research is the extent to which results obtained in the study can be generalised to other contexts. Given the focus on gathering learning experiences on Ameland, it is more than likely that other contexts will yield different outcomes. Nevertheless, it is expected that learning about transition paths, especially that of a frontrunner, can provide general insights regarding learning mechanisms that are applicable in other contexts. Hence, the issue of generalisability will be re-addressed in the discussion as part of transferability of lessons learned.

A last component is the reliability of research and refers to the consistency of the measurement in order to minimise errors and bias (Yin, 2009). In ensuring the consistency, it is important to be aware of the presence of the researcher in the research setting. Hence, the researcher will remain neutral and will refrain from steering the conversation while conducting the interviews or guiding the focus group. Also, the researcher sent out the transcripts to participants of the study for a final approval to ensure reliability of the data. Also, any notes made during the interviews and focus group will serve to provide an account of the data acquisition process.

4. RECONSTRUCTING THE TRANSITION ON AMELAND

As an extension to the case study approach discussed in the previous chapter, this chapter will provide a further description of the case study at hand: Ameland. Over the years, Ameland has gone through plenty of developments pertaining sustainability transitions. This chapter provides a short introduction to the island setting (section 4.1.). The subsequent section, section 4.2., will provide an overview of the transition developments in the recent history by means of constructing a timeline.

4.1. SETTING THE ISLAND SCENE

The island of Ameland is one of the eight islands situated in the Dutch part of the Wadden Sea, a world renowned UNESCO World Heritage Site, and borders the North Sea (see figure 7). The island has a landmass of 5.659 ha and contains a wide variety of landscape biotopes including beaches, forests, salt marshes, meadows, tidal flats (*het Wad*), dunes and agricultural pastures. The island is home to approximately 3.800 residents spread across the four villages of Hollum, Ballum, Nes and Buren (Gemeente Ameland, 2023; Van Dam and Van der Windt, 2022). The island is a municipality in the province of Friesland and can be reached from a ferry departing from the mainland near Holwerd (province of Friesland). Ameland is also a popular holiday destination as the island draws in 600.000 tourists on a yearly basis. Next to tourism as a major employer on the island, the Dutch Oil Company, or *Nederlandse Aardolie Maatschappij* (NAM) and the municipality are the other parties creating job opportunities (Van Dam and Van der Windt, 2022).

Figure 7. Overview of the Ameland study area
Photo: Ameland Rondvluchten

4.2. AMELAND'S TRANSITION AMBITIONS – A BRIEF HISTORICAL OVERVIEW

In order to better understand learning processes in STs, it is necessary to first establish a timeline (see figure 8) that summarises the transition developments on Ameland throughout the years. The timeline shows that the start of the transition on Ameland was marked by the municipality that initiated several local projects with a primary focus on renewable energy, which was met with positive responses (Van Dam and Van der Windt, 2022). That very same year, a mayor was also appointed who invited energy producing and gas companies to collaborate on a joint-ambition to make Ameland more sustainable (Van Dam and Van der Windt, 2022; Geerdink et al., 2020; Duurzaam Ameland, n.d.). This collaboration would later develop into the first partnership between private and public parties. This partnership provided a monetary incentive to the transition as these private parties invested in developing renewable energy, energy reduction savings measures and other sustainability initiatives on the island. In 2018, the mayor left office.

Soon after in 2007, the partners from the collaboration entered into a Covenant Sustainable Ameland intended to advance the idea of Ameland to become more sustainable and self-sufficient. The Covenant adopted a special focus on the energy transition (TNO, 2021; Wetzels et al., 2019). A beneficial impact of the Covenant is that it paved the way for small-scale innovative pilot projects stimulating the production of renewable energy (Gemeente Ameland, 2023). The signing parties included the municipality and a local energy cooperative (*Amelander Energie Coöperatie*), an energy

producing party and knowledge institutions. In the near future, two more Covenants would be signed that would introduce new stakeholders to the partnership. As a result, the period that followed showed an increase in momentum towards renewable energy applications (TNO, 2021). This momentum is evident from the pilots conducted in that period and the completion of a solar park in 2016 (Geerdink et al., 2020). An additional solar park is planned to start its first phase in 2023 in the Ballumerbocht (Gemeente Ameland, 2023). Next to starting construction of the solar park, a communication working group and and a small paper, the Sustainable Amelander were erected. This allowed to share the progress of developments and highlighted a resident as an example (Geerdink et al., 2020). 2018 marked island-wide engagement in which charrette rounds were organised to spark debate about renewable energy developments.

On a broader scale, Ameland's mentality aligns with the ambitions set by the Wadden Islands partnership (Samenwerkingsverband De Waddeneilanden, 2022). This partnerships consists of the four other Dutch Wadden islands like Texel, Vlieland, Terschelling and Schiermonnikoog. Together, they established the Execution Programme Wadden Area which represented an agenda containing points of direction for the upcoming transitions and other developments up until 2050. The executive Programme passed its final approval in 2023 by the national government. In total, the Programme contains five themes or sub-lines that make up the 'Regio Deal Waddeneilanden' or Region Wadden Islands. These sub-lines, including a brief description are listed below (Rijksoverheid, 2023b):

1. *Sufficient & affordable housing* – realisation of affordable housing units for (young) islanders and employees as well as optimising services (e.g. health care).
2. *Future-resilient entrepreneurship & development* – explore options to diversify the islands' revenue streams and focus on providing a good quality education.
3. *Accessibility & Connectivity* – improve accessibility of the islands. The sub-line recognises the ferry as vital mode of transportation to and from the islands, but also dedicate efforts to exploring more sustainable modes of transport.
4. *Renewable energy* – create a robust energy infrastructure with a special focus on producing renewable energy (e.g. solar and wind power). Also focus on exchanging best practices between energy cooperatives on the islands.
5. *Circular economy* – develop material flow analyses for all the islands. This sub-line represents an all-encompassing theme that addresses smart water usage, making efficient use of available resources and to improve cooperation and adoption of integrated approach to projects.

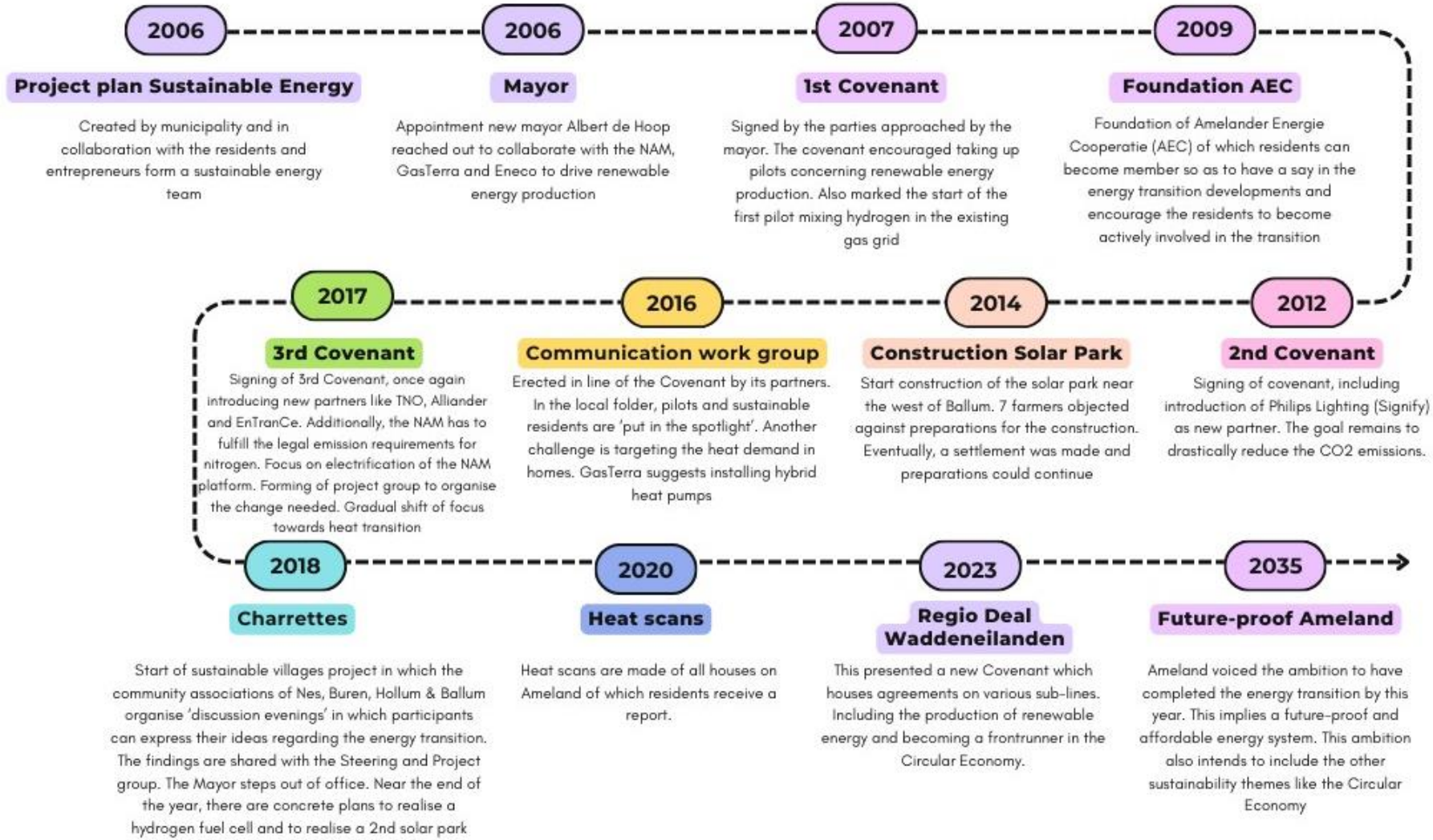

Figure 8. Timeline showing 18 years of transition developments taking place on Ameland and the final target in 2035 (adapted from Gemeente Ameland, 2023; Geerdink et al., 2020)

5. RESULTS: CREATING A LEARNING HISTORY

In the previous chapter, a historical overview is provided of the transition developments on the island (mainly from 2006 up until 2025). Though illustrative of the ongoing developments, this overview does not specify moments in time that inspired actual change nor does it consider lessons learned. With the help of a learning history, this chapter was able to reconstruct Ameland's transition trajectory. As part of this reconstructive exercise, this chapter will elicit the critical moments and lessons learned that have helped advancing transitions on Ameland. Interestingly, the findings show that Ameland is in fact going through three simultaneous transitions: an energy, heat and circular transition.

This chapter reads as follows: the findings will first focus on pinpointing the critical moments from an exhaustive list of factual events spanning the three transitions (see section 5.1.). The subsequent section (5.2.) formulates lessons learned from the transitions and will further explore the learning capacity of a concerted network. Third, section 5.3. will address the learning capacity of the Amelander network. The final section, section 5.4., will provide further insights on how actors in the Amelander network attempt to transcend Ameland as island context and how they collectively investigate the applicability of experiences to future transitions.

Overall, the critical moments and lessons learned as part of the learning history are derived from interviews held with representatives from the municipality, local businesses, community association, nature organisation and knowledge institutions. Additional verification of statements and identification of relevant experiences for other contexts occurred via a focus group consisting of a similar group of stakeholders.

5.1. CRITICAL MOMENTS

As part of the interviews and focus group, events and lessons of the three transition have been documented and evaluated using the learning history approach. Participants were asked to provide an account of their experiences related to the energy transition and STs as a whole. The goal here is to create recollection of experiences and marking events that serve as critical moments in the transition process thus far. A compiled overview of these events and lessons learned is included on the timeline (see figure 9) that shows Ameland's transition trajectory. The timeline sub-divides the events and associated lessons learned per transition. The blue bar denotes the energy transition, the yellow bar that of the heat transition and the green bar marks the circular transition.

While each event undoubtedly instigated a certain degree of change, not all of them can be demarcated as a critical moment. These are based on moments in time were extensive reflection took place. Reflection may occur after shock events, changing interactions between stakeholders or as the result of discursive change. A total of six critical moments are identified. These are indicated with a number (1-6) in figure 9. Upon closer examination of the critical moments, one can observe that in most cases changes were deliberate. Yet, one external crisis demonstrates that change can sometimes be unplanned.

Critical moment 1. Swearing in of the mayor

This critical moment appeared at the beginning of the energy transition in 2006 when Albert the Hoop was sworn in as mayor for Ameland. His arrival opened up the conversation and mobilised stakeholders because of his strong ambitions to make Ameland more sustainable/energy neutral. According to a research representative this put Ameland in a unique situation as the municipality started to play a decisive role in the energy transition. At the time, the majority of municipalities opted for a more facilitative role. The mayor mostly had an outreaching effect, which was made evident by the formation of the covenant Sustainable Ameland which included various knowledge institutions and energy partners. Interestingly, the mayor's leadership brought parties to the table that brought knowledge to the network and were willing to invest in sustainability initiatives on the island. The partners invited by the mayor can be said to originate from his own network with the primary purpose of making the island more sustainable. This generated momentum in the initial years of the energy transition. This is best-illustrated in the following quote:

"And we had a mayor who was very enthusiastic about energy and the energy transition and savings and particularly that other companies would pay that for us. And that presented an easy point of entry for us."

(Community association representative, 6-12-2023, translated from Dutch)

However, the focus group pointed out that 2014 marked a change in perception towards the mayor's role as initiator. At that moment in time, the mayor was criticised for taking too much ownership of the transition. According to the panel members, he was drawing in too many projects. Instead, participants advocated for a greater role to be played by residents in transitions. This implied a changing role for the municipality from initiator to a facilitator of the energy transition. This sentiment was confirmed by a former municipality representative who also acknowledged this shift. He argued that the top-down approach accelerated change in the beginning years, but soon realised you need support from the residents. Overall, the arrival of the mayor can be distinguished as a critical moment, because it demonstrates transitions benefit from a strong initiator to overcome barriers in the starting phase of a transition. But as a transition matures, leadership needs to become more widely shared.

Critical moment 2. Foundation Amelander Energy Cooperative (AEC)

The foundation of the AEC in 2009 marks the second critical moment. A visit to the Danish island Samsø preceded this critical moment. An AEC representative explains that Samsø can be considered an exemplary case for sustainability. The representative indicated he became inspired by the idea of setting up an energy cooperative. The cooperative on Ameland would have a main purpose of making the island self-sufficient by means of meeting the energy demand using renewable alternatives. The founding of the cooperative marked the start of involving residents in the energy transition. This sentiment is displayed in the following quote:

"…, because using that approach [founding AEC], you involve everyone in the energy transition. And that is what you need, you need as many people as you can find. Not a policy maker or something like that."

(AEC representative, 28-11-2023, translated from Dutch)

Interestingly, this quote highlights the discursive change that a transition should not be approached from the top down. Instead, a transition should be initiated bottom-up through residents who will start to play a more active role in shaping transitions. This further signals a changing relationship between the municipality, AEC and the residents. This is characterised by a mutual exchange. For example, the municipality helped the AEC to professionalise and the AEC showed the importance of informal interactions through kitchen table conversations. This has approach inspired the municipality to adopt the participative model. But most importantly, the foundation of the AEC provided a voice to residents in shaping the energy transition. More specifically, cooperatives are structured in a way that members are co-owners, meaning they also have decision power.

Critical moment 3. Appointment programme manager sustainability

This critical moment coincides with the appointment of a programme manager for sustainability for the municipality of Ameland in 2014. His role is to initiate renewable energy projects, but he also has put the heat transition on the map. In fact, the energy and heat transition are close related as he placed the focus on insulating homes, which presents the heat side to the energy transition. Several interviewees indicated that he has taken over the initiating role from the mayor. In cases where interviewees referred to him, they particularly praised his do-mentality. One former municipality representative expressed the following:

"*He is an important islander. He has lived there [Ameland] for 30 years and he is very, he will provide a less-polished story than I will. He is more do, less talk."*

(Former municipality representative, 29-11-2023, translated from Dutch)

This quote suggests a more pro-active approach as opposed to the conventional preference to discussion rhetoric in transition developments. Another AEC representative explained that such a do-mentality is not common in governmental official. Again, this reinforces the importance of taking concrete steps towards realising sustainability initiatives. One council member expressed the following connection between do-mentality and realisation of the solar park:

"And that is where Ameland has guts. So yeah, in that respect, I do think Ameland has a frontrunners position, because we simply do it. And why do we do it, because we have a Luc van Tiggelen at the municipality and we used to have a mayor who took up a leading role in erecting the solar park."

(Council member representative, 13-12-2023, translated from Dutch)

This quote attributes an instrumental role to two municipal actors in pursuing renewable initiatives. Contrasting the programme manager as critical moment from that of mayor points towards a difference in leadership. In fact, the programme manager embodies the municipal shift facilitating a bottom-up approach. The municipality started viewing residents more to hold expert knowledge as

well. Therefore, working closely with the Amelanders became a starting point for transitions. As a result, the municipality established stronger connections with the community associations. But also the process of identifying alternative sources of renewable energy is done collectively with residents from each village through information evenings.

Critical moment 4. Realisation of the solar park

This critical moment refers to the establishment of the solar park in 2016. The idea to do so stemmed from the mayor. During his holiday to France, he was inspired by the construction of a solar park near his holiday address. Once returned to Ameland, he wondered whether this was possible for Ameland as well. That same afternoon, this idea was taken up and potential locations were explored. Ultimately, the idea was realised making Ameland the first to create a solar park in the Netherlands. This solidified Ameland's status as frontrunner of the energy transition. In addition, the solar park put Ameland on the map as 'living lab' for companies who seek to test their novel technologies.

Furthermore, the completion of the solar park demonstrates the importance of showcasing concrete projects to a wider audience, communicating tangible assets as prerequisite for an ST. A panel member explained that this created publicity for Ameland as they featured in the news. The publicity potential was also addressed by a municipal representative. He argued that the solar park brought about discursive change among local entrepreneurs. He recalled that the park drew in visitors interested to see the solar park. They rented bikes, dined in restaurants and carried out other activities. This generated income for the local entrepreneurs. Similarly, the ambition of the solar park also marked the start of more actively engaging residents in the transition process. This is portrayed in the following quote:

"And what was quite remarkable, and that is what I find an important point, is that as soon as this ambition arised surrounding the first solar park, the municipality was actively discussing with the islanders about all those plans and ideas. This quickly created a sense among islanders that this energy transition belonged to us."

(Former municipality representative, 29-11-2023, translated from Dutch)

This quote highlights the benefits of engaging local residents and other islanders in the transition process. Particularly because this changed the attitude towards sustainability measures. For the entrepreneurs, sustainability was now perceived to have economic potential and it brought the energy transition closer to the residents. The necessity to have tangible components was stressed further during the panel discussion. The panel unanimously agreed that CE remains an ambiguous concept and is mostly present as a paper practice. In reality, this is present in the lack of utility and benefit perceived from the circular transition. It was reasoned that concrete projects and its tangible outcomes can help communicating the sense of urgency and clarifies what is entailed with a transition.

Critical moment 5. Heat scans

In 2020, heat scans were made of nearly all houses on the island. This was done using help from volunteers from the community associations. After the scans were conducted, everyone interested could receive a report containing images of potential heat leaks. The reason to mark heat scans as a critical moment is that there is a greater emphasis on local engagement. More than the energy transition, the heat scans marked that transitions should not be primarily an endeavour led by a government to impose measures. According to a former municipal representative interviewed, the heat transition is inherently tied to people's homes, which are variable meaning there is no universal solution. This also showed that you have to visit each house to discuss plans and opportunities with the owner in question.

Furthermore, the heat scans indicate a changing relationship between the municipality and community associations. A former municipality representative explained that the heat scans made them realise that they could rely more on community associations. This sentiment is best-reflected in the following quote:

"But that all happened using volunteers. So the community associations were really like that is our thing so to say. So that contributed a whole lot to expanding the knowledge about the energy transition. And you will notice that people will work on it without the municipality interfering, that people will start mutually discussing about it and will visit each other. … . So from that point onward on Ameland, we did not do anything without including the community association and the energy cooperative and the entrepreneur association."

(Former municipality representative, 29-11-2023, translated from Dutch)

This prompted a wider realisation that extended beyond the delivery of the heat scan report as product. The involvement of volunteers was claimed to expand on the knowledge as well as strengthened social cohesion because it sparked mutual discussion among residents. Overall, the heat scans as critical moment demonstrate how attributing responsibility to community can increase backing for a transition.

Critical moment 6. Energy crisis

This critical moment represents an external event that is rooted in the conflict in the Ukraine, which started in 2022. Though presenting an external development, the effects of this conflict affected Ameland as well. The most notable effects addressed by participants of this study included a rise in gas prices and participants raised concerns over potential gas deficits. Despite having negative consequences, participants of the study also addressed positive implications. For example, the crisis generated substantial increase in awareness and placed greater emphasis on independent energy production. For instance, people became more aware of their energy usage and started actively investing win ways to cut down on their energy bill. Commenting on this issue, a museum representative provided the following experience for their organisation after switching to a new provider:

"And I think that the energy costs for just that location alone would increase five- or eightfold. And on the back of a matchbox, we calculated that we would go bankrupt after eight years. That isn't normal. And that is when we learned: 'oh, we have to start producing ourselves.' We placed a lot of solar panels and found out that we had to reduce. A transition always starts with reducing."

(Museum representative, 1-2-2024, Translated from Dutch)

This signals a sense of urgency as the rising energy prices threatened to impact the museum financially. In practice, this translated to reducing efforts through monitoring of usage in order to make informed decisions. This theme also came up in the panel discussion where participants expressed that utility and urgency are not felt yet for the circular transition. The participants present argued that in order for this to happen, people need to be impacted financially. This impact is most notably present in a crisis. Therefore, this critical moment communicates that a transition needs an external push factor to induce a sense of urgency.

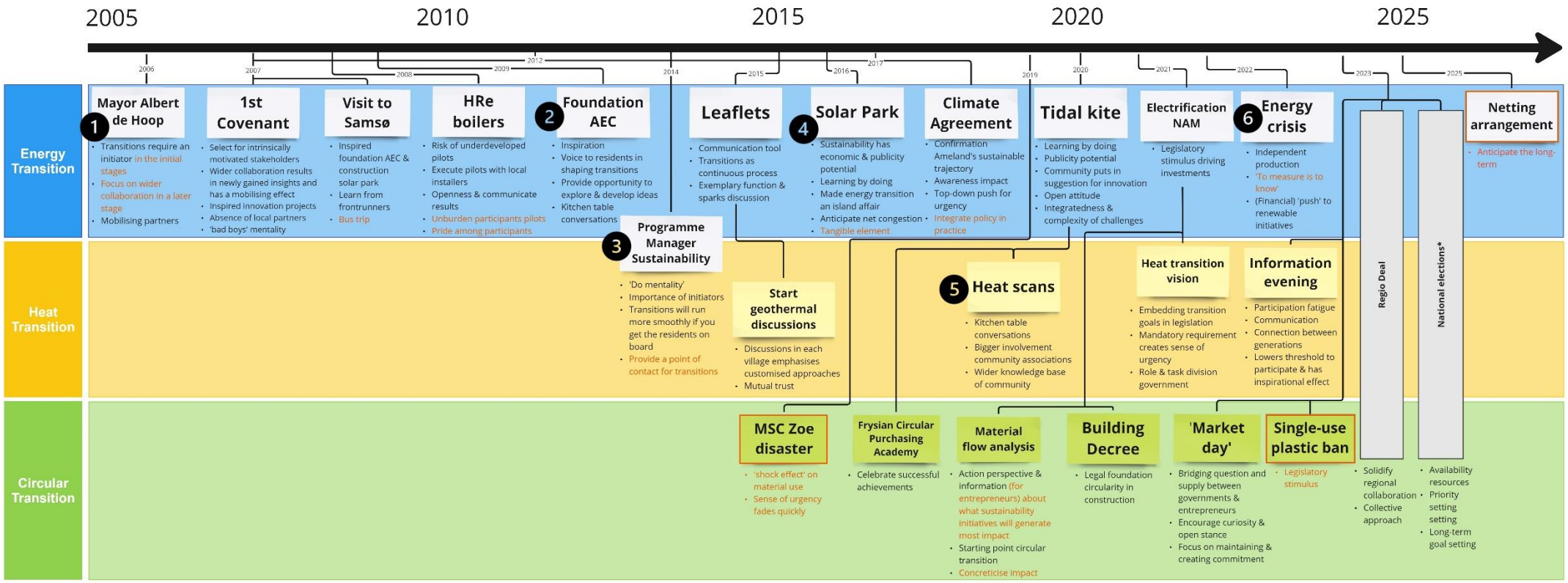

Figure 9. Swimming lane diagram of Ameland's learning history displaying the most important events and associated lessons learned for the ongoing energy, heat and circular transition. The text and boxes highlighted in orange depict the additions extracted from the focus group discussion. The numbers (1-6) denote critical moments

5.2. LESSONS LEARNED

This section will address the lessons learned from the experiences gained with innovation projects and other developments as part of Ameland's transition trajectory. Not only will these lessons prove valuable for progressing Ameland's future STs, they may also be relevant for other regions seeking to further develop their transition ambitions. Concretely, this retrospective exercise in interviewees and focus group participants showed that pinpointing lessons learned is not necessarily a straightforward process. In some lessons learned, it is worth acknowledging that in some cases, coming up with lessons learned posed a struggle. Overall, eight lessons have been defined in this section. This section will end with a description of the learning capacity of Ameland as concerted network in 5.2.1.

Lesson 1. It is important that initiators feel compelled to take the lead in transition developments
A lesson learned that can be derived from the critical moments pertaining the mayor, founding of the AEC and the programme manager of sustainability is that you need initiators in the initial phases of a transition to generate momentum. Generally, an initiator was often reported to exert influence on developments. An initiator is active on multiple fronts through increasing support for a transition, ensuring that projects are implemented and urgency and utility are communicated in an understandable manner to residents and entrepreneurs. Initiators also play a unifying role by means of mobilising stakeholders and visibly demonstrating a change trajectory. As addressed earlier in critical moment 1, a critical sidenote to the role of an initiator is that he or she may also take too much ownership of a transition.

Despite this point of criticism pertaining the role of an initiators, participants from interviews and focus group clearly recognised the need for appointing an initiator. However, to date no initiator has been identified yet for the circular transition. One knowledge institution representative remarked the following when asked about who should take up this role in the circular transition:

"No, no. It [circular transition] is still in its infancy and someone has to be compelled to take up that role. And he should also receive the opportunity and means necessary to fulfil that role. So far, that has not happened yet."

(Knowledge institution representative W1, 28-11-2023, translated from Dutch)

Commenting on the absence of an initiator, interviewees replied with a set of characteristics that potential candidates should comply with. Valued traits include intrinsic motivation, independency from organisations, perseverance, visionary and have a do-mentality. This mentality presents a unique characteristic reflected in a daring attitude that brought Ameland to its status as frontrunner of the energy transition. In addition, the candidate should fulfil a stature role in society, like the mayor. Stature refers to being visible in society and act as a primary point of contact for residents. In spite of these characteristics, no individual has been found who embodies these traits.

In the focus group, this matter of initiator for a circular transition was discussed to greater detail. The discussion pointed out that an initiator does not necessarily have to stem from a municipal background. Initiators can also be a company director, an engaged resident or a mix of parties. But, there is also a higher risk of such a broadly shared initiator's position to fall apart. Interestingly, nearing the end of the focus group discussion, an energy cooperative representative present stated he wanted to take up the initiator's position for the new transition with special attention to drinking water. Another panel member suggested that this role should be fulfilled by the company responsible for drinking water supply. Overall, this illustrates the diverging views on who can be deemed an appropriate candidate for the initiator's position and whether this role should be fulfilled by an individual, small group of individuals or an organisation.

Lesson 2. Local identity features are starting points to build a transition on

This lesson refers to aligning of renewable initiatives to the local identity. In Ameland's case, the island mentality resonated well with the ambitions to become energy neutral. Particularly the drive towards self-sufficiency and social cohesion often returned as core identity features. More specifically, compared to a regular village on the mainland, the Amelander community is more reliant on one another. This reliance stems from the past where the ability to self-support was vital for sustenance. This sentiment is reflected in the following quote:

"In the past, there was always the possibility that during the winters, the Wadden Sea would freeze over. The ferry would not go out anymore and you were completely left to fend for yourself and make sure that you would have sufficient amount of food to bridge the winter. So take what you could get. Meaning that if anything of value washed ashore, then you had to be there. If by any means possible, you would share it with your fellow villagers and with the other islanders. And yeah, that is in our genes and that is why you have a strong social cohesion on such an island. And that is the sentiment I made use of when founding the energy cooperative by focussing on self-sufficiency as that resonates well with the islanders."

(Representative AEC, 30-11-2023, translated from Dutch)

This quote reveals how historical events have influenced the current preference towards self-sufficiency, which in return sparked mutual dependence among the islanders. This has resulted in a tightly-knit community where everyone knows everyone. This points towards a concerted network with short distance to communicate and spontaneous conversations. In addition, this quote demonstrates how the AEC representative leveraged these identity features to serve as the foundation for establishing the Cooperative. Other interviewees confirmed this sentiment of self-reliance to embedded in the island fabric. Therefore, this statement reveals that alignment with local social and cultural factors can lead to greater acceptance and support of a development.

Lesson 3. Intrinsic motivation plays a significant role in collaboration

This lesson focuses on the role of intrinsic motivation in a transition. Especially in the selection process at the start of collaboration. Most notably, two interviewees recalled that initially they had not considered intrinsic motivation up until later in collaboration. For the municipal representative, this realisation appeared after switching CEOs. The representative stated that the previous CEO he worked with showed interest and dedication to Ameland's sustainability initiatives, while his successor did not. He stated that unfortunately, working with the new CEO did not lead to anything. Following this experience, he explained that the municipality started to devote more attention to screening:

"I would start searching even more for intrinsically driven people. In the beginning, we did not do that and we only realised later. … . So really people who show commitment. That is what I would look for even more seriously."

(Municipal representative M1, 22-11-2023, translated from Dutch)

Similarly, an energy cooperative representative put forward the growing friction between board members of the cooperative and Council of Commissioners. He explained that one Commissioner turned out to be too demanding. Eventually, the Council stepped down which, according to the cooperative representative, resulted in a crisis situation. In the end, a new Council was appointed and the crisis was averted. The cooperative representative that this situation could have been prevented by paying better attention to the selection process:

"But if we had better screened the commissioners in advance, then we would not have asked this financial man obviously. So we should have looked better what type of person is it. In spite of it [Ameland] being a small community and that you know everyone. It turned out that we did not know this man well enough."

(AEC representative, 28-11-2023, translated from Dutch)

Overall, this focus on intrinsic motivation was confirmed in the focus group discussion in which selection of committed individuals also returned. For example, panel members advocated to focus on selecting committed individuals regardless of background and role in the network. Yet, the contribution of intrinsic motivation was also nuanced, particularly when considering the circular transition. More specifically, panel members argued in favour of legislation rather than relying solely on intrinsic motivation in order to install a sense of urgency among entrepreneurs and residents to change their behaviour. This will be discussed to greater detail in section 5.3.

Lesson 4. Exposure in the media can help bring attention to a transition

This lesson is based the perceived benefit of media attention for generating publicity for pilots, especially when these have proven successful. This was made particularly evident by the solar park, which led to visibility for the region (see critical moment 4). This was the outward effect that was also recognised by the focus group. In addition to the outward effect, exposure through (national) news outlets is also found to have an internal effect. To give an example, within a community, media exposure was claimed to boost a sense of pride among residents and entrepreneurs on Ameland and was reasoned to positively influence uptake of sustainability measures. As the focus group discussion progressed and the focus shifted to finding an appealing project for the circular economy, exposure once again returned as an important item to bring attention to a project. As a result, the focus group realised that formulating an appealing idea and relying on the network are not enough, but also require developing a marketing strategy (which includes reaching the national news) in order to have a successful pilot. Hence, this leads to believe that exposure by the media was formulated as an important consolidator of success.

While showcasing success undoubtedly facilitates garnering support for STs, innovations need to be featured prime-time in order to receive the exposure needed. One community association representative explained that on numerous occasions, Ameland had a successful project, but the project was eventually overshadowed by another news item. This is exemplified in the following quote:

"Yes, we had a good project. But every time we had the scoop so to say, some disaster struck somewhere in the world. They had visited from the NOS [Dutch media outlet], but then we still end up in the 6 o'clock version in the morning. Then you miss so much exposure, so much. If you only have a small headline on NOS.nl or with the Telegraaf [Dutch newspaper] or what else. There is so much difference in how the Netherlands takes up the news then and how many respond to it and how proud people are of it [pilot project]."

(Community association representative, 1-2-2023, translated from Dutch)

This quote demonstrates that media outlets can facilitate spreading awareness on a transition. But at the same time, innovations will need to feature in the right media slots in order to ensure that a wide target audience is reached.

Lesson 5. A transition benefits from creating long-term visions

This lesson responds to the desire to establish a continuity of measures by laying out a long-term vision. Judging from the accounts provided by interviewees and the focus group, a clear direction for transitions remains largely lacking. However, rolling out a direction is particularly complicated by the short-term scope by politics. In several interviews, this returned in relation to the recent Dutch Provincial and national elections. One of the interviewees from the circular association in Friesland remarked the outcomes could affect the ambitions and financial resources made available for sustainability measures. In addressing this issue, she responded with the following statement:

"… you do not want to be constantly dependent on political developments. So you will have to put some sort of dot on the horizon far away from which you can reason backwards, actually back casting what is already there

and what is needed now. And that is important, because if you only look at politics, you are in the whim of the day and the whim of four years."

(Representative Circular Association Friesland, 4-1-2024, translated from Dutch)

This quote above reveals that having a long-term vision does offer a means to navigate the changing political field. Other interviews with a council member and knowledge institution confirmed the current narrow scope. They warn that a narrow scope runs the risk of plans changing course of action which harms the continuity of actions. At the same time, politics can also inspire direction setting. To give an example, interviewees and panel members referred to the mandatory Regionale EnergieStrategie, or Regional Energy Strategy (RES). As a result, provincial governments would create plans for integration of renewable energy and insulation measures to guide long-term decisions.

Yet, creating a long-term strategy is not only difficult from a political point of view, the short-term scope is also present in wider society. From the interviews and focus group discussion, it appears that people have difficulty in visualising or anticipating future events. In addition, panel members described that the occurrence of crisis events such as economic sanctions, global pandemics and so from the past decade clarified the need to anticipate future events. This sparked a discussion about that people do not seem to respond to the risks nor the long-term impact of their behaviour. This leads to believe that people find it hard to visualise the impact of current behaviour on livelihoods for future generations. A reason that panel members attributed to this lack of direction is that the transition towards, for instance a circular economy is not clear. In the interviews, a solution was offered to create road maps to visualise the direction. In the following quote, one knowledge institution representative explains the benefit after having created such a roadmap:

"Before that, well the overview was just less, less visual so to say. And precisely visualising those cause-effect relationships, allows to take a collective view and find out like hey, something is missing here or how does this work. And so, if you have a better overview, then you can also take more targeted decisions and eventually also allocate energy and money more effectively."

(Knowledge institution representative W1, 28-11-2023, translated from Dutch)

Lesson 6. Numbers tell the tale in a transition

This lesson underlines the importance of data input to provide insights on where one can make most impact in a transition and forms the basis to make informed decisions. As addressed earlier in critical moment surrounding the energy crisis, prices rose quickly. This prompted reducing the energy demand and make efforts to localise energy production. This experience is illustrated in the following quote:

"A transition always start with reducing. But in order to do so, you need data and we did not have that. … . We did not know anything and that presented a major learning point for us that you need the data. Ever since, we have been keeping track of it."

(Museum representative, 1-2-2024, translated from Dutch)

As a result of this situation, the museum representative indicated that they started monitoring their daily energy usage in order to determine a trend. This helped them to take more targeted savings measures in reducing energy consumption. Key to establishing this trend and further reduction efforts was the data on energy use. In the beginning however, the museum representative commented that they did not have the data at their disposition. For instance, this complicated estimating the museum's daily energy use and where they could take energy savings measures. Other focus group members confirmed this issue with the exchange of data. According to the panel members present, this issue mainly revolves around the reluctancy of grid operators to supply the data. One municipal

representative commented that he had just received the data from a grid operator. But this data should be approached with scrutiny as the dataset contains estimations.

A similar observation is made for the circular transition in which the question was raised whether it was clear for entrepreneurs where one can make most impact in terms of sustainability measures. In the example, a situation was addressed in which the owner of a restaurant had an estimation made of where they would make most impact. This is illustrated in the quote below:

"But it is also about if you are aware as an entrepreneur that you can make most impact there [with what you serve on the menu]. Because you can say: 'well yeah, but I have solar panels on my roof, so I am already contributing.' But maybe that is not all."

(Knowledge institution representative W2, 1-2-2024)

This quote demonstrates the benefits of having the numbers point out at what fronts changes can be made. For the restaurant owner in question, the calculation led to surprising results. The results pointed out that from all measures taken, i.e. composting toilet, solar panels, capturing rainwater, the restaurant owner would make the biggest sustainability impact with what was served on the menu. This example explained above shows that having the insights will increase awareness on where to take action.

Overall, both examples point towards the relevance of obtaining data insights as a means to clarify where reduction measures will be most impactful.

Lesson 7. A transition requires paying more attention to broader stakeholder engagement

This lesson revolves around creating appropriate means to engaging residents and other stakeholders. In fact, the event that sparked wider focus on stakeholder engagement is the trial with HRe boilers in 2008. As part of this pilot, boilers were placed in people's homes that provide both heat and produce electricity. However, in due course, multiple of these installations caught fire which caused unrest on the island. One of the researchers involved in generating an overview of the energy transition, quoted the following excerpt from a report:

"And I quote: 'a lot of residents are dissatisfied with the way in which the company handles their complaints. After intervention from the mayor, the communication with residents is drastically altered and other boilers are installed by the gas company. And here, the failure of the experiment had negative implications for the upcoming experiments on Ameland, because the residents started with a deficit in trust."

(Researcher, 16-1-2024, translated from Dutch)

With this statement, the researcher warned that there is always a risk involved in testing new technologies. According to the researcher, if consequences are not communicated properly, this will have wider implications on trust levels in society. Especially on an island where word of the boilers catching fire quickly spread across the island. Another reason why residents were critical of this pilot was the lack of including local installers. To the local installers, excluding them from the pilot was perceived as a loss of income. Overall, this pilot brought about the realisation that it is better to include local stakeholders and communicate plans and ideas in the transition process.

Interestingly, the pilot with the HRe boilers also had positive implications according to a community representative. A positive experienced that was related to testing the boilers included that participants in that study felt that they were completely unburdened throughout the project. To give a few examples, the company trialling the innovation paid regular visits to the households to monitor the equipment and participants received additional fire detectors. In the focus group, other panel members also confirmed the relevance of unburdening participants in a study. One entrepreneur

noticed that generally in a transition, people are left to gather the information themselves, which takes up a lot of time. Instead, he argued for the following:

"I think that it is very important that if we decide as government that when something has to be done, that you provide that on a silver platter to people. Like: 'look, do this and that with your house, we take care of it all and you will not even have to think about it.' I think that is very important."

(Entrepreneur representative En2, 1-2-2024, translated from Dutch)

After this pilot, more attention was paid to providing information on the transition process through leaflets and information evenings to give a few examples. In addition, residents were also more actively involved in the transition process. A primary example of this is the construction of the solar park, which sparked more active engagement of the islanders in the transition process (see critical moment 4).

Yet, these information evenings also revealed a new issue with participation. Namely that of recurrence of the usual suspects in participation and inability to find strategies that resonate with a wider demographic. More specifically, youth are mostly perceived to be absent from information evenings. In addition, interviewees mentioned that usually, the same group of people attend these meetings. This removes the opportunity for broader discussion and exploring the diversity of opinions and ideas. One interviewee was particularly critical of the following:

"… and what I often hear now is participation, participation. Well, that presents nothing more or less than to discuss with your residents and to allow them to come up with suggestions. And then you can see that on such an evening, the youth is not present. And then I think, no, do you know what you should do? Make an interesting video where you get a hold of the opinion of the younger generation. That is something that is not clear, certainly not on a governmental level."

(Council member representative, 13-12-2023, translated from Dutch)

This statement appeared in response of the information evenings that were perceived too lengthy. Alternative, this quote also points towards using the appropriate platforms to spread the message and reach a wider audience. Right now, the possibility was mentioned to include social media. This was put forward as a more interactive way of spreading messages that targets younger audiences. Another solution was suggested by a programme manager of Collaborative Partnership the Wadden Islands is to alternate between participation strategies on top of information evenings. He indicated that current methods run the risk of participation fatigue, which increases the likelihood of including only the 'usual suspects'. Ultimately, this argues for a mix of participation strategies consisting of surveying, kitchen table conversations, etc. Doing so will attract a diverse group of people that will bring new perspectives to the table.

5.3. LEARNING CAPACITY

Having compiled a list of critical moments and associated lessons learned, this section will more closely examine what the network has gained from its transition efforts. So far, the findings point towards a relatively strong network consisting of both on-island and external relationships. Thus far, the findings revealed that the learning process has increasingly focussed on collaborative efforts characterised by a hands-on approach and short distance to meet. This is reflected in the investment in high-quality interaction, knowledge production and transfer and reflexivity.

First of all, Ameland's transition trajectory demonstrates that investment in high-quality interaction translates to results in practice. A primary example of this interaction was found in the collaboration between stakeholders both on and off the island in the Covenant. Each of these parties could provide resources in terms of expertise or funding to the table. This interaction resulted in a common ambition

to invest in and create renewable energy projects on Ameland. This brought forward 'icon projects' such as the solar park and had a further mobilising effect to get stakeholders working with the transition. However, as one researcher pointed out, the covenant mostly operated ad hoc and approached the transitions on Ameland as top-down. But, as the critical moments and lessons learned showed, more importance is attributed to including residents. Residents were shown to have extensive personal networks themselves and could quickly mobilise volunteers. This is especially evident in the heat scans, where volunteers helped the municipality out in making scans of homes to see wherever 'heat leaks' occurred. Interestingly, this example is also evidence of the changing interaction between community associations and municipality. More specifically, the municipality distributed some of their governmental tasks to the community associations in return for reimbursement. This reinforced the ties between municipality and community. However, communication often falters. For instance, a community association representative recalled the situation in which they had to distribute P1 meters. To the community association, the expectations, contact persons, who should receive such a meter and so on was not clear.

Secondly, there are also signs of knowledge production and transfer throughout the network. For example, the collaboration between parties present in the covenant predominantly gained experience with realising innovation project. Knowledge gained included what obstacles obstruct realisation, contact information with other companies, insights in the decision-making process, approaching issues from multiple angles and a clarification of the challenges at hand. Interestingly, knowledge production on Ameland was not restricted to experts or companies. In the community, signs of knowledge production is displayed in the heat scans. This mostly increased awareness on the heat transition (see critical moment 5). But capacity-building within the community can also be inherently tied to the ability to transfer information in the island network. As an example, the leaflets are often put forward by interviewees as an important communication tool in the transition. Not only do the leaflets explain innovation projects, but these also highlight 'sustainable Amelanders'. The latter was especially helpful as exemplary function for other residents. A municipal representative indicated that neighbours would visit the neighbour that had featured in the leaflet with the renewable initiative and also got community members talking about sustainability initiatives.

Lastly, reflexivity can be found in learning-by-doing approach which continues to drive Ameland's innovation projects. Using this approach, the Amelander community can simultaneously act and reflect upon lessons learned. Even in light of uncertainties associated with novel technologies, the 'do-mentality' remains highly valued by participants to this study. This gears learning towards experimentation through intervention. This focus on learning by doing, places pilots within real life. According to an entrepreneur, this opens up the space for multiple parties to learn: companies who have developed the technique, the municipality and residents. Notable solutions that resulted due to the learning by doing approach included the addition of a battery for the second solar park as means to anticipate grid congestion. Another example refers to the greater importance that is being attributed to residents and other local stakeholders in shaping transitions. Key to this learning by doing approach is transparent communication. Not just on the overall process and project outcomes, but also when mistakes are made. According to a programme manager of Collaborative Partnership the Wadden Islands, one has to accept that projects may fail, but that these present important opportunities to learn.

5.4. A FUTURE OUTLOOK FOR THE CIRCULAR TRANSITION

As stated before, Ameland is currently undergoing an energy, heat and circular transition. Each transition brings forward new challenges and therefore new lessons to be learned. This requires going

beyond the frontiers of the currently unfolding transitions on Ameland towards a future outlook. Central to this outlook is to focus on applicability of lessons learned from previous transitions to future transitions and whether the approach to future transitions should remain the same or require a completely different approach. This theme was discussed as part of a focus group discussion.

In the beginning of the focus group, the discussion pointed out that unlike the energy transition, the transition towards a circular economy is not perceived as a clear process. More specifically, circularity as a concept was reported to remain too abstract. Especially in terms of where you can make most impact and how circularity can be translated into targetable action. One actor even commented that similar to the sustainability concept, CE runs the risk of becoming a buzzword without people knowing what it actually means. In addition, circularity is perceived as a topic that is not directly of interest. This sentiment is reflected in the following discussion between panel members (see text box 2):

C:	*Personally, I do not have the feeling that with people, at my place, with entrepreneurs that circularity plays a big role. It is still very much a paper far-from-my-bed show [issue that is not directly of interest].*
Cm:	*It is not tangible enough yet?*
M1:	*Someone who is passionate about it, will do it. But the larger masses will not yet.*
C:	*The larger masses do not see the advantage of the …*
W:	*It does not come close enough yet.*
M1:	*It does not hurt enough.*
E:	*Until the beaches here [on Ameland] were full of rubbish from the MSC ZOE disaster*
C:	*That is when, …*
E:	*That is when we got a shock that left us thinking: 'what just happened?' and 'Do we need all of this stuff?'. Yes, this is what is going on around the world and do we need to continue all of this? But this sentiment quickly fades.*

Text box 2. Focus group fragment translated from Dutch (C: community association representative, Cm: co-moderator, M: municipal representative, W: knowledge institution representative, E: AEC representative)

This discussion above shows that at the moment, utility and urgency for circularity are not clearly felt by the wider public. Even in light of the MSC ZOE disaster in which people were confronted with their consumption, the urgency was apparently not felt enough. This appears to align with statements made in earlier interviews that pointed out that the circularity transitions is mainly an awareness process. Overall, this communicates that the transition to a circular economy is not concrete yet.

After the panel members established the need for concrete projects to communicate what a transition to a circular economy entails, the discussion continued on what is exactly needed to make this happen. In doing so, panel members pointed out that circularity remains a paper practice, which makes it harder to steer towards uptake as it is simply not mandatory. One panel member commented that as a municipality, they can only communicate a preference to include circularity in business operations. Although she added that there are entrepreneurs who show willingness to include circularity in their business operations, uptake remains primarily reliant on intrinsic motivation. Multiple panel members agreed that if intrinsic motivation is absent, that a circular transition will fail to materialise. One entrepreneur explained this in the following way:

"A critical moment that I feel is missing is that you have to make it, just like traffic regulations, a mandatory component for companies and consumers. Just like you stop for the red traffic light and you cross for a green light. Well, that is what you have to do with these transitions to steer behaviour. Because if you have to start searching for the intrinsic motivation in people, well, if it does not bite you, then whatever."

(Entrepreneur representative En1, 1-02-2024, translated from Dutch)

Similarly, a community association representative stressed the importance of legislation as incentive:

"No and what I notice in entrepreneurs, there are definitely some who are working on it. Well, and the moment when we were not allowed to have plastic fry containers anymore, everyone obediently switched to cardboard or paper or other alternative containers."

(Community association representative, 1-02-2024, translated from Dutch)

Both statements made by the participants show that progressing transitions could benefit from a regulatory stimulus in uptake of sustainable alternatives. This points out that panel members believed legislation to be outweighing other modes of influencing through financial incentives or information provision. Again, this demonstrates the widely shared sentiment of using mandatory elements to steer behaviour as commitment will not appear naturally.

At the same time, it is also worth noting that attributing a greater role to legislation should be approached with caution. Panel members warned that legislation is not necessarily only facilitative in a transition. This debate is presented in the following excerpt (see text box 3):

M2:	*In Liander's [grid operator] case. The legislation towards Liander dictates that they are not allowed to invest in anything other than cables and pipelines. And there are multiple alternatives to tackle [grid] congestion, but they are not allowed to be applied*
En:	*So you should focus more on working at the municipal level actually.*
M2:	*Well, yes.*
En:	*That is also rigid, but it is closer*
M2:	*We do have pilots for that, but it is hindered by legislation*
W1:	*Well yes, that could mean that you select a pilot where you do not have to deal with such rigid legislation, but where you can influence the rules yourself.*
C:	*But to come up with.*
M2:	*That is behind the meter*
W1:	*That is the next step. Right, but the more local you keep it, also in terms of legislation, the more is possible.*

Text box 3. Focus group fragment translated from Dutch (M: municipal representative, En: entrepreneur representative, W: knowledge institution representative, C: community association representative)

This fragment discusses a case in which legislation is deemed too rigid and thus obstructing the trialling of novel technologies. This is exemplified in the grid operator not being allowed to invest in alternative technologies that mitigate grid congestion. As part of this example, an entrepreneur present in the discussion pointed towards a potential benefit of operating on a municipal rather than national level. At this level, panel members believed that there is greater flexibility in legislation to trial such innovations. This reasoning is based on the hydrogen cell pilot as this was an innovation in which they claimed that legislation was temporary relaxed to accommodate for testing.

In the next part of the discussion, the focus group was asked about what they would repeat as a concerted island network for a future transition. Panel members proclaimed that a future transition would benefit from collaboration of committed stakeholders. From both the focus group and earlier interviews, collaboration appears to benefit from intrinsic motivation as well as the strong ties between local stakeholders. An AEC representative added that next to collaboration, efforts should be directed toward formulating an appealing project for the circular transition. Again here, the strong ties between community members on Ameland return as a strong asset that can contribute to realising an idea as long as its resonates with the community. This leads to the idea that concretising a transition to the circular economy benefits from starting out in a small group that focuses on a particular circularity theme. Essentially, this divides circularity as umbrella term into several more manageable

sub-themes. Ultimately, when asked what type of theme would resonate with the community, the AEC representative brought the topic of efficient freshwater use to the attention of the panel.

"And would it not be lovely to trial that on Ameland. So that we can, I think we can reduce almost 50% on fresh water by stopping to flush the toilets with drinking water and instead use rainwater. The technique is already there. Quite simple. If we then think of a vehicle to start trialling that at people their homes, then we can start with that nicely. First make a pilot of course, like we did with other projects on Ameland. First make a pilot, show that you can do it, draw in some press. … . And then you can say: 'we did that on Ameland. Within two years we have a unit installed at everyone 's house so that we do not have to flush our toilets with drinking water.' Very circular."

(AEC representative, 1-2-2024, translated from Dutch)

While panel members showed an interest in this idea, panel members expressed a concern about the costs of such a project. An municipal representative argued that given the current water price, that such a project would not be profitable. In response to this problem, another municipal representative pointed out that in the near future, the water pipeline from Vitens (a drinking water company) will need to be renewed. If the company decides not to invest in the pipeline, according to the representative, they should provide a financial contribution to the start-up of a drinking water pilot. The other panel members appeared to agree on this idea. Now that the panel members settled on a project, the remainder of the discussion centred around identifying potential candidates for collaboration (see text box 4):

E:	*But what if we could get important stakeholders like Vitens, the waterboard, munipality, energy cooperative, maybe, around the table. You name it. And you try to get a project out of that and then generate momentum.*
W2:	*Yes, and the theme is up to date with droughts and …*
M1:	*But that will only work out if Vitens [water company] put their hart into it, like yes the costs are too high in the future. If it lacks drive there, then it will not happen.*
C:	*No, then it will not work out.*
W2:	*Or you need to find an investor that will empty their pockets.*
M1:	*Well yeah, but we have not seen so many in front of the municipaltity. They are not lined up in rows of 10.*

Text box 4. Focus group fragment translated from Dutch (E: AEC representative, W: knowledge institution representative, M: municipal representative, C: community association representative)

This fragment shows that panel members attribute importance to multi-stakeholder collaboration. Important here according to panel members is that the parties involved should be intrinsically motivated and acknowledge the utility and urgency associated with the circular transition. At the same time, panel members also specified attracting (external) benefactors to fund the project. However, what remains challenging in this aspect is to frame the project in such a way that investing in such a drinking water project can benefit the company as well as the Amelander community. According to the municipal representative, this realisation to explore this solution should originate internally from Vitens itself. He explains that this is part of recognising the urgency and taking ownership of change. This idea is modelled after the situation in Terschelling where there is an ongoing research on efficient water use where Vitens does take an active role in the collaboration.

Overall, the discussions witnessed above shows that the local stakeholders are struggling with how to best-shape future STs. This becomes evident from the emerging debate in which panel members on the one hand expressed a desire to be steered through legislation and on the other argued for more local flexibility in terms of legislation. This debate can be rooted in the fact that panel members feel that the urgency remains largely missing in wider society to take action. They must be impacted before

they start to reconsider sustainable alternatives. At the same time, the call for greater flexibility on a local level appears to be from the increasing focus on bottom-up inspired initiatives throughout the course of the energy and heat transition on Ameland. But there is also discussion between panel members on how to collaboration on the drinking water theme they settled on. For instance, who is going to take the lead in this collaborative effort, should this leading position be shared with other stakeholders, how to attract investors, etc.

6. DISCUSSION: ANALYSING THE LEARNING HISTORY

The previous chapter provided insights in how Ameland, as island community, has taken up the challenge of transitioning to a more sustainable island. The findings revealed the importance of appointing initiators in generating the momentum necessary to get a transition beyond its starting phase. In addition, the findings point towards an increasing relevance of community engagement in transition developments. Particularly helpful here in driving transitions forward include the informal network and strong social cohesion between stakeholders. This is reflected in purposeful action and self-supporting nature of the islanders. On multiple occasions, these identity features were found to be a contributing factor in shaping Ameland as frontrunner of the energy transition. Against this background, Ameland as a case demonstrates that accomplishing complicated transitions is possible, even in small-scale island communities with limited institutional capacity.

Whereas Ameland portrayed a frontrunner status in the energy transition, the transition to a circular economy has yet to start gaining ground. To this end, this discussion will focus on analysing the transformative capacity of Ameland as island community across the transitions. In doing so, this chapter proceeds by embedding Ameland as local island context within broader context (6.1.). The following section (6.2.) will determine critical junctures by examining the learning history. Understanding the historicity of events will be the starting point for the third section, 6.3. Within this section, a broader reflection will take place on the multi-loop learning process on the island and will discuss the transferability of lessons learned to future practice. The final section (6.4.) will offer a methodological reflection on the study and will critically evaluate the learning history tool.

6.1. UNDERSTANDING THE ISLAND SCALE

In this thesis, the findings examined how certain moments contributed to the realisation of sustainability initiatives on Ameland. Interestingly, when studying Ameland's transition trajectory, it turns out that the island to a certain extent is comparable to the contextual conditions as described by Sperling (2017). In his work, Sperling (2017) has attributed the success of realising the Samsø Renewable Energy Island project to these conditions (see table 6). This is not surprising given that in the early stages of the energy transition, a select group of islanders went to Samsø. Several interviewees indicated that this visit was inspiring and gave rise to sustainability initiatives. This may have contributed to the translation of some of the success factors in the Amelander context. Especially in attributing greater importance to local engagement in shaping STs.

Similar as to what Sperling (2017) concluded, this thesis also confirms the presence of 'soft topics' as driving factors in transitions. Soft topics mentioned include the political and socio-cultural context, planning processes, communication and local ownership (Sperling, 2017; p. 885). In understanding Ameland as island context and its capacity as a network, the self-supporting nature and strong social cohesion can be viewed to be the backbone of Ameland's transition developments. This is expressed in the involvement of residents and the collective do-mentality to uptake of initiatives. Once again, this finding stresses the importance of focussing on socio-cultural aspects of transitions. Usually, transitions are predominantly viewed as technocratic, while instead they should also incorporate the social dimension. This holds especially true for the circular transition in which closing loops is not only a material change, but also has behavioural implications among residents (Beamer et al., 2023; Friant et al., 2020; Kirchherr et al., 2017).

6.1.1. Internal scale

Having established soft topics as important drivers in a ST, this section will now analyse the conditions that enabled the transformations on Ameland. In doing so, the analysis will make use of the external and internal contextual conditions formulated by Sperling (2017). An overview consisting of both internal and external dimension is listed in table 6 below. The table reads as follows, for each dimension, the factors and a brief explanation of the factor is provided. The final column categorises the items indicating presence of Sperling's factors on Ameland.

Table 6. Analysis of the internal and external contextual conditions on Ameland

Dimension[1]	Factor[1]	Ameland context
Internal	Community spirit	✓ Open & accepting attitude towards new ideas ✓ Community suggestions ✓ High attendance information evenings ✓ Learning by doing
	Local traditions and history of cooperative projects	✓ AEC ✓ Community associations conducting heat scans
	Sense of locality and responsibility	✓ Securing funds in trialling H2Watt pilot ✓ Do mentality
	Entrepreneurial individuals	✓ Mayor ✓ Sustainability policy officer ✓ AEC co-founder
	Networks	✓ Close connections ✓ Contact information ✓ Covenant: gentlemen's agreement

	Guiding visions and plans	✓ Regio Deal as platform to help shaping other STs for Wadden Island municipalities ✓ Municipal ambition to become frontrunner
External	Guiding visions and plans	✓ Signing ambition document with province ✓ In 2023 received recognition in top-30 frontrunner islands of EU
	Government technology support	✓ Municipality aids in permit procedure and provides subsidies
	Government process support	✓ Environment and Planning Act ✓ Information leaflets ✓ Regio Deal
	Expert assistance	✓ Knowledge institutions, energy parties and grid operators in Covenant

This unravelling of the internal island dimension from table 6 shows the elements guiding change. Key success factors from this table 6 is that Ameland as a community has a long-standing history of cooperation, shows a reliance on informal networks, opportunity for community suggestions and the do mentality. However, in line with Sperling (2017), Ameland's success is often attributed to the island-specific circumstances. This gives rise to the question what non-island contexts can learn from these findings. Relevant points for non-island contexts include:

- Community engagement – the findings show that the community can come up with creative solutions and respond well to being attributed responsibility. For instance, the tidal kite was suggested by members of the community. Yet, in mainstream transition processes, there is a tendency to resort to experts to come up with solutions and then consult the users (Huttunen et al., 2022). This implies that local knowledge remains to be acknowledged in such processes. Conversely, focus on community suggestions first and then take this idea to experts will make local stakeholders feel more valued and taken seriously. But this will also contribute to increasing understanding on sustainable practice (Huttunen et al., 2022). In return, this can contribute to create support for a transition. This is a relevant finding for non-island contexts as well given that interventions are increasingly met with resistance which results in delays for projects (Svartdal and Kristoffersen, 2023).

- Informal relationships – residents on Ameland value contact fellow residents or even government officials and pointed out the importance of conversations in informal settings. Although the informal relationships may not be one-on-one realisable for non-island settings, this focus does contribute to making a community more socially resilient. Particularly the focus on community activities can help build social cohesion. This is relevant given the prevailing sentiment among Dutch citizens that social cohesion is eroding (Schmeets and Te Riele, 2014). Therefore, non-island contexts can learn from how to build stronger ties between stakeholders. What governments in particular can learn from this is to not only work from the municipality, but also pay residents a visit in a place they feel comfortable.

- Do mentality – studying Ameland's transition trajectory showed a preference to a do mentality, particularly among entrepreneurial individuals. This appears to be a different approach to conventional policy-making, which is consensus-based and characterised by negotiation (Lockwood and Devenish, 2024). This tends to lead to endless debates and prolongs the step from translating policy to practice. Therefore, the do mentality teaches non-island contexts how to balance between doing and discussion.

6.1.2. Embedding the (internal) island scale in the external scale

Although the above-mentioned island mentality appeals to the shared sentiment of independence from the mainland, the findings suggest it cannot be viewed as separate from the mainland. Arguably, this underlines embedding Ameland as island in a broader context. In proving this point, this section will demonstrate the connection of the internal island scale to the wider external environment. This connection is explained using inviting external parties into the island network and the implications of outside pressures.

First of all, the inclusion of external parties. In this study, evidence was found of actors considered outside the network to get involved in the transition developments. This was mainly highlighted by the covenant. The actor groups that were distinguished in this covenant consisted of market parties (mainly to supply financial resources), academia (because they can bring knowledge to the network) and the municipality (facilitated with permit and subsidy procedure). According to Fischer and Newig (2016), a wide range of scholars refer to the inclusion of outsiders to the network. Especially in realising radical change required for STs.

Next to inclusion of outsiders, external factors were also found to influence the local context. This aligns with Van Dam & Van der Windt (2022) finding that transition processes have both an internal place-based context that interacts and consequentially is shaped by external conditions. The findings suggest two of such conditions including an external pressure in the form of crisis events and the national elections. First of all, exogenous shocks referred to by participants include the COVID-19 pandemic, MSC ZOE disaster and conflict in the Ukraine on transition developments. These cases exemplified instances that evoked a swift change with drastic impacts visible in terms of accelerated uptake of more sustainable alternatives. Discussion the implications of crisis events deserves special attention because of the risk of repetition in the future, their potential in interrupting the status quo and breaking away from existing path dependencies (Johnston and Schot, 2023). The energy crisis emphasises a shock event presenting a discontinuous change in the form of accelerating pace of the energy transition. The occurrence of an external shock as critical juncture confirms the statement made by Sol et al (2018: p. 1387) that learning does not take place in a vacuum:

"*It is a vulnerable activity, which can be greatly influenced by the context in which it takes place. Especially when these contexts are turbulent or discordant there is a great chance that these characteristics will affect the inner dynamics of learning within the system involved."*

This quote challenges the consideration of niches as protective spaces in which innovations can gradually develop as originally suggested by Geels (2022). Indeed, actors on Ameland were very much attuned to the global developments and their implications on the local context (see lesson 6). Alternatively, in order for niche development to become successful, it needs to extend its scope beyond this protective space and challenge the dominant routines and/or practices (Nylén, 2021).

Moreover, political developments are also reasoned to impact the local island context. In this thesis, political developments were found to provide a push factor that restricted or provided overall facilitation of developments. To illustrate, one of such political implications is the Dutch provincial elections in 2023. One circular association representative mentioned that the election results implied a changing direction affecting sustainability ambitions and disposition of financial resources to transitions. But only time will tell whether the implications of the election outcomes will be truly restrictive or facilitative towards transition processes. On another note, the awarding of just over 15 million euros in the Regio Deal, serves as an impulse to realise the ambitions of the Wadden Island Programme, *Programma Waddeneilanden* (Samenwerkingsverband De Waddeneilanden, 2023). While one example clearly shows a potential tension between politics and sustainable development,

the other indicates a monetary incentive. This underlines the importance of focusing on political developments in transition studies. In addition, both examples demonstrate that external conditions can interfere with the island, clearly embedding hem within a larger (institutional) context.

Overall, the paragraphs above confirm initial claims of underestimation of the political power dimension of the MLP framework by Geels (2011). The examples regarding the elections, Regio Deal and implications of the energy crisis show that local activities are heavily influenced by national and even global developments. Again, this contributes to the claim made by Shove and Walker (2007) that power and agency are dispersed across levels rather than concentrated in the regime analytical level or in one single actor. This leads to believe that in its current form, MLP assumes rather than concretises agency (Sorrell, 2018).

6.2. CRITICAL JUNCTURES: PATH CREATION AND BREAKING IN TRANSITIONS

Pinpointing key moments of change on Ameland has been done through the lens of learning history. By focusing on moments in time with major implications on daily life inspires greater reflection on past experiences and possibly foregoing action in order to progress STs. Critical junctures in this case present such moments in time inhibiting potential for change and where reflection – action is most likely to take place (Buitelaar et al., 2007). Overall, this section will now continue to discuss the yielded insights from the learning history assessment pertaining critical junctures. It will shed more light on two instances that had a path creating and breaking effect. Firstly, the mayor symbolising path creation in the form of shaping the direction of the island's sustainability ambitions. Secondly, the energy crisis signifying a potential path breaking event.

6.2.1. The mayor as path creator

The first critical juncture appeared at the beginning of the energy transition with the appointment of the mayor in 2006. The findings attribute importance to appointing an initiator. This confirms the important role of actors (Fischer and Newig, 2016; Genus and Coles, 2008; Hajer, 2006). More specifically, the findings emphasise considering individual agency as a relevant driver in STs, especially in overcoming obstacles in the initial stages of a transition. Indeed, as discussed by Hajer (2006), key change agents have a prominent role to play in problem definition and deciding on a direction in which solutions are sought. Medema et al. (2014) add that change agents contribute to clarifying a vision. To Medema and colleagues (2014), this presented a first step in the challenging of assumptions and facilitated coordination of actors.

Having established the importance of key change agents, it is now necessary to conceptually link the presence of a such a change agent to path creation. The findings suggest that the transition process on Ameland resembled a continuous, almost incremental pathway. Originating from the mayor reiterating his vision through the formation of a 'bad boys club'. Then the path is subsequently 'stabilised' by including the input from other market parties and academia who allocate money or bring in knowledge to the network. This was later on formalised in three covenants that facilitated the realisation of initiatives and forging of icon projects. This gradually build momentum over the years. Essentially, this points towards the mayor constituting a transition trajectory. Viewing it this way aligns with the statement by Burch and colleagues (2003) who believe that change is primarily internally driven and gradual to progress as a result of reflection and action. In doing so, a connection can be established between inherent power relation in the discourse and subsequent forming of discourse coalitions (Späth, 2012; Hajer, 2006). Especially the mobilisation of stakeholders in the covenant allowed for the alignment with respect to formulating ideas and solutions in response to a problem.

Overall, this critical juncture represents a prime example of the importance of agency in an attempt to realise change. Notably, an actor's decision in affecting the course of events and its ability to set in motion a period of changes. In addition, path creation highlights once more how social dynamics underpin technological innovations (Meyer and Schubert, 2007). Yet, attributing importance to key change agents in driving institutional change should be approached with caution. In their literature review, Fischer and Newig (2016) did not find concrete evidence that transitions may fail as a result of an absent change agent. What they did find was that the presence of one does appear to support a transition. Similarly, the findings also nuance the importance of key change agents. They suggest appointing a key change agent at the beginning to overcome potential obstacles. Opposed to earlier research on the energy transition (TNO, 2021), this study highlights that the initiator does not necessarily have to be a municipal actor.

6.2.2. External pressure as path breaker

In addition to path creation by the mayor, the energy crisis showed that there is also scope for path breaking. Unlike the critical moments described earlier, critical junctures have the potential to cause a certain 'lock-in' of or can 'unlock' transition paths due to their self-reinforcing mechanism. In such instances, it is through the impact of exogenous shocks that triggers a period of rupture, providing an opportunity to break with the status quo and creating alternative paths for action (Johnston and Schot, 2023; Buitelaar et al., 2007; Meyer and Schubert, 2007). Generally, crises have the capacity to induce such a trigger.

The energy crisis embodied such an external shock, disrupting the status quo. More specifically, in increase in uptake of renewable alternatives and discursive change in solar panel aesthetics. Interestingly, as stated before the MSC Zoe also presented a shock situation, but did not inspire profound change for the circular transition as the energy crisis did for the energy transition. Johnston and Schot (2023) have investigated why certain shocks do lead to a strong break with past trends, while in other cases systems do not seem to respond to the shock. In their reasoning, they refer to 'imprinting' or prolonged effect of a shock as being complementary to making active use of a windows of opportunity. Imprinting leaves an enduring mark on the landscape, which make it more sensitive for replacing decisions and rules with new ones in a relatively short time span. According to Johnston and Schot (2023) mechanisms at play here explaining the heightened change potential of the energy crisis may be the willingness to act, collaborate and changing of direction to prioritise local production and reduce energy demand. Likewise, the shared sense of energy independence from Russian gas formed a collective experience driving subsequent action.

At the same time, one should remain cautious in the change potential of shocks. To give an example, Geels et al. (2022) warn for the overly optimistic representation of recovery scenarios after COVID-19. Indeed, a similar situation may arise for the uptake of renewable alternatives. For instance, one can raise the question whether in light of the energy crisis, installing solar panels is just a short-term coping mechanism. While the energy crisis most definitely shows signs of leaving a long-lasting mark and accelerated shift to renewable energy, there are also signs of continuing fossil fuel use to meet current energy demand (Johston and Schot, 2023). Overall, as observed in the focus group, the attention to implications of external pressures shocks remains an important consideration. Especially given that in the recent years has seen the recurrence of shocks like COVID-19 pandemic and energy crisis, indicating a period of instability that will continue to play a role in STs.

6.3. MULTI-LOOP LEARNING ON AMELAND

In analysing transformative capacity of a system using the learning history approach, this thesis finds a strong thematic overlap between critical juncture theory and multi-loop learning. In relation to the previous section (6.2.), this section will increasingly focus on the capacity for institutional reflection by means of examining the learning dimension through triple-loop action. As explained in the theoretical framework (chapter 2), the learning process is driven by interaction and reflection, which ultimately can influence behaviour or alter understanding of a certain problem and its solutions (Van Mierlo and Beers, 2020). All participants in the study confirmed that learning is a continuous endeavour. Innovations will present new technologies, introduce new stakeholders enter the arena and so forth. This demonstrates that change is constant. This thesis decided to focus to investigate learning of Ameland as island entity as a whole. In doing so, this section reflect on the triple-loop process on the island. This section will also pay special attention answering the set of accompanying questions: 'are we doing things right?' (in 6.3.1.), 'are we doing the right things?' (in 6.3.2.) and 'how do we decide what is right?' (6.3.3.).

6.3.1. Single-loop learning: learning by doing

In the literature, single-loop learning is often distinguished as superficial learning (Stam et al., 2023). In this case, learning is perceived to be rather limited, because it primarily focuses on fixing errors (Stam et al., 2023; Armitage et al., 2008; Argyris and Schön, 1978). An instance where single-loop learning was observed to have occurred, is the addition of a battery in the plans of the second solar park. A municipal representative explained that installing a battery presented a response to work around the issue of grid congestion. However, this neglects targeting the wider underlying causes of grid congestion and improving on the grid infrastructure itself. This example confirms the analysis made by Stam and colleagues (2023) that the single-loop learning process is predominantly action-oriented.

This raises a further question of whether this tendency towards action was specifically designed this way or naturally progressed to allow for single-loop learning. Arguably, single-loop learning can be said to be both progressed by deliberate actions and show an incremental pathway (Stam et al., 2023). The learning process can be considered as a deliberately 'designed process' due to the do-mentality propagated by key change agents. This is particularly reflected in the learning by doing approach. Interestingly, the solutions to societal problems are most often sought in reworking them into a pilot. Inherently making pilots a key part of the single-loop learning process. Not only can this be concretely observed in the interviews where reference was made to pilots (e.g. HRe boilers, hydrogen fuel cells and tidal kite), but also in the focus group. In the latter, panel members collectively established that awareness on circularity would most easily be solved through demonstrating innovations in a pilot format.

Although this resembles a targeted action, the single-loop learning on Ameland can also be shown to be a constantly evolving process. In reviewing the moments in time where pilots were created, pilots are not pre-determined, but rather are rolled-out in an unplanned way based on the needs and suggestions of society at that point in time. This provides greater flexibility to formulate immediate fixes to an occurring problem. Describing the learning process this way considers each initiative or pilot as a new building block contributing to mainstreaming a transition in society. In essence, this equates innovation to a sequence of events highlighting incremental change (Stam et al., 2023). Even if this description may make the process seems linear, a transition trajectory is very much iterative in nature.

Overall, this leads to believe that an answer to the question 'are we doing things right' is simply a matter of learning by doing in a pilot format. However, diving deeper into these projects also exposed issues in terms of communication, trust, inclusion, etc. This makes for definite space to take targeted action, but as Argyris and Schön (1978) suggest, the learning process does not stop by tackling a problem. Instead, one has to address the root causes leading up to the problem. Thinking on such a level, necessitates questioning the frames adopted. This will be discussed in the next paragraph.

6.3.2. Double-loop learning: revisiting experience

Double-loop learning goes a step further than correction errors as this loop also involves questioning of assumptions guiding action and objectives (Stam et al., 2023). The findings show that double-loop learning on Ameland mostly took place in the energy and heat transition. More specifically, the findings show that in 'are we doing the right things?' reflection was found to take place after trialling of a novel technology, re-evaluation of objectives and actor roles or even in light of a crisis. Interestingly, what this shows is that double-loop learning can take in multiple phases of a transition, including emergence of an innovation and agenda setting for instance.

To begin with the re-evaluation of the self-sufficiency objective. Approximately in 2008, together with other island municipalities, Ameland signed the ambition manifest (Van Dam and Van der Windt, 2022). A primary objective was to become completely self-sufficient by 2020. This can be said to clearly align with the drive of the island municipality to increase self-supportive capacity and to manage themselves without interference from the mainland. This was and remains an important narrative given its groundedness within historical background and wider cultural identity. However, as 2020 drew in closer, this ambition proved unrealistic. At that point, Ameland was faced with the question of continuing the current effort or should the aim be altered? This reconsideration exposed that the initial objective was overly optimistic regarding the speed with which innovations were expected to be embedded in society. But according to a provincial representative, transitions are complicated due to the integratedness of issues. Again this shows that STs are multi-faceted and that neglecting the social dimension can lead to disrupt the transition process (Friant et al., 2020). In light of this experience, a more realistic ambition would be to focus on achieving carbon neutrality by 2035 (Gemeente Ameland, 2023).

Another case where an experience was revisited included the HRe boiler pilot in 2008. In the interview, a researcher pointed out evidence that would characterise the pilot as a failure (see lesson 7). On the contrary, in the focus group discussion, this pilot was also perceived to have had positive contributions. Examples include unburdening of participants in the pilot, regular check-ups and exposure in the media. This can be noted as an instance of reframing in which an experience with a negative connotation was expressed as a positive one. This was supported by panel members. But relating this experience to are 'we doing the right things?' also presented a shift in focus. According to Geerdink et al. (2019), the HRe boiler departed from the focus on individual learning within the confinements of the study to collective learning beyond the study itself. This challenged the assumption that transitions are purely technical, but also imply organisational and social challenges.

Furthermore, in answering whether we are doing the right things, the role of initiators is also relevant to discuss once more. While the interviews mainly highlighted the importance of initiators like the mayor, the focus group offered a more nuanced description of the role. Although panel members still reciprocated the mayor's role in mobilising actors and overall enthusiasm, the newly adopted frame centred around more widely carried ownership of a transition. This shows that there is contemplation among panel members to focus on a new initiator from the municipality or to wait until a new actor from society (e.g. engaged entrepreneur or resident) feels compelled to take up this role. This presents

an interesting discussion, because in literature, society still expect governments to initiate action and direct the transition effort (Borrás and Edler, 2020).

As a final argument, this thesis once more discusses the energy crisis in 2022 and its impact on challenging of assumptions. According to Loeber et al. (2009), crises play a notable role as a trigger to double-loop learning. Especially their unexpected nature and large-scale implications encourage critical reflection of current practices. Both in the interviews and focus group, the dominant structures of energy production and consumption patterns were challenged. This is reflected in the sentiment to explore local alternatives for energy production as a way of gaining energy dependence. This boosted uptake of solar panels and contributed to a changing perception on their aesthetics. But this also asked whether efforts should target the issue of increasing demand instead. In addition, a concern was also raised in the focus group discussion about potential clash with objectives from the energy and circular transition. This clash mainly revolves around the material use (Friant et al., 2020).

In summary, in telling their story, Amelanders referred to the role of actors and important events in shaping the transition. Understanding their interpretations of reality, their interests and values as well as openness to new ideas helped analyse how change actions came to be. Moreover, the collective exercise as part of the focus group meant to target both reviewing of change developments and visioning of lessons learned to the future circular transition suggests that through contestation and negotiation reflection took place. Not just by adjusting their actions, but also through reassessing their mental models in light of the newly gained experience, which signifies double-loop learning. Overall, this also demonstrates that lived experiences are dynamic and can change over time (Van der Hulst et al., 2024; Sol et al., 2018).

6.3.3. Triple-loop learning: Still muddling, not yet through

So far, this thesis has focussed on detecting errors and addressing the values underlying action. This section will now focus on triple-loop learning, which requires analysis on whether a structural change has taken place of the dominant paradigm (Stam et al., 2023; Armitage et al., 2008). In exposing a paradigm shift, this thesis takes a unique approach in expanding the scope of research beyond a single transition to studying triple-loop action *across* STs. More specifically, most transition studies do not take such an extensive time span that enables retracing past and anticipation of future events (Stam et al., 2023; Trimble and Plummer, 2019). For adopting a longer scope, this thesis confides in the finding that change is non-linear (Stam et al., 2023; Armitage et al., 2008). This implies constant reflection takes place. Thus, this section will argue to what extent triple-loop learning has actually taken place throughout Ameland's transition trajectory. Is this a story of muddling through using the same approach or do Amelanders adapt their approach in light of the future circular transition? This is followed by an analysis to what extent transition efforts on Ameland influenced systemic ways of thinking. Lastly, this section will end with discussing the transferability of lessons.

As the finding show, the transition to a circular economy is a complicated matter. This is reflected in the struggle of panel members and interviewees to reflect deeper on lessons learned from the energy and heat transition and form a prospective image for the circular transition. This is made evident from the emerging debate on balancing the application between top-down steering and bottom-up participation. Whereas, the energy and heat transition trajectory showed a distinct move away from ad hoc initiated leadership to harnessing community support, the circular transition has detected an increasing desire for external steering. This matches with the wider trend observed by Nachtigall et al. (2024) who showed that countries are increasingly relying on policy and regulatory measures in order to take robust climate action. At the same time, rules are also regarded as a restriction to innovation.

This presents a dilemma in which top-down steering is perceived as needed, yet also creates a procedural boundary in implementing sustainability measures (Soininen et al., 2021).

In response to this emerging debate on balancing the application of either top-down or bottom-up approach, the literature suggests both are in fact necessary in sustainability transformations (Cramer, 2022; Caldwell et al., 2021; Hajer et al., 2015). Cramer (2022) stresses that successful rolling out of the circular transition requires both top-down steering through governmental intervention and to bottom-up self-organisation. In his argument, Cramer (2022) reasons that policies or rules implemented will not be sustained without receiving acceptance from market parties and communities. This aligns with the finding in this thesis that demonstrates that in sustainability transformations, and those to come, top-down steering and multi-actor interactions are equally important in shaping transitions. This suggests a hybrid way of steering.

Overall, while the shift from an energy to a heat transition showed a gradual shift from top-down to bottom-up, participants in this study remained indecisive for settling on an appropriate approach for the future circularity transition. This shows that indeed, governance is a messy process in which changes may in fact involve continuation of old and new practices at the same time (Lowndes, 1997). This can be said to hold true for Ameland given that mostly the same group of (local) stakeholders are involved. But also the Amelanders still confided in their ways of solving problems through experimentation. Newer practices revolve around the organisational part of pilot project process. Particularly by celebrating successes of pilots and by deploying a marketing strategy for pilot projects through media exposure. This gives rise to the idea that the overall transition process resembles somewhat of a muddling through process. Interestingly, the focus group discussion led to a pilot to address the problem of efficient freshwater use as a response to concretise the circularity transition. In doing so, panel members advocated to break down a transition in more manageable sub-themes. This desire to break down can be grounded in the literature. More specifically, Lindblom (1979) describes that problems are too complex and have too many interacting components to generate an implementable outcome. According to Lindblom (1979), refers to incrementalism to break up the process in smaller steps to help to adapt to addressing the complexity of the situation. Though this may come across as sluggish, the literature point towards the importance of building support for climate action through these small, yet rapid changes as opposed to drastic changes that create resistance and thus lock-in (Levin et al., 2007).

6.3.3.1. Systems thinking across transitions

After all, examining triple-loop action across STs in this study is not restricted to envisioning the circular transition, but also in assessing past STs (e.g. energy and heat transition). While the section above shows a struggle, a systemic change did take place from the energy to the heat transition. For one, this is reflected in the paradigm shift from top-down to bottom-up. Between these two transitions, more importance was attributed to harnessing community support in transitions. In practice this shift is embodied by the change in mindset of the municipality. This increasing focus on community-municipal interactions and recognition of residents' capabilities points towards learning among policy-makers. Similarly, Stam et al. (2023) also demarcate interactions and communication as important learning tools in a transition. In addition, interviews and the focus group also discussed the integratedness of multiple transitions themselves.

Another example of systems thinking within past transitions include the realisation of interdependencies between transitions. Adopting a long-term outlook on the energy transition revealed that carbon neutrality is not just a matter of increasing renewable energy production capacity, but also involves focus on energy savings. One interviewee explained that this required action in terms of insulation. In fact, this presents a broadening of problem perception in the pursuit of achieving

carbon neutrality to go beyond an energy transition domain. This is consistent with wider literature who recognise this as a characteristic systems thinking ability to connect various problem domains within a wider set of sustainability issues (Hölscher, 2018). Moreover, the efforts in the form of heat scans can be said to have aligned with creating a more encompassing overview of the energy transition in residents.

In continuing this thought stream, Hölscher (2018) states that widening of the scope is the result of taking distinct process steps. A closer view on the three transition showed that the process as part of the energy and heat transition is clearer compared to that of the future circular transition. The field visit to Samsø may have very well been a contributing factor to rolling out the energy transition on Ameland. Indeed, the focus on frontrunners can offer a vision, can offer a guiding framework and a frame of reference in shaping a transition (Rotmans and Kemps, 2003). Therefore, this finding leads to believe that a transition is also a goal-seeking and learning process in one, which continuously adapts as transitions progress as well.

6.3.3.2. Place-boundedness of transitions

So far, this section has focussed on paradigm shifts as part of the triple-loop learning. It is now necessary to address the transferability of the lessons learned to other contexts. In the literature, transitions are mostly described to have place-based solutions. Each location is considered to have distinctive features reasoned to hinder applicability in other contexts (Van Dam and Van der Wind, 2022; Kallis et al., 2021; De Waal and Stremke, 2014). In their argument, Van Dam and Van der Wind (2022) lead us to believe that distinct island features will complicate generalising outcomes from tested technologies to the mainland. Similarly, De Waal and Stremke (2014: p. 4408) question the transferability potential of renewable energy systems due to the context-specific nature of locations in which these systems are tested.

Though it holds true that each context hosts a unique set of characteristics and capacities, this thesis argues that transferability is not always place-bound. The examples addressed shortly will argue that transferability of lessons learned lie mostly in the social domain. One of the main examples contributing to this statement is the experience with bottom-up participation in pilots. One actor highlighted that the focus on participation helped companies gain insight in managing stakeholder expectations and overall dynamics of multi-actor collaborative settings. It was particularly this combination of being both facilitated in testing technologies (e.g. helping with acquiring subsidies and permit procedure) in relation to gaining experience with multi-actor involvement in transitions that made Ameland an attractive case for companies. This solidified Ameland's status as living lab. This experience is relevant, because under the newly implemented Environment and Planning Act, citizens will have a more prominent role in planning projects (Bisschops, et al., 2023). Another example highlighting transferability is the publicity potential of pilots. Panel members claimed that featuring a transition in the news instigated a sense of pride among pilot participants, but also had an outward effect of putting your transition on display. This has a wider effect on awareness as sparks wider discussion about sustainability measures. This is consistent with the wider connectivity through online networks (e.g. social media and news outlets) facilitating transferability of lessons learned (Goldie, 2016).

6.4. METHODOLOGICAL REFLECTIONS

Overall, doing qualitative research is about making sense of study participants' experiences offering a window in the complexity of the underlying processes driving change. This endeavour has led to inviting a diverse group of stakeholders ranging from the municipality, knowledge institution,

cooperative, resident representative, nature and entrepreneurs to share their insights. Interestingly, some participants can be said to wear two hats. Therefore offering both an expert lens as professional and insider to the community. As indicated by the interviewees, in transition developments on Ameland, there is a list of usual suspects. Usually, when asked for potential candidates for interviews, almost all participants referred to the same set of candidates. Again, this exposes the inherent shortcoming of snowball sampling as this data collection method tends to lean towards putting forward participants the candidate is already familiar with (Yin, 2009). However, given the small community, this was to be an expected outcome and under other sampling methods may have led to a similar outcome. In addition, interviewees warned for participation fatigue as a similar group of participants is approached for interviews or partaking in research studies. This concern should be considered upon creating another study on the island. Therefore, ideally, the researcher could have targeted more critical stakeholders in interviews to add new perspective. In reality, these candidates prove hard to find as critical opinions are usually not publicly displayed nor communicated to fellow islanders.

Nevertheless, the outcomes from the semi-structured interviews, provided input to reflect collectively in a focus group discussion. Within this focus group discussion, identified key representatives from the municipality, a local energy cooperative, local knowledge institution and entrepreneurs were invited to discuss past sets of experiences, possible transcending lessons learned and actions taken. By running a focus group complementary to the interviews enabled to verify or debunk statements made by interviewees. One of the main benefits associated with a focus group is the establishing of group rapport as a result of direct interaction between participants (Hennink et al., 2011). Evidence of establishing rapport was found in the discussions surrounding identification and elaboration on critical moments and identifying transcending lessons. Using a poster containing pre-determined set of critical moments and lessons also presented an interactive tool in facilitating the discussion. The moderators, being the supervisor and thesis student, invited the panel members to list any additions, which acted to promote further discussion on the topic. Another benefit was generation of additional input on top of the transcript. To give an example, asking the panel members to write on post-ids enabled additional points that served to back-up the statements made in the interviews.

However, Hennink et al. (2011) also mention some limitations of focus group discussions. To begin with group dynamics. If not managed properly, give room for individuals to dominate the conversation. This may overshadow the more quiet participants. In reality, the moderator found it rather challenging to manage the group dynamics. Particularly in striking the right balance between impeding on the conversation and nudging it where necessary. An example of this is where the panel members got caught up in a discussion surrounding the Environment and Planning Act. But this moved the discussion away from the discussion of identifying critical moments and associated lessons learned. Fortunately, the moderator could rely on the co-moderator's experience to guide the discussion back on-topic. This experience shows that the moderating role is more active in guiding the conversation than initially anticipated. Other personal reflection points are to be more pro-active in giving turns to more quiet participants to involve them better in the conversation, do not hesitate in interrupting the more dominant participants and when it is right to ask follow-up questions. Another critical claim made by Hennink et al (2011) is that in a focus group, the conversation tends to orient towards achieving a consensus, thereby mitigating critical voices. While the focus group did point out that the discussion at some point revolved around finding an appropriate theme, this was not perceived as negative by the researcher. To the researcher, this contribute to gain an insight in how local stakeholders determine what would be a good approach to shape future transitions. Overall, the focus group and interviews are deemed appropriate tools in evaluation and examining transition development directions.

For both data acquisition methods, a local gatekeeper from the Waddencampus was consulted to provide suggestions with regards to identifying stakeholders. According to Hennink et al. (2011) the use of a gatekeeper is common in identifying panel members, but presents an additional challenge to limit bias on the gatekeeper's behalf. This runs a similar risk as compared to snowballing in the sense that this limits inclusion to the 'inner circle' of the participant in question (Yin, 2009). This issue was mitigated by having a meeting with both the supervisor and contact person. This meeting centralised around discussing the focus group format and collectively brainstorm which type of stakeholders could be appropriate representatives. But the researcher also actively engaged in finding and approaching suitable candidates.

6.4.1. Learning history reflection

Lastly, this section will reflect on the use of the learning history method and its reconstructive power in particular. This thesis showed that deploying this evaluative tool allowed to distil the main change events and lessons learned across the three transitions from multiple accounts. These efforts enabled forming a coherent overview of the transition process and resulted in the timeline depicted in figure 9. This timeline served both as a visual tool that supported communication and mutual reflection of Ameland's transition trajectory as well as presented a final deliverable of this thesis. In that respect, the timeline as product aligns with the philosophy by Roth & Kleiner (1995) in which learning histories should inspire reflexivity in conversations. This emphasis on reflection on actions also allowed to establish a link between the two core theories of this thesis, being critical junctures and multi-loop learning.

Although considered a suitable tool to obtain a chronological overview of the change process, a main point of criticism is the focus on assessing past experiences. Indeed, the learning history presents a retrospective approach to actions and their results as well as how these are perceived (TNO, 2021; Geerdink et al., 2020; Vangansbeke et al., 2015; Roth & Kleiner, 1995). However, this renders the method less useful in situations where STs are unfolding, like in the case of the circular transition. Especially capturing the narrative elements in such instances becomes increasingly complex as there is no real collective recollection of activities and experiences just yet. In addition, recollection of experience itself is also more prone to potential altering or embellishing of storylines (Van der Hulst et al., 2024).

Although this study could rely on numerous accounts and focus group to confirm facts, researchers should always keep in mind that the farther a historical event is located from the present-day situation, the greater the likelihood of incorrect recollections of experiences. An example where an incomplete recollection of experience may have occurred is the trial surrounding HRe boilers in 2008. In the interviews, a researcher pointed out that this resulted in trust issues, which negatively impacted the following pilots. In the focus group however, panel members mainly had a positive connotation of this pilot project. Again, this situation described above points out the importance of triangulation in forming a complete picture of the transition process.

7. CONCLUSION: LEARNING (HISTORY) MATTERS!

This thesis set out to explore what Ameland as island community learns across transitions. The past chapters have provided an insights in how (local) stakeholders on Ameland reflect on their sustainability transition process. Especially on what lessons they deem as relevant and which of these are relevant to be applied in a future transition. But also to pinpoint critical moments affecting the course of a transition. Underlying this effort is the learning history evaluative method to reconstruct a timeline showing the major transition developments on Ameland. Studying this transition trajectory revealed the unfolding of three sustainability transitions: an energy, heat and circular transition. The analysis showed that the transition efforts did not appear overnight and have been shown to have a longstanding socio-cultural and historical background. This is reflected in the tendency towards self-organisation and formation of strong community bonds. Again, this supports the importance of adopting a longer time-frame to study learning processes across STs.

This chapter will now wrap up the insights from this study by providing an answer to the main research question. Formulating an answer is supported by addressing the sub-questions in section 7.1. Subsequently, section 7.2. will talk about the scientific contributions of this thesis. At the end of this chapter, both practical recommendations are provided in section 7.2. and several recommendations will be made for future research in section 7.3.

7.1. ANSWERING THE RESEARCH QUESTIONS

As part of this section, first answers to sub-research questions are provided. Then the main answer to the research question posed in the introduction can be formulated.

1. *How is the actor network constituted with respect to sustainability transitions on Ameland?*

What this thesis observes from studying Ameland's transition trajectory is that there is a distinct willingness and entrepreneurial spirit among islanders to collectively take up a challenge to become frontrunner and to retain this status for transitions to come. Studying the critical moments reveals that the Amelander network has the capacity to take ownership of a transition and can come up with creative solutions and set in motion a chain of actions. This is facilitated by the vast personal network among community members, but also short distance between municipality and residents, and/or entrepreneurs. Overall, this attributes importance to the informal network as well in transition settings.

Furthermore, this interaction does not limit itself to actors within the network, but extends beyond Ameland to market and energy stakeholders. More specifically, attracting parties with a certain skillset or expertise and funding proved key in execution of projects. Therefore, this ability mobilise not only local, but also stakeholders external to the island contexts is important when forming high-quality interactions.

Overall, analysing the Amelander network shows that the niche is supportive of innovation processes. This is reflected in the further development of ideas, mobilisation of stakeholders necessary to realise ideas and build momentum on Ameland. But this thesis also showed that innovation processes in niches are not taking place in a vacuum, which led to the contestation of niches as protective spaces.

2. Which events from Ameland's transition trajectory can be marked as critical moments?

A thorough analysis of Ameland's transition trajectory pinpointed a total of six critical moments:

1. Appointment of the mayor
2. Foundation of the AEC
3. Programme manager sustainability
4. Realisation of a solar park
5. Conducting of heat scans by volunteers
6. Energy crisis

These critical moments embody that the transition on Ameland is both internally as well as externally drive. For instance, the energy crisis presented such a development that provided an external push to boost renewable alternatives at a local level. As a result of this crisis, the focus shifted to localised production and active retrieval of data to monitor and reduce on energy use. This also pointed out that the data transparency is necessary in order to determine where savings measures can be taken.

At the same time, transitions are also inherently internally driven. This is exemplified by the so-called change agents on Ameland like the mayor. The mayor mobilised stakeholders to fund and bring in expertise to the island network, but also provided a coherent direction that aligned all the projects all under the renewable energy umbrella. Participants to this study mainly believed his initiating role was appropriate in the start, but agreed that when a transition is maturing, the initiating role should be taken up by members of society. This shows that an initiating role does not necessarily need to be fulfilled by a governmental actor. Similarly, the second and third critical moment also refer to a key change agent. The second critical moment showed that a transition benefits from engagement of

citizens, entrepreneurs and other members of society. The foundation of the cooperative meant that Amelanders now had a more active voice in shaping the transition. The third critical moment is the appointment of a programme manager. With the appointment of this programme manager, the do-mentality on the island became more pronounced. Given that three of these critical moments refer to change agents, participants to this study recognised the importance of appointing one. However, one has not been appointed yet for the future circular transition.

The fourth critical moment refers to the realisation of a solar park. To participants in this study, the solar park presented a tangible component of the energy transition on Ameland. It brought about publicity potential for the island and changed perceptions on renewable energy. Also, Amelanders were involved in discussing the plans and ideas. This inspired the sentiment that transitions can benefit from media exposure.

While the foundation of the AEC and solar park sees an increase in engagement of the community, the fifth critical moment of heat scans presented a moment in time where residents were actively involved. This made the municipality realise that they could attribute more responsibility to the community associations.

3. *What do Ameland's sustainability initiatives to date reveal about the learning history?*

In assessing the transition trajectory on Ameland, this thesis rooted learning in multi-loop learning. In this study, single-loop learning can be detected in the focus on pilots within the energy and heat transition. A notable example included the addition of battery to the second solar park and overall learning by doing approach. Second-loop learning is also found to occur on Ameland and was explained using examples such as the re-evaluation of the self-sufficiency objective, the HRe boiler pilot, the role of initiators and the energy crisis as trigger to learning. These examples show that local stakeholders reflect on the developments by modifying the objectives, revisiting the contributions (e.g. either positive or negative), more broadly carried ownership in a transition and challenging their ways of doing respectively.

With respect to triple-loop learning, it is more difficult to draw a conclusion. While the energy and heat transition showed a clearly paradigm shift from top-down to bottom-up, the transition to a circular economy shows uncertainty as to what the best approach may be for future transitions. The group discussion showed that there is a tendency towards steering through a regulatory push. This is believed to be necessary since the urgency to act and overall utility is found to be largely missing in wider society. Yet, legislation is perceived to not only contribute, but also obstruct the transition effort as it provides little room for flexibility. In the end, reflection did take place, but panel members largely fell back on the existing approaches of devising a pilot and including the usual suspects in collaboration.

4. *How do actors in the Ameland network respond to the lessons learned from the energy transition in light of shaping the circular economy?*

Collective reflection clarified that the transition towards the circular economy is predominantly an awareness process. The findings show that increasing awareness could benefit from developing appealing projects that communicate what a transition towards a circular economy entails. In addition, some intrinsically motivated should feel compelled to take up an initiator's position and engage in collaboration with other stakeholders who share this sense of urgency and utility. When the pilot is trialled, it is important to unburden those partaking in the project and if successful, celebrate the achievement.

Now that the sub-questions are answered, it is now possible to answer the main research question:

What is the learning capacity of a small-scale island community across sustainability transitions, using Ameland as case study?

- The ability to invest in high-quality interaction both in informal and formal relationships. This lead to collaborative partnerships that allowed to bring in funding and expertise into the network. This resulted in the innovation of pilot projects on Ameland. Furthermore, evidence for high-quality interaction is also found between community associations and the municipality.

- Capability to build knowledge and transfer this through the network. Knowledge production occurred on organisational level by gaining insights on the procedural aspect of realising innovation projects and community engagement. Transfer was facilitated throughout the network by means of the leaflets.

- Reflexivity was found in a learning by doing approach and attributing more responsibility to local stakeholders.

7.2. SCIENTIFIC CONTRIBUTION

This section will go over how the main findings of this thesis contribute to academia. First and foremost, it is clear that this study has taken up the challenge to bridge the gap between sustainability studies and learning processes. Typically, research mostly attempts to make explicit learning in a single transition trajectory. In doing so, this thesis builds on theoretical concepts. To give an example, this thesis demonstrates that MLP lacks the ability to uncover patterns across transitions and mostly assumes a linear trajectory to transition. This prevents research to conduct a meta-analysis. o studying a long-term trajectory would in fact require multiple the S-curves (as depicted in figure 1) alongside each other. To address this issue, this thesis integrates the reflection mechanisms of single-, double- and triple-loop learning within and between transitions. This has been conceptualised in figure 5.

Moreover, this focus on examining learning across transitions has been one of the few studies establishing a link between learning capacity and long-term transition trajectories. In establishing this connection, this thesis makes use of the learning history evaluative method to reconstruct a timeline showing the major transition developments on Ameland. This tool remains relatively under-used in research, but has proven a valuable approach to supporting mutual reflection of local stakeholders on their own transition trajectory.

Lastly, this thesis also proves that lessons learned in an island context can be transferred to other contexts. The lessons learned within this thesis demonstrate to be predominantly social, meaning insights regarding organisation of the transition process and community engagement. This can be helpful for non-island contexts who are starting out to create a strategy for testing innovations.

7.3. PRACTICAL RECOMMENDATIONS

In advancing transitions, local initiatives and organisational capacity are identified as factors driving change. Rightly so, this thesis proves that when a community rallies behind a vision and when giving responsibility, they prove more than capable in realising their ambitions. Based on the lessons expressed by the in-depth interviews and focus group participants, this section will now synthesise these overarching lessons using a step-by-step approach (see figure 10). These six steps are outlined below and are reasoned to facilitate roll-out for future sustainability transitions regardless of context.

Step 1. Break up a transition in manageable steps – Before the start of proposing change measures, it is necessary to map out key components of a transition. See which what problems may be affecting

transition dynamics and what solutions are preferred by society. Having this information at one's disposal can enable identifying an overarching goal and sub-components. Following this, it is necessary to make a transition as concrete as possible by considering themes such as drinking water. For instance, in the focus group, participants referred to the effect of the solar park on the island. Having such a project made the energy transition more tangible and visible for the wider community. On top of that, this project showed to align with the locally valued sense of self-sufficiency.

Step 2. Erect a taskforce – Realising change is more likely to be successful if you got the local residents and other affected parties on board. In doing so, start with stakeholder mapping to identify stakeholders who are committed and intrinsically motivated in an early stage. Moreover, find investors who share this sentiment and are willing to fund a pilot project. In this identification stage, one can rely on the existing network to invite stakeholders to the table and expand from there. To this end, inviting external expertise into the network can be beneficial to elevate projects. Note here that initially determined goals set in the previous set are not set in stone and can alter as a result of exchanging perspectives. Also, remain open to suggestions from society on plans, objectives, concerns regarding uncertainties and opinions.

Step 3. Develop a pilot to test the innovation – Design a pilot to test a new technology. In doing so, provide (regulatory) room to test the application and involve the community as much as possible. Participants should be unburdened as much as possible throughout the trials. Make it a social experience. With social experience, this thesis means to engage in efforts to involve residents by helping them envision what impact their decisions have on the wider system. But also keep an open mind to what they can bring to the table. Engage this group by involving them in 'simple' tasks, like the heat scans. Though seemingly a small act, this was proven to make them more enthusiastic and committed to sustainability.

Step 4. Seek exposure – Feature the completed pilot in the media. Effectively putting a transition on display to the wider public ensures visibility for the innovation. This is reasoned to demonstrate that realisation is possible and encourages wider acceptance, awareness and replication elsewhere.

Step 5. Celebrate success – Take time to celebrate milestones and successful deliverables of a project with those involved in the process. Doing so will recognise the effort and dedication behind the achievements, presents a rewarding experience for those participating and serves to inspire others so that in return, they will also take up sustainability efforts.

Step 6. Evaluate progress – Having completed the steps described above, the final phase revolves around evaluation. Evaluation is a necessary step in navigating transitions due to their complex and dynamic nature. This is consistent with what this thesis is trying to prove: engage in constant learning to improve actions as transitions progress. In this exercise, room should be given to assess whether (learning) objectives have been met and identification of core learning experiences. In addition, these core lessons learned should be related to future transitions. If any further obstacles appear, one can always go back to the drawing board. This suggests the potential of various development rounds to a transition and promotes the idea of transitions as iterative and continuous process.

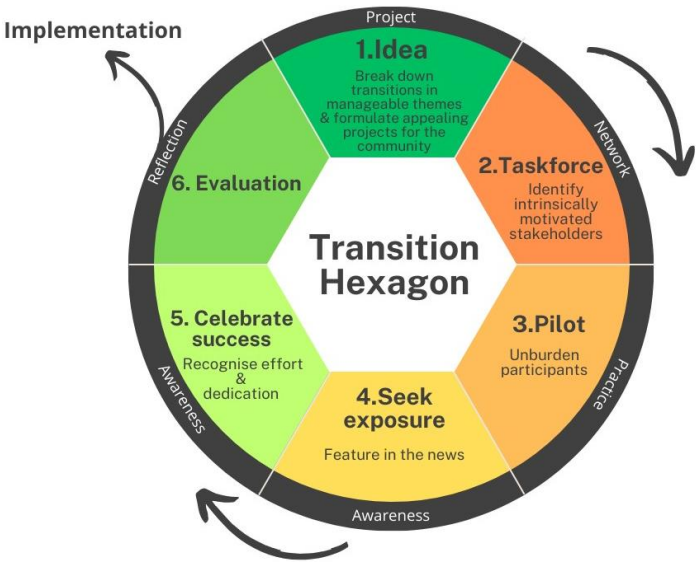

Figure 10. The transition hexagon describing the six phases to facilitate roll-out of a sustainability transition. The steps are derived from the claims from the focus group

7.4. FUTURE RESEARCH

The Ameland case points towards how strong organisational capacity and initiative-rich communities can catalyse change needed to realise transitions. At the same time, this study is aware that such capacity to organise and social cohesion as observed on Ameland may not be present in all communities. This presents an important matter to consider given that many of the sustainability transition initiatives are envisioned to take place in the Dutch rural landscape, often in small-scale communities (TNO, 2021). More than ever, these projects raise concerns from the communities in question and results in opposition. This should not be neglected, meaning that the question on how to achieve such organisational capacity in communities with lower social cohesion, both in urban and rural settings alike, remains and important topic. These often show different complexities and stakeholder settings that need to be considered. Therefore, continued efforts are needed to further fledge out the connection between organisational capacity and improving social cohesion.

Furthermore, covenants are mostly considered for their potential in stimulating a dialogue and seldomly result in concrete projects (Geerdink et al., 2019). On Ameland, the use of covenants as instruments has proven successful and provided a solid base for realising projects. However, a critical note of this instrument is the ad hoc mentality and relatively closed nature of the agreement. Participants referred to the covenants as resembling a bad boys club in which decisions are made for the people instead of in consultancy with people. In a way, this questions democratic credibility of covenants. This inevitably requires further research reflecting on the inclusivity of small-scale networks and how this may affect transition dynamics.

As a final suggestion for future research, this thesis leaned on the multi-loop learning framework by Argyris and Schön (1978) to understand to what extent learning took and is taking place within a small-scale island network. Based on the wider literature, this paper assumes that transitions may benefit from deeper organisational reflection required for triple-loop action. But is there a preferred loop of learning? Would transitions benefit from a more superficial and incremental path for learning, or should deeper learning associated with the double- and triple-loop be prioritised over incremental learning pathways? Just as there are multiple alternative transition pathways, it is necessary to address this question in future research.

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APPENDICES

APPENDIX A: PRELIMINARY ACTOR ANALYSIS

Table 7. List of actors on Ameland identified per category

Energy	Entrepreneurs	Government	Resident	Knowledge institutions
NAM	OPA	Province of Friesland	Resident associations	TNO
GasTerra	Coöperatieve Vereniging Vakantiepark Klein vaarwater	Municipality of Ameland	Residents	Waddencampus
Eneco	Restaurants	Duurzaam Ameland		HG
Alliander				EnTranCe
Amelander Energie Coöperatie (AEC)[1]				

Table 8. Preliminary actor analysis on roles, issues, stakes & goals and potential strategies or resources deployed by key actors

Actor	Roles	Issue	Stake/goal	Strategy/resource
Municipality	Initiator & facilitator of (energy) transition. Be the connecting element between private firms, knowledge institutions and the residents	Balance various needs of island municipality (e.g. energy, housing, tourism, etc.)	Aspirations to meet energy demand on the island in a sustainable way. Eventually become CO2-neutral by 2035	Provide subsidies and other funding for implementing energy reduction measures in households
Village interest groups (*Dorps-belangenvereniging*)	The villages Nes[2], Buren, Hollum[3] and Ballum each have an association that hosts activities intended to promote social cohesion for the respective village. Involved in participation but also represent the interests from the respective villages	Strive for a balance between economic gains and 'liveability', but for an accessible island[2]	Hosting activities for the village	Mobilisation force of members and volunteers to help with brainstorming about activities and hosting them[2]

Entrepreneurs association	Advocate on behalf of the entrepreneurs and bringing together the entrepreneurs to collectively map the options for sustainable company operations. Consider themselves as drivers of the economy[4]	Identify the benefits to make the company more sustainable	Create opportunity for sustainable business operations	Support entrepreneurs and organise regular meetings to provide information on sustainable business operations
Amelander Energie Coöperatie	Produce energy by means of carrying out renewable energy projects on the island. Also raise awareness among residents[5]	Maintain and attract members to the cooperative	Meet the energy demand and ensure to transition to harvesting clean energy→self-sufficient Ameland[1]	Revenue from energy production is directed to further development of more sustainable energy sources on the island. Can mobilise members
Covenant	Partnership that consists of NAM (gas production), GasTerra (integration renewable energy complementary to gas where possible), Eneco (energy producer & supplier), Philips (lighting systems), Alliander (grid maintainer on Ameland), TNO (innovation know-how), EnTranCe (education and research) and the municipality[1, 6]	Find ways to integrate and test pilots pertaining renewable energy production[1]	Advance the energy transition on Ameland by engaging in a collaborative partnership that brings together parties that can fund the transition, and that bring in expertise [1,6]	Develop overall trajectory, make available budget and decisions[1, 6]

[1] Geerdink et al. (2020), [2] Dorpsbelang Nes (2022), [3] Dorspbelang Hollum (2022), [4] Duurzaam Ameland (2017), [5] Amelander Energie Coöperatie U.A. (n.d.), [6] TNO (2021)

APPENDIX B: INTERVIEW GUIDE (DUTCH)

Interview guide

Locatie: _____
Datum: _____
Duur: _____

Kanttekening voor interviewer:

- ✓ Benoemen toestemmingsformulier (indien niet al getekend) en nogmaals vragen checken voor opname
- ✓ Aan het eind: korte beschrijving algemene sfeerimpressie tijdens het interview (hoe zat de geïnterviewde tegenover me, wat valt op, etc.)

Introductie

In het kader van mijn afstudeerscriptie bekijk ik het transitieproces van de afgelopen x jaar, dat Ameland heeft doorgemaakt. Ik ben met name benieuwd naar belangrijke keerpunten, leermomenten en het netwerk op Ameland. Ook blik ik vooruit op hoe de geleerde lessen eventueel van toepassing kunnen zijn op de toekomstige transities.

- Wat zou ik van Ameland moeten weten, wat maakt Ameland zo bijzonder?

Vragen:

Kritieke momenten:

1. Op welke manier was u betrokken bij de energietransitie op Ameland?
    a. Waarom is dit belangrijk voor u om hier betrokken bij te zijn?
2. Kunt u kort beschrijven hoe dat proces verliep?
    a. doorvragen evenementen uit vooronderzoek (zie tijdlijn onderaan vragenlijst)
3. Wat waren keerpunten/omslagpunten in dat proces?
    a. Waren deze keerpunten/omslagpunten positief of negatief?
    b. Welke lessen heeft u kunnen trekken uit deze omslagpunten/keerpunten?
4. Heeft u wel eens gedacht, dit wordt helemaal niets?
    a. Of wordt het nou juist een succes?
5. Kunt u voorbeelden geven van momenten waarop jullie je moesten aanpassen aan veranderende omstandigheden?

Lerend vermogen:

6. Zijn er voor zover u weet al eerder duurzaamheidsprojecten geweest?
    a. En bijvoorbeeld op het gebied van energietransitie?
7. Wat zijn voor u de belangrijkste lessen die u heeft getrokken uit het transitieproces?
    a. Wat voor gevolgen hebben deze lessen gehad op het energietransitieproces?

Samenwerking/netwerk:

8. Zijn er in het verleden al eerder samenwerkingsprojecten gestart op het gebied van duurzaamheid?
9. Zijn er organisaties of groepen die zich op dit moment specifiek bezig houden met energietransities op het eiland? Zeg maar ‘de-wie-doet-wat’.

    a. Zijn dezelfde mensen betrokken bij andere transities? Bijv. bij CET
10. Hoe ervaart u de samenwerking op het eiland?
    a. Wie neemt het voortouw?
    b. Is uw mening over de samenwerking in loop van tijd veranderd?
11. Heeft u het idee dat u (samen, oftewel individueel) tot nieuwe inzichten bent gekomen?
    a. Kunt u hier voorbeelden van benoemen?

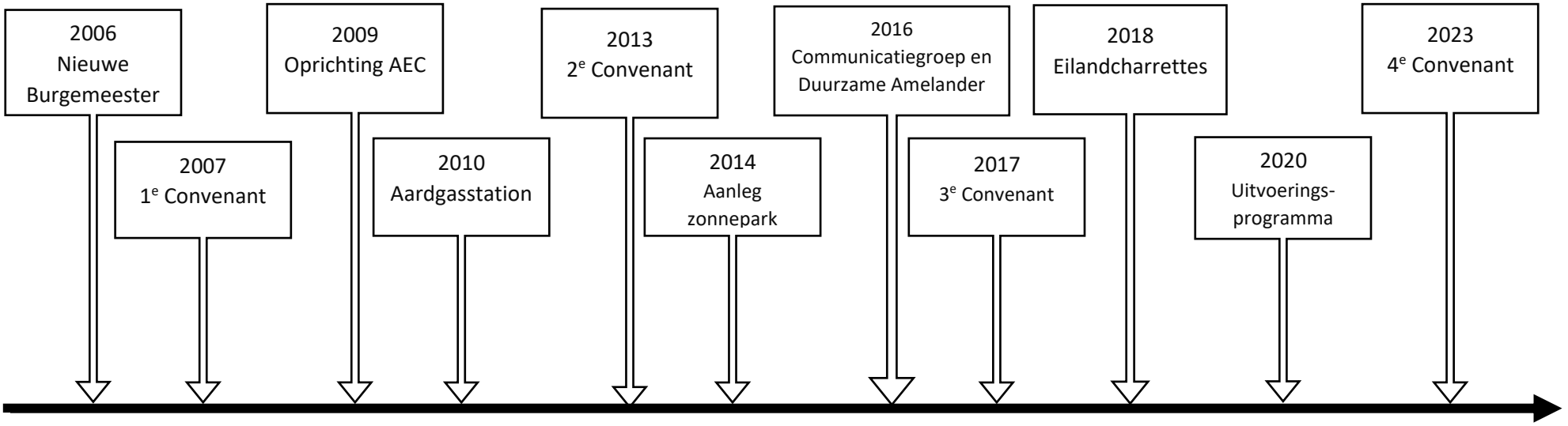
Toekomst:

12. Welke positieve punten van de energietransitie moeten we zeker meenemen naar de aanstaande (circulaire) transitie?
    a. Valt er nog wat te leren of zijn we uitgeleerd?
13. Wat zou u anders doen bij toekomstige transities op Ameland?
14. Welk advies zou u willen meegeven aan andere eilanden?

Afsluiting:

- We hebben het tot nu toe over onderwerpen gehad die uit vooronderzoek kwamen, maar missen er volgens u nog onderwerpen?
- Opmerkingen of verdere vragen?
- Kent u nog andere personen of organisaties die we in ieder geval moeten benaderen voor een interview?

Tijdlijn Energietransitie



Based on pre-research

Based on interviewee reponse

Actor: _____

APPENDIX C: CODE LIST

Table 9. Representation of the codes used in the thesis grouped according to theme

Code group (n=54)		Count	Groundedness
Community spirit[1]			
	Local engagement[1]	11	42
	Identity	8	15
	Self-sufficiency[1]	11	28
	Social cohesion[1]	10	30
Local traditions and history of cooperative projects[1]			
	Collaboration[1]	14	83
	Communication[1]	8	48
Sense of locality and responsibility[1]			
	Island qualities[1]	9	20
	Attachment[1]	1	1
	Contextual	11	18
	Stewardship[1]	1	1
Entrepreneurial individuals[1]			
	Change agents[1, 2, 3]	14	77
	Intrinsic motivation	11	47
	Partnerships[1]	5	13
Networks[1, 2]			
	Informal[2]	5	17
	Formal[2]	3	5
	Distance to meet	10	17
	Trust	3	7
	Knowledge	10	28
	Participation fatigue	3	7
	Local economic retention	7	8
	Funding	14	55
	Open attitude	7	11
	Social capital	8	17
	Awareness	6	30
Guiding visions and plans[1]			
	Frontrunner	13	26
	Pilot	14	86
	Direction[1, 10]	14	91
	Practical	8	19
	Incremental	6	12
	Driving factor	14	88
	Hindering factor	15	147
	Urgency	5	12
Critical moment[3]		15	69
	Opportunity[3]	9	25
	Impact[9]	9	51
	Discursive change[3, 11]	10	26
	Mentality switch	7	11

	Visibility[9]	6	20
Learning capacity			
	Adaptability	6	12
	Capacity-building[12]	8	15
	Reflexivity[6,7]	7	19
	Interaction[9]	13	33
	Inspiring cases	7	15
	Lessons learned	15	115
Sustainability transition			
	Renewable energy	14	43
	Circular developments	12	91
	Uncertainties[4]	4	7
	Heat transition	9	17
	Innovation[5]	6	15
Institutional			
	Legislation	12	75
	Top-down approach	14	37
	Bottom-up approach	5	20
	Policy	11	30
	Institutional capacity	2	7

[1] Sperling (2017), [2] Schön (1973), [3] Buitelaar et al. (2007), [4] Shove and Walker (2007), [5] Geels (2011), [6] Argyris and Schön (1987), [7] Armitage et al. (2008), [8] Stam et al. (2023), [9] Von Schönfeld and Tan (2021), [10] Rotmans et al., 2001, [11] Hajer (2009), [12] Von Schönfeld et al. (2020).

APPENDIX D: TEMPLATE INFORMED CONSENT FORM FOCUS GROUP AND INTERVIEWS (DUTCH)

Toestemmingsformulier

Betreft: U bent uitgenodigd om deel te nemen aan een studie over duurzaamheidstransities op Ameland. Deze studie is een onderdeel van een masterscriptie aan Wageningen University & Research. Het doel van dit onderzoek is om te kijken naar het leertraject van mensen die dicht bij de duurzaamheidstransities staan.

Proces: Ik verklaar hierbij te zijn ingelicht over de aard, methode en doel van het onderzoek en het is mij duidelijk waar ik aan meewerk. Ik heb vragen over het onderzoek kunnen stellen en die zijn naar tevredenheid beantwoord.

Ik begrijp dat:

- Ik mijn medewerking aan dit onderzoek kan stoppen op ieder moment en zonder opgave van reden
- Gegevens anoniem worden verwerkt, zonder herleidbaar te zijn tot de persoon
- De geluidopname opgeslagen wordt volgens richtlijnen van de universiteit, t.m.t. na de afronding van de scriptie

Ik verklaar dat:

- Ik geheel vrijwillig bereid ben mee te doen aan dit onderzoek
- De uitkomsten van dit interview verwerkt mogen worden in een verslag en/of wetenschappelijke publicatie
- Ik toestemming geef om het interview op te nemen door middel van een voice-recorder.

Indien u verdere vragen heeft of opmerkingen over het onderzoek, kunt u de onderzoeker telefonisch of via mail benaderen op: iris.vandongen@wur.nl /06-19642631

Om uw goedkeuring te registreren voor deelname en opname van dit gesprek, zou ik graag uw handtekening ontvangen.

_____ _____

Handtekening deelnemer *Handtekening onderzoeker*

Datum: …-…-… , [locatie]

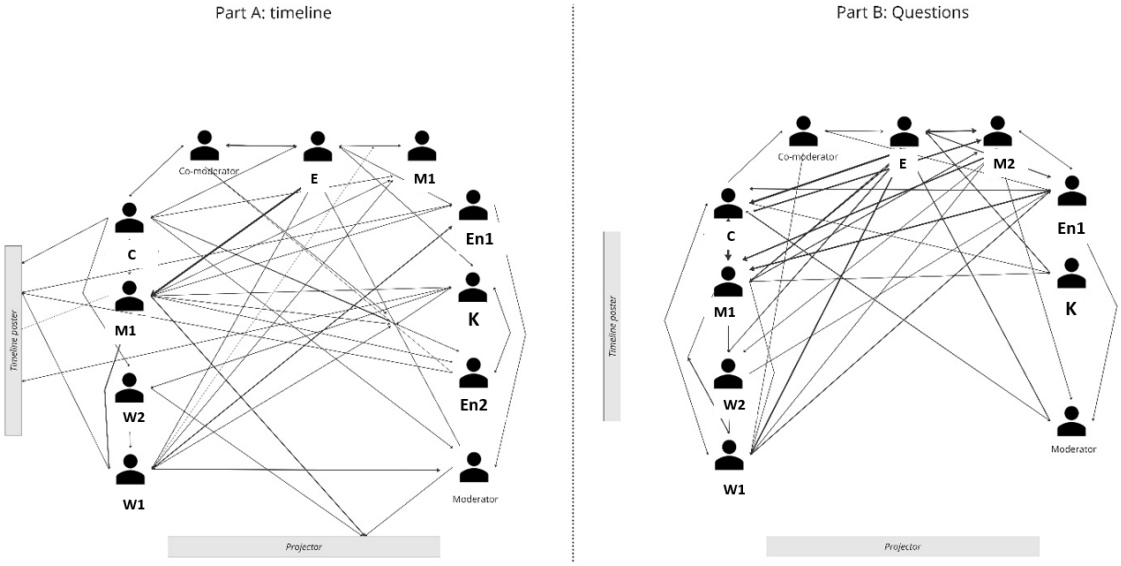
APPENDIX E: WORKSHOP FLYER (DUTCH)

APPENDIX F: FOCUS GROUP SCRIPT, AMELAND (DUTCH)

Onderdeel	Uitwerking	Aandachtspunten
Introductie (15:30-15:45)		
	Welkomst en uitleg doel van bijeenkomst: - Bevestigen leertraject op Ameland middels aankaarten omslagpunten en gekoppelde lessen - Toepasbaarheid lessen energietransitie op die van de circulaire economie	
	Voorstelronde	
	Programma bijeenkomst & tijdsduur (2u): 1)presentatie (10 min.) – 2)leertraject – 3) pauze – 4)toekomst Toestemming vragen voor opname	Neem geprinte versies mee toestemmingsformulier
Deel 1: leertraject energietransitie (15:45-16:15)		
Aanvullen leermomenten en CMs	Voor deze opdracht opdelen in 2 tweetallen en 1 drietal en laat ze brainstormen over het volgende: Schrijf op een blauwe post-it wat voor jullie belangrijke leermomenten/lessen waren n.a.v. de keerpunten op de tijdlijn. Plak deze erbij. Ontbreken er keerpunten? Schrijf deze op gele-post-its en plak deze op de tijdlijn.	Let op: - Waar ligt de shift in aanpak (bottom-up vs top-down) - Ranking omslagpunten (critical junctures)
Plenair	- Welke lessen springen eruit? o Waarom? - Welke lessen zijn relevant voor andere plekken die dezelfde transitie doormaken? (Wat is jullie mooiste herinnering aan de (energie)transitie op Ameland?) →back-up	
Deel 2: Toekomstgericht denken (16:30-17:15)		
Overstijgende lessen	Na al die innovatieprojecten, samenwerkingsverbanden, e.d. van de energietransitie is er veel geleerd. Maar nu juist verder kijken naar wat er meegenomen kan worden naar de circulaire economie.	Let op: - Niet inzetten op definitie CE - Evaluatie i.r.t. leren (e.g. praktijkgericht werken) - Samenwerking - Externe 'triggers' - Barrières vs drivers
	- Welke lessen moeten we meenemen naar een circulaire transitie? - Wat moeten we als Ameland hetzelfde blijven doen? o Wat moet er anders? - Welke invloeden van buitenaf hebben impact op een transitie? Bijv. veranderend bestuur, intrekken van subsidie, een energiecrisis, veranderingen in samenwerking of bij een milieuramp zoals het overboord gaan van containers bij de MSC Zoe.	

Afsluiting (17:15-17:30)		
	Vraag 6. Wat zouden jullie als tip willen meegeven voor andere dorpen of steden die aan het begin staan van een transitie?	
	Samenvatten punten en vragen voor laatste opmerkingen of toevoegingen	

APPENDIX G: SCHEMATIC DRAWING OF INTERACTIONS DURING THE FOCUS GROUP



Panel member composition (En: entrepreneur representative, K: museum representative, M: municipal representative, E: AEC representative, C: community association representative, W: knowledge institution representative)