

## **“It’s only possible with resistance.”**

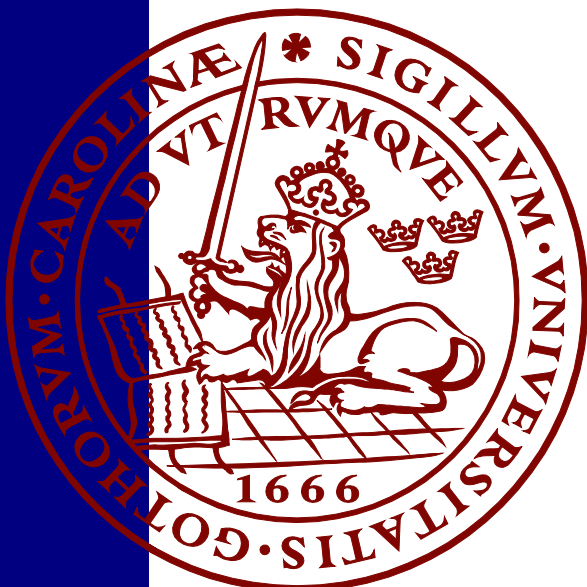
Understanding the Importance of Public Participation and Power  
in Climate Change Adaptation on the Halligen, Germany

*Friederike Küchler*

---

Master Thesis Series in Environmental Studies and Sustainability Science,  
No 2022:012

A thesis submitted in partial fulfillment of the requirements of Lund University  
International Master’s Programme in Environmental Studies and Sustainability Science  
(30hp/credits)



# **LUCSUS**

Lund University Centre for  
Sustainability Studies



**LUND**  
UNIVERSITY

---

**“It’s only possible with resistance.”**

Understanding the Importance of Public Participation and Power in Climate  
Change Adaptation on the Halligen, Germany

Friederike Küchler

A thesis submitted in partial fulfillment of the requirements of Lund University International  
Master’s Programme in Environmental Studies and Sustainability Science

Submitted the 10th of May, 2022

Supervisor: Ebba Brink, LUCSUS, Lund University

**Empty page**

## **Abstract**

Halligen are small low-lying islands that only exist in the North Sea and get flooded during storm surges. The North Sea's sea level is projected to rise 60 to 70cm by 2100, making climate change adaptation a question of survival for the Hallig residents. Previous research has focused on technical aspects of adaptation, leaving a knowledge gap on how power and public participation shape adaptation on the Halligen. This thesis contributes to an increased understanding of how power and participation shape adaptation on the Halligen. Data was collected through 17 qualitative interviews with residents and government representatives. The content analysis shows that a lack of traditional knowledge incorporation in decision-making can result in ineffective climate change adaptation. Furthermore, authorities' power over the residents limits their resistance. I conclude that an understanding of power relations and how to involve knowledge coproduction is needed to develop robust and effective climate change adaptation.

**Keywords:** traditional knowledge, actor-oriented power perspective, low lying islands, refusal, sustainability science, maladaptation

**Word count:** 11.913

## Acknowledgements

I want to thank my family and friends for the constant support and words of encouragement. Without you, I would have given up long ago!

My gratitude goes out to my amazing supervisor group: Jasi and Florina, thank you for constantly checking in with me and encouraging me along the way.

I especially want to thank my supervisor Ebba. Thank you for your patience, guidance and encouragement. I could not have asked for a better supervisor!

To my corridor mates Nomi and Davide:

Mucikám, köszönöm a támogatásod, különösen a bízott szavaidat és hogy mindig sírhattam a válladon!

Amore mio, grazie per il tutto il tuo supporto, soprattutto i tuoi "complimenti" e per avermi dato una spalla su cui piangere!

Lastly, I want to thank the people who contributed so much to this thesis and who made this thesis possible: the residents of Hallig Hooge and Hallig Langeneß and the authority representatives. Ohne eure und Ihre Zeit und eure und Ihre Mühen hätte ich nichts worüber ich schreiben könnte. Alle Hooger und Langeneßer mit denen ich gesprochen habe bin ich unendlich dankbar, dass Ihr mir das Leben auf einer Hallig nähergebracht habt. Das gilt ganz besonders für die Familie auf Neuwarf. Meine Zeit auf Hooge und Langeneß werde ich nicht vergessen und ich kann es nicht besser sagen als John Jacobsen in ‚Auf der Hallig‘:

Meine Hallig, du leuchtender Edelstein,  
Umbraust von den stürmenden Wogen,  
Du nordische Mär, du Kämpferin du,  
Hast fest mich ans Herz gezogen.

**Table of Contents**

- 1 Introduction ..... 1**
  - 1.1 Climate Change, Adaptation and Public Participation on the Halligen ..... 1
  - 1.2 Research Aim and Contribution to Sustainability Science ..... 3
  
- 2 Setting the Scene: The North Frisian *Halligen* ..... 4**
  
- 3 Theoretical Entry Points ..... 10**
  - 3.1 Climate Change Adaptation..... 10
  - 3.2 Public Participation in Climate Change Adaption ..... 10
  - 3.3 Power in Climate Change Adaptation ..... 11
  - 3.4 Resistance and Refusal..... 12
  
- 4 Methodology ..... 14**
  - 4.1 Methodological Approach ..... 14**
    - 4.1.1 Research Philosophy ..... 14
    - 4.1.2. Research Type ..... 15
  - 4.2 Data Collection ..... 17**
    - 4.2.1 First Phase – Fieldwork on the Halligen ..... 17
    - 4.2.2 Second Phase – Interviews with Representatives from the Responsible Authorities ..... 18
  - 4.3 Data Analysis Methods ..... 18**
  
- 5 Results and Analysis ..... 21**
  - 5.1 Residents’ Perception of Climate Change ..... 21**
  - 5.2 Attitudes Towards Climate Change Adaptation ..... 22**
  - 5.3 Perception of Residents’ Role in Climate Change Adaptation Processes ..... 25**
    - 5.3.1 The Role of Traditional Knowledge ..... 25
    - 5.3.2 Ability to Influence Decisions ..... 28
  - 5.4 The Role of Resistance in Climate Change Adaptation Processes ..... 28**

|  |           |
|--|-----------|
| 5.5 Participation of <i>Hallig</i> Residents in Climate Change Adaptation .....  | 29        |
| <b>6 Discussion .....</b>  | <b>32</b> |
| 6.1 Summary of the Main Findings.....  | 32        |
| 6.2 Integration of Findings from the Body of Existing Knowledge and Implications for<br>Climate Change Adaptation on the <i>Halligen</i> ..... | 33        |
| 6.2.1 Participation and the Role of Traditional Knowledge in Climate Change Adaptation.....  | 33        |
| 6.2.2 Power in Climate Change Adaptation .....   | 34        |
| 6.2.3 Resistance in Climate Change Adaptation.....   | 35        |
| 6.3 Research Limitations and Reflexivity .....   | 36        |
| 6.4 Future Research .....  | 37        |
| <b>6 Conclusion .....</b>  | <b>38</b> |
| <b>7 References .....</b>  | <b>39</b> |
| <b>Appendix .....</b>  | <b>52</b> |
| Appendix A.....  | 52        |
| Appendix B. ....   | 53        |
| Appendix C. ....   | 54        |
| Appendix D.....  | 56        |

**List of Figures**

Figure 1 ..... 2

Figure 2 ..... 4

Figure 3 ..... 5

Figure 4 ..... 5

Figure 5 ..... 6

Figure 6 ..... 6

Figure 7 ..... 7

Figure 8 ..... 7

Figure 9 ..... 8

Figure 10 ..... 8

Figure 11 ..... 16

Figure 12 ..... 24

Figure 13 ..... 25

**List of Tables**

Table 1 ..... 30



## Abbreviations

|        |  |
|--------|--|
| CCA    | Climate Change Adaptation  |
| IPCC   | Intergovernmental Panel on Climate Change  |
| LKN    | Landesbetrieb für Küstenschutz, Nationalpark und Meereschutz Schleswig-Holstein<br>[Government-owned Company for Coastal Protection, National Parks and Ocean Protection Schleswig-Holstein] |
| MELUND | Ministerium für Energiewende, Landwirtschaft, Umwelt, Natur und Digitalisierung<br>[Ministry for Energy, Agriculture, the Environment, Nature and Digitalisation]                            |
| UNB    | Untere Naturschutzbehörde Kreis Nordfriesland [Lower Nature Conservation Authority Administrative District North Frisia]   |

# 1 Introduction

## 1.1 Climate Change, Adaptation and Public Participation on the Halligen

The Intergovernmental Panel on Climate Change (IPCC) has reported that anthropogenic warming of the atmosphere, ocean and land has occurred and will continue until the middle of this century (IPCC, 2021). Thus, sea levels rising will increasingly put human settlements in low-lying areas and on small islands at risk (IPCC, 2019). To address the impacts of climate change effective climate change adaptation (CCA) is needed (Denton et al., 2014; IPCC, 2022). CCA has long been understood as finding the right technology to address climate change-related hazards (Bassett & Fogelman, 2013). However, more recent research has recognised the importance of incorporating social aspects of CCA development (Nightingale, 2017; O'Brien & Hochachka, 2010). Nevertheless, CCA decisions are still often made far away from the site of implementation, thus lack local context and risk unjust CCA (Patel et al., 2020; Shakya et al., 2019; Soanes et al., 2019).

Public participation is understood as a tool to acquire knowledge of the social and ecological context of adaptation (IPCC, 2018, 2022; United Nations, 1992). Knowledge co-production within public participation can increase the acceptance and effectiveness of CCA measures (Djenontin & Meadow, 2018; Hügel & Davies, 2020). However, these processes are subject to power relations which shape what measure is adopted and how (Boyd, 2017; Hügel & Davies, 2020; Wamsler, 2017; Wamsler & Raggars, 2018). The understanding of how power operates between drivers and subjects of adaptation is still limited, especially in the Global North since research on power issues in adaptation has so far strongly focused on Africa and Asia (Woroniecki et al., 2019).

Furthermore, how resistance as a way of pushing back against power influences adaptation outcomes has rarely been the research focus in CCA studies (Woroniecki et al., 2019). Not understanding the influence of power relations in CCA risks the persistence of an unequitable exercise of power in knowledge creation and implementation of adaptation measures (Eriksen et al., 2015; Woroniecki et al., 2019). This in turn puts at risk a holistic and profound understanding of the local context of adaptation (Djenontin & Meadow, 2018; Hügel & Davies, 2020).

An understanding of how participation, power relations and resistance shape adaptation is lacking for the *Halligen*,<sup>1</sup> which are very small islands in the North Sea that belong to Germany (Klöck, 2019).

---

<sup>1</sup> Hallig: singular, meaning one island; Halligen: plural, meaning two or more islands

Here, research on adaptation has strongly focused on the technical side of adaptation (Hofstede, 2008; Jensen et al., 2011; Kumbruck et al., 2022; Schindler et al., 2014; Schindler & Willim, 2015; Schüttrumpf, 2013; Wöffler et al., 2012). Thus, this thesis will conduct a study on public participation and power relations in CCA on the Halligen (Germany) to further the understanding of how participation and power can contribute or constrict the development of equitable CCA.

Effective CCA is urgently needed at the North Sea as the sea level is projected to rise 60 to 70 cm by 2100 in a high greenhouse gas emissions scenario (RCP8.5) (European Environment Agency, 2021). *Halligen* are small islands in the North Sea that lie so low that they are flooded during storm surges and are thus strongly exposed to climate change impacts and severe flooding (Federal Environmental Agency [Germany], 2015; Staatskanzlei Schleswig-Holstein, n.d.-a). For now, the occurrence of a flooded *Hallig* is part of normal life. The regular occurrence of floods is what distinguishes *Halligen* from islands. The term *Land unter* is used to refer to a flooded *Hallig*<sup>2</sup>. Houses and infrastructure are built on terps that are the only visible land during *Land unter* (see Figure 1). The terps are approximately 5 m higher than the surrounding land and often have extra protection through a ring dike levee.



**Figure 1. Land unter on Hallig Langeneß.** The areal image shows the *Hallig* Langeneß during a *Land unter* with only terps being visible. From: Klimawandel bedroht Halligen [Climate Change threatens Halligen], by WWF (2022). Copyright 2022 by Martin Stock.

Because of the *Halligen*'s exposure to rising sea levels, the German federal-state government, called Schleswig-Holstein, has decided to raise every terp to ensure the liveability on the Halligen

---

<sup>2</sup> This study uses the German term '*Land unter*' instead of the translated term 'land submerged' to emphasise the phenomena's uniqueness and highlight the connection to the *Halligen*.

(Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein [LKN], n.d.-a). The terp raising represents the most important CCA measure for the Halligen (Federal Environmental Agency [Germany], 2015).

As mentioned above, understanding the power relations in CCA and participation is vital for effective CCA. A search for scientific articles about power and participation in CCA on the *Halligen* brought forward only two articles by Häußling et al. (2016) and Klöck (2019), indicating a severe gap in the scientific knowledge of how power and participation shape CCA on the *Halligen*.

## **1.2 Research Aim and Contribution to Sustainability Science**

This thesis supports CCA on the German *Halligen* by developing an understanding of how public participation and power relations influence the development of adaptation on the *Halligen*. More specifically, this thesis reveals how residents and their experience are incorporated in public participation for CCA. Furthermore, this shows how participation and CCA is shaped by power relations and resistance on the *Halligen*. I thus not only hope to improve equity in adaption on the *Halligen* but also to enhance the scientific understanding of how power and resistance shape CCA.

The thesis asks the following three research questions to reach the named research aims:

*(RQ1) How do residents of the North Frisian Halligen perceive their role in CCA processes?*

*(RQ2) What role does resistance play in shaping CCA on the Halligen?*

*(RQ 3) How is Hallig residents' participation in adaptation processes shaped by their CCA perception and resistance?*

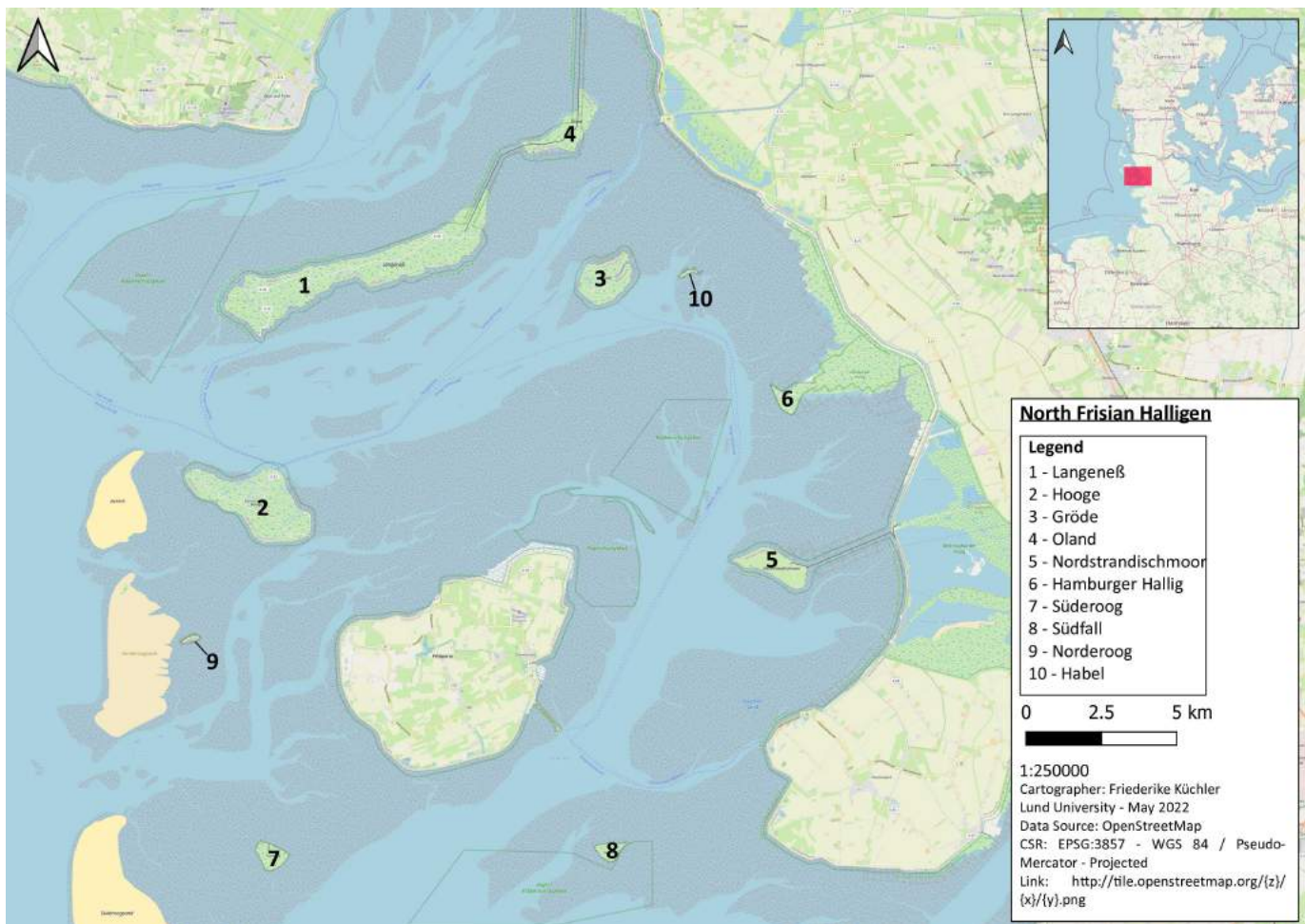
This thesis contributes to sustainability science by connecting sciences which is pivotal for advancing sustainability science (Clark & Harley, 2020). Drawing on different disciplines to generate more comprehensive answers to complex questions (Repko et al., 2012), allows sustainability science to produce more socially robust and salient knowledge (Knaggård et al., 2018). Producing usable, substantiated knowledge on sustainability challenges that can inform political processes in addressing these challenges is at the core of sustainability science (Jerneck et al., 2011).

Chapter 2 provides an introduction to the *Halligen*. The third chapter introduces the theoretical entry points of this thesis: CCA, public participation, power and resistance. The applied methodology is presented in the fourth chapter. The fifth chapter presents the findings of this thesis by answering the research questions. The research questions are then further discussed in the sixth chapter. The final chapter provides a conclusion to the thesis.

## 2 Setting the Scene: The North Frisian *Halligen*

*Halligen* are small islands that are the remnants of former marshland flooded in the Middle Ages. The remaining 10 North Frisian *Halligen* are unique in their nature and culture. Regular flooding of the *Halligen* has resulted in a unique composition of specialist plant and animal species (Fröhlich & Rösner, 2018).

The *Halligen* are separated into different municipalities, all of which belong to the administrative district called North Frisia. Schleswig-Holstein in turn is the state to which North Frisia belongs (see Figure 2). Ten *Halligen* belong to North Frisia, and five of these are permanently inhabited by a total of 257 permanent residents (Biosphäre Die Halligen, 2017).



**Figure 2. Map of North Frisian *Halligen*.** The numerical order corresponds to the area size of the *Halligen*, with Langeneß being the biggest *Hallig* and Habel being the smallest. The smaller overview map shows the location of the *Halligen* in a greater area. Own work.

The *Halligen* are home to the Frisians, a recognised national minority and ethnic group (Bundesministerium des Inneren und für Heimat, 2022). Frisians have lived along the North Sea coast of today's Germany and the Netherlands for approximately 2,000 years. Frisians have region-specific

languages; approximately 8,000 to 10,000 people speak the local dialect of North Frisian (Staatskanzlei Schleswig-Holstein, n.d.-b).

The word *Hallig* means “flat” or “low” and refers to the fact that the *Halligen* lie only a few decimetres above the local mean high tide (Ministerium für Energiewende, Landwirtschaft, Umwelt, ländliche Räume des Landes Schleswig-Holstein [MELUND], 2014). Hallig Hooge and Hallig Langeneß are the lowest-lying *Halligen*. Hooge’s mean high tide is at 640 cm, and it becomes flooded at a tide level of 738 cm (LKN, n.d.-a). Dikes, which would completely prevent water from flooding the *Halligen*, do not exist on any *Hallig*. *Halligen* are therefore regularly flooded (Strack & Jensen, 2014). Figures 3 and 4 show the difference between a the normal *Hallig* landscape and a *Land unter*.



**Figure 3. View across Hallig Langeneß.** The picture shows the view from the top of terp ‘Neuwarf’ across Langeneß with the *Hallig* land visible. Picture taken on the 15th of February 2022. Own work.



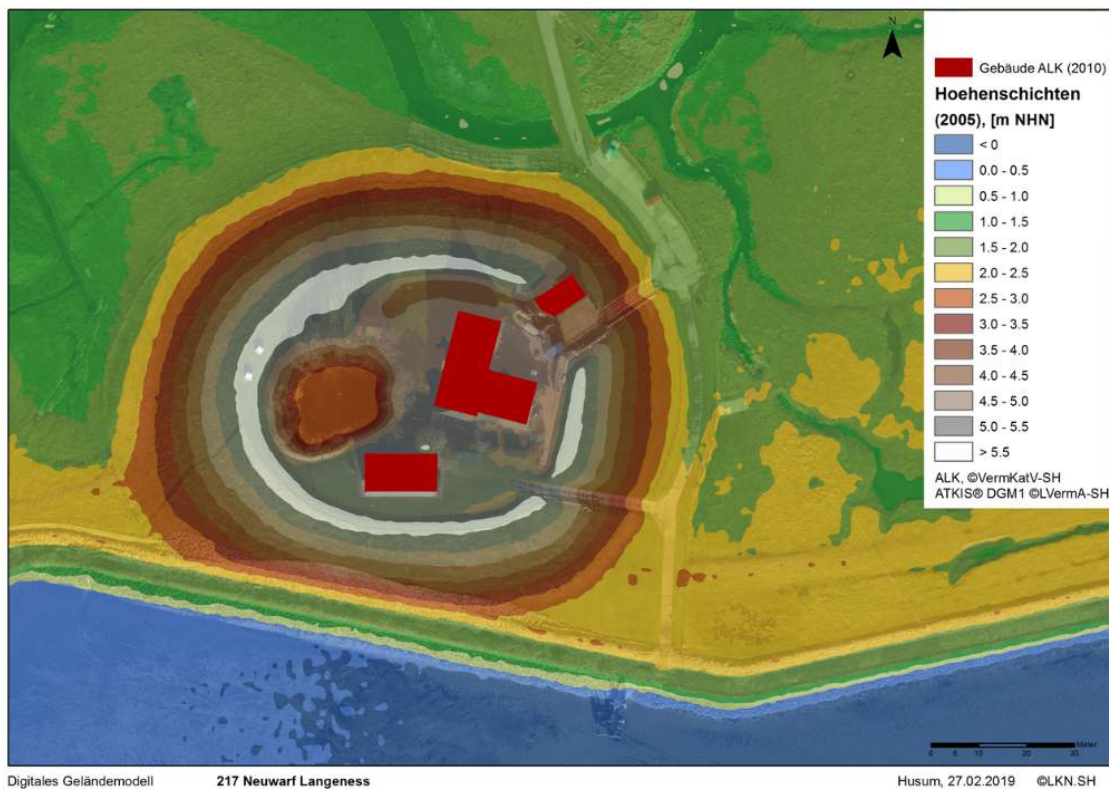
**Figure 4. View across Hallig Langeneß during *Land unter*.** The picture is taken from point as Figure 3, from the top of terp ‘Neuwarf’, but during *Land unter*. The *Hallig* land is not visible, only the next two terps are visible. Picture taken on the 17th of February 2022. Own work.

The flooding of the *Halligen* is essential for their survival because storm surges wash sand, mud and shell pieces onto the *Halligen*. The alluvial matter sediments and thus increases the *Halligen*’s height up to 3,8 mm per year (MELUND, 2014).

*Hallig* residents have learned over centuries how to protect themselves by living on terps. Terps are elevated plots of land on which houses and other infrastructure are built (see Figure 5). Figure 6 shows a terrain model of Neuwarf which illustrates the different heights of a traditionally built terp. The terps all have individual names and are surrounded by water during *Land unter*.



**Figure 5. Neuwarf on Langeneß.** This picture shows the terp “Neuwarf” on Langeneß. A driveway up the terp is on the left side in this picture. Picture taken on the 15th of February 2022. Own work.



**Figure 6. Terrain model of Neuwarf.** This terrain model shows the contour levels (called Hoehenschichten in the model) in meters above standard elevation zero.<sup>3</sup> The red squares represent houses. The height of the terp increases from 2 – 2,5 m to above 5,5 m on top of the ring dike. The terp is lower inside the area that is surrounded by the ring dike. From: Langeneß by Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein, 2019. Copyright 2019 by LKN.SH.

<sup>3</sup> The *standard elevation zero* is the German equivalent to meters above sea level (Bundesamt für Kartographie und Geodäsie, 2022).

The edges of the *Halligen* are secured against erosion by stone revetments (see Figure 7; Strack & Jensen, 2014).



**Figure 7. Revetment on Hallig Hooge.** Stone revetment on the northern side of Hooge with the ferry dock in the background. The revetment is around 2 meters wide and paves the *Hallig* edge. Picture taken on the 27<sup>th</sup> of February 2022. Own work.

Groynes are used around the *Halligen* to protect the revetments and edges from erosion by reducing the flow velocity (Strack & Jensen, 2014; see Figure 8).



**Figure 8. Groyne on Langeneß.** This picture shows a groyne made of stone on Langeneß. It is around 30 meters long and 4 meters wide. It vertically protrudes from a *Hallig*. By protruding into the ocean, groynes interrupt the water flow thus reducing erosion and water speed. Picture taken on the 22<sup>nd</sup> of February 2022. Own work.



Sluices connected to tidal creeks on the *Halligen* prevent *Land unter* during high tides by staying closed. However, after storm surges, they are opened to drain seawater from a *Hallig* (Strack & Jensen, 2014; see Figure 9).



**Figure 9. Sluice on Hallig Hooge.** This picture shows a closed sluice on Hallig Hooge. This sluice controls the water levels of the biggest tidal creek on Hooge. Picture taken on the 27<sup>th</sup> of February 2022. Own work.

So far, three terps have been reinforced<sup>4</sup> or are still under construction to adapt to climate change: terp Norderwarft on Nordstrandischmoor, terp Treuberg on Langeneß and terp Hanswarft on Hooge. Norderwarft has been reinforced by building a new terp right next to the old one. The old Treuberg terp was torn down and completely replaced (LKN, n.d.-a; see Figure 10).



**Figure 10. Reinforced Treuberg terp.** The picture shows the reinforced Treuberg terp on Langeneß which is now 5,9m high. Picture taken on the 23<sup>rd</sup> of February 2022. Own work.

---

<sup>4</sup> The terms ‘reinforcing’ and ‘raising’ of terps are used interchangeably in this study. The corresponding German terms ‘Warftverstärkung’ and ‘Aufwartung’ are also used interchangeably and refer to the same measure: a terp is raised and thus reinforced, and it is reinforced by raising it.

Terp Hanswarft was reinforced by raising and extending the sides of the terp. The raising of Hanswarft did not involve the building of new houses. Only the sides of the terp were reinforced instead of tearing the houses down and then raising the whole terp. This method of terp reinforcement will likely be adopted for most other terps because houses do not have to be torn down (LKN, n.d.-a).

These reinforcements have in common that they no longer have a ring dike and instead the top of the terp is on one level like a plateau (see Figure 10). Furthermore, the incline of the terp sides is shallower to reduce the waves' impact force. All terps have been raised to a height that is higher than the level of a flood with a 100-year return period (LKN, n.d.-a).

The state Schleswig-Holstein finances 95% of the cost for terp reinforcements. The rest is paid by the federal state of Germany and EU subsidies (LKN, n.d.-b). Different ministries and organisations of Schleswig-Holstein supervise and coordinate the reinforcement. The most important institutions are the Ministerium für Energiewende, Landwirtschaft, Umwelt, Natur und Digitalisierung<sup>5</sup> (MELUND) which supervises the reinforcements, the Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein<sup>6</sup> (LKN) which coordinates and executes the reinforcements, and the Untere Naturschutzbehörde Kreis Nordfriesland<sup>7</sup> (UNB) which ensures that reinforcements are conducted with minimal negative environmental impacts (LKN, n.d.-a).

---

<sup>5</sup> In English: Ministry for Energy, Agriculture, the Environment, Nature and Digitalisation

<sup>6</sup> In English: Government-owned Company for Coastal Protection, National Parks and Ocean Protection Schleswig-Holstein

<sup>7</sup> In English: Lower Nature Conservation Authority Administrative District North Frisia

### **3 Theoretical Entry Points**

#### **3.1 Climate Change Adaptation**

Climate change is an accepted and certain reality. Its impacts can already be felt, and it is thus necessary to find ways to adapt human society to the expected changes (IPCC, 2022). The IPCC defines adaptation as “reducing climate risks and vulnerability mostly via adjustment of existing systems” (IPCC, 2022, p. 22). The IPCC report (2007) defines climate vulnerability as “the degree to which geophysical, biological and socio-economic systems are susceptible to and unable to cope with adverse impacts of climate change” (IPCC, 2007, p. 73). Climate risks result from “dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards” (Reisinger et al., 2020, p. 5).

Adaptation can be divided into reactive and autonomous or anticipatory and planned adaptation (Fankhauser et al., 1999). The first adaptation type describes interventions implemented *ex post* to respond to an undesired climate event (Fankhauser et al., 1999; Rahman & Hickey, 2019). Anticipatory and planned adaptations are *ex ante* interventions with a specific goal and are based on predictions (Fankhauser et al., 1999; Smit et al., 2000). Implementing anticipatory and planned adaptation requires the executive government and private actors to balance local needs and values, scientific information and local knowledge (Djenontin & Meadow, 2018; Rahman & Hickey, 2019). In 2018 and 2022, the IPCC highlighted the importance of public participation in adapting to climate change risks (IPCC, 2018, 2022).

#### **3.2 Public Participation in Climate Change Adaption**

There is no singular or universally accepted definition of public participation. The term is primarily used as an umbrella term to cover different forms of interaction with people (Hügel & Davies, 2020). These interactions can entail dialogues, analyses and debates to inform and listen but can also go as far as joint implementation of an agreed-upon solution (Arnstein, 1969; Hügel & Davies, 2020; Wiedemann & Femers, 1993). In a review of 484 papers, high levels of participation were found to be beneficial for the efficacy of CCA (Hügel & Davies, 2020). Authorities sometimes view long-ranging collaborations as time-intensive, cumbersome and conflict creating. However, only these processes enable considered debates, resulting in more robust and accepted decisions (Hügel & Davies, 2020).

Public policymaking has long been permeated by dependence on scientific knowledge. Governments have long disregarded traditional knowledge in policymaking (Burby & May, 2009; Puppim de Oliveira & Fra.Paleo, 2016; White, 1975). However, the interest in traditional knowledge has increased over

the last decade (Naess, 2013). Traditional knowledge is understood as practices, innovations and knowledge unique to indigenous and local communities (Convention on Biological Diversity, 2021). This knowledge has often developed over centuries and has been shaped by the community's relationship with culture and the environment (Convention on Biological Diversity, 2021).

Governments' increased interest in incorporating traditional knowledge into CCA planning can be ascribed to the benefits of using traditional knowledge in CCA. Robustness and acceptance of decisions regarding CCA can be increased by incorporating traditional knowledge into science and policies (Djenontin & Meadow, 2018; Hügel & Davies, 2020). Furthermore, traditional knowledge systems often have a more holistic understanding of their environment. In combination with science, this holistic understanding can assist in finding locally appropriate adaptation interventions (Berkes, 2009; Fischer, 2000).

Knowledge coproduction is a method that goes beyond the understanding of traditional knowledge as content input. Scholars argue that knowledge coproduction can bring together various actors to create knowledge (Berkes, 2009; Djenontin & Meadow, 2018). Knowledge coproduction leaves behind the science versus traditional knowledge debate and embraces partnership between science and traditional knowledge (Berkes, 2009). For example, participatory modelling links local and traditional knowledge, observations and experience to science and modelling. It can thus aid participatory decision-making and collective problem framing. Participatory modelling does not understand traditional knowledge as content input but rather as a system which can be used (Hubacek et al., 2017). Traditional knowledge cannot pass on factual knowledge of climate change or data from generation to generation. When policymakers or scholars require this, traditional knowledge is used as content input. Using traditional knowledge just as content input risks increased structural resistance in the future as well as ongoing conflict, obscuring ambivalences and preventing dissolving difficult choices (Hügel & Davies, 2020; Sprain, 2017). Traditional knowledge as a process involves passed on ways of observing and making sense of new information (Berkes, 2009).

### **3.3 Power in Climate Change Adaptation**

Research indicates that successful participation and adaptation are influenced by power dynamics between actors. Participation is rarely apolitical and occurs in spaces that are not neutral. These spaces are subject to power imbalances between those involved and can thus be hierarchical and exclusive instead of open and inclusive (Cooke & Kothari, 2001). Participation thus does not automatically lead to equitable and successful adaptation (Hügel & Davies, 2020).

CCA studies employ different framings of power (Woroniecki et al., 2019). This study follows the actor-oriented power perspective since it understands power as being consciously exercised and not as something that is exercised unconsciously between actors. It thus focuses on the actors (Svarstad et al., 2018).

Three assumptions form the basis of this power perspective: First, power is exercised to achieve an actor's intention. Second, two or more actors are involved in actions through which power is exercised with one actor often trying to exercise power over the other while the other actor tries to resist the power. The third assumption is that the intended outcome is produced through these actions. Intentionality, relationality and causality thus together constitute power (Engelstad, 1999).

Actor-oriented power thus assumes a close connection between power and agency. Agency can be enabled or constrained by power-exercising actions (Dowding, 2008; Svarstad et al., 2018). This study understands agency as the capacity of actors to do what they want (Dowding, 2008). Understanding the agency of actors and how power is exercised helps scholars detect environmental injustice and unsustainable practices and interventions (Svarstad et al., 2018).

Woroniecki et al. (2019) identified different power expressions and power dynamics within the actor-oriented power perspective: "power over" and "power to" as two expressions of power and "empowerment", "disempowerment" and "resistance" as specific power dynamics in CCA. "Power over" describes power when it constrains another actor or that actor's behaviour (Dahl, 1957). "Power to" captures the capacity of an actor to produce an intended outcome (Pansardi, 2012). "Disempowerment" describes an actors loss of power through the exercise of "power over" by another actor (Woroniecki et al., 2019). "Empowerment" describes people's ability to gain power after they were denied this power (Kabeer, 1999). "Resistance" refers to actors pushing back against "power over" (Hollander & Einwohner, 2004) and will be further described in the next section.

### **3.4 Resistance and Refusal**

With an increased interest in understanding the power dynamics in CCA processes, resistance has emerged as a lens to provide insights into these power dynamics (Barnett, 2020; Henrique & Tschakert, 2019; Woroniecki et al., 2019). A universal definition of resistance does not exist, but most studies name action and opposition as the core elements of resistance (Hollander & Einwohner, 2004). This study adopts Johansson and Vinthagen's (2016) definition of resistance, which is: "resistance as an *oppositional act*. It is an activity – a social action that involves agency; and that is carried out in some kind of oppositional relation to power" (p. 418, original emphasis). In the context of resistance, opposition is understood as countering, rejecting, challenging, contradicting or damaging (Hollander

& Einwohner, 2004; Pickering, 2000). Woroniecki et al. (2019) identify “noncompliance, leverage of institutional resources and legal frameworks, political alliances” (p.6) as examples of how resistance is represented in CCA processes.

Refusal has developed as a new concept to understand responses to power. It is not a new version of resistance but rather a critique of it (McGranahan, 2016). Scholars who promote refusal argue that the concepts of resistance are insufficient and often overestimate the position of the state. Resistance implies the opposing of those with greater power in a relationship with imbalanced power distribution (McGranahan, 2016; Seymour, 2006; Simpson, 2007), while refusal altogether rejects the hierarchical relationship, thus reconfiguring it entirely (McGranahan, 2016).

## **4 Methodology**

### **4.1 Methodological Approach**

#### **4.1.1 Research Philosophy**

A researcher forms several assumptions throughout the research process (Burrell & Morgan, 2016). These assumptions influence how researchers understand their research question, use a methodology and interpret their findings (Crotty, 1998). Doing research means evolving knowledge in a particular field. Assumptions and beliefs that are subject to knowledge development are summarised under the term “research philosophy”.

This section introduces assumptions that shape any research philosophy, namely ontological and epistemological assumptions. The research philosophy that this study follows is then presented.

Assumptions about the reality of nature are the concern of ontology. Questions of whether reality is “the product of one’s mind” (Burrell & Morgan, 2016, p. 1) or whether the world exist independently from human consciousness are fundamental considerations (Burrell & Morgan, 2016).

Epistemology addresses assumptions about the nature of knowledge. “How is it possible, if it is, for us to gain knowledge of the world?” (Hughes & Sharrock, 1997, p. 5) is the fundamental question of epistemology. Understanding one’s epistemological assumptions is important for choosing a research method (Saunders et al., 2019).

To summarise, well understood and consistent assumptions are the foundation for a credible research philosophy (Saunders et al., 2019). Decisions regarding the used methodology, research design and strategy, data collection procedure and analysis are, as mentioned above, shaped by the assumed research philosophy (Crotty, 1998). It is thus necessary to reflect on the research philosophy that guides this research.

This study follows interpretivism and thus aims to generate new, profound understandings of the world. Interpretivism assumes that humans and the social world cannot be studied in the same way as the natural world because humans create meanings. Therefore, an interpretivist researcher aims to step into the social world of research participants, to understand how they give meaning to, understand and interpret the social world (Saunders et al., 2019). This aim is reflected in the data collection method of this study.

In this research philosophy, ontology assumes that reality is complex and rich with endless different interpretations and realities. Culture and language socially construct the world, which is subject to a constant and ever-changing flow of processes, experiences and practices (Saunders et al., 2019).

The epistemological assumptions of interpretivism follow the understanding that narratives, perceptions and interpretations are appropriate ways to generate and contribute new understandings and worldviews (Saunders et al., 2019).

Interpretivist research is predisposed to inductive inference, meaning that known premises are applied to generate untested conclusions which can be generalised. A qualitative research methodology is typically used to explore a phenomenon and to discern patterns and recurring themes (Saunders et al., 2019).

#### **4.1.2. Research Type**

##### ***Interviews with Residents from the Halligen***

This study is guided by interpretivism and thus utilises a qualitative research methodology since qualitative research allows the researcher to “capture the meaning of and regularities of social action” (Sarantakos, 2013, p. 148). Qualitative interviews are a common and accepted method for gaining knowledge about a social phenomenon and people’s experiences and interpretation of reality (Zhang & Wildemuth, 2009). Working within the interpretivist research philosophy implies that a research participant’s understanding of reality can only be elicited in their terms and through their own perspective (Denzin, 2017; Zhang & Wildemuth, 2009). Unstructured interviews follow these assumptions and aims to obtain an in-depth understanding of a particular social phenomenon and its cultural context (Zhang & Wildemuth, 2009). Since this aim is in line with the aim of this thesis, I chose unstructured interviews to collect data on the *Halligen*.

The following paragraphs introduce the principles and strategies for conducting unstructured interviews. I used these standards as guidelines during the interviews.

Unlike structured and semistructured interviews, unstructured interviews do not follow predefined questions, theoretical frameworks or hypotheses. Rather, questions are generated as a response to a participant’s narration. Therefore, every unstructured interview follows a different structure and pattern, exposing the researcher to unanticipated themes. Being exposed to these unanticipated themes and participants’ perspectives helps the researcher grasp the participants’ social reality (Zhang & Wildemuth, 2009).



A researcher's influence and control over an unstructured interview is intended to be minimal (Burgess, 2002). Thus, the researcher follows the participant's narration and spontaneously generates questions based on and reflecting the interview so far. To ensure that I accomplished this, I followed Spradley's (1979) suggestion to use three different types of questions that help probe and adjust the direction of the conversation, beginning with descriptive questions through which participants are allowed to freely describe an activity or experience. Structural questions are the second type of questions. These questions give the researcher an understanding of how the participants' knowledge is organised. Finally, contrasting questions can give the researcher an understanding of contrasting narrations by allowing participants to compare different situations and the reason the meaning of the situations.

During the interview, questions must not be directive since a directive question can bias the answer (Burgess, 2002; Patton, 2015). Whyte (1994) developed a directiveness scale for statements and questions (see Figure 11).



**Figure 11. Directiveness Scale.** The directiveness scale for statements and questions with increasing directiveness from left to right. Own design based on Whyte, 1994.

I tried to maintain low levels of directiveness to keep my influence to a minimum and thus allow the participants to relate their understanding of reality from their perspective.

To further minimise the possibility of influencing the participants, I followed Zhang and Wildemuth (2009) suggestion to present myself as “a learner, a friend, a member of the interviewee’s group” (p. 3) who is willing and interested to understand. Adopting this role enabled me to build rapport with the participants. Rapport is a harmonious and trusting relationship between the researcher and the participants. This enables a free flow of information between both parties (Spradley, 1979).

### ***Interviews with Representatives from the Responsible Authorities***

I planned to conduct semistructured interviews with representatives of authorities connected to CCA on the *Halligen*. I chose semistructured interviews because they guarantee a greater consistency and comparability than unstructured interviews while also allowing participants to state their understanding and interpretation of their social world. Furthermore, semistructured interviews enabled me to investigate a fairly specific topic to facilitate analysis (Adams, 2015; Bryman, 2012).

I have used an interview guide for this research (see Appendix A). The interview guide contains preformulated questions (Bryman, 2012). I focused on open-ended questions because they allow participants to reflect on an experience through their own perspectives and words (Adams, 2015).

I asked all of the questions during each interview and used similar wording in each interview. Following the chronological order of the interview guide is not a prerequisite for a semistructured interview. Researchers need to be flexible and adjust the order if doing so fits better with the narration of the participant. However, the initial guide should be drafted for the ideal sequence of questions (Adams, 2015).

## **4.2 Data Collection**

I collected data in two phases. In the first phase, I conducted unstructured interviews with residents of two North Frisian *Halligen* (Hooge and Langeneß) between 13 February and 1 March 2022.

The second data collection phase involved semistructured interviews with representatives of relevant government authorities. I conducted these interviews remotely over the telephone between 1 and 6 April 2022.

All participants were granted anonymity by default; participants who wanted to appear with their name had to actively tell me so. Before each interview, I summarised the topic and purpose of this study and asked participants to either sign a consent form or state their consent orally. I assured all participants that they could withdraw their participation during the research process. For this purpose, all participants received my contact information and another summary of the purpose of this research.

### **4.2.1 First Phase – Fieldwork on the Halligen**

I conducted fieldwork on Hallig Langeneß and Hallig Hooge. I chose these *Halligen* for logistic reasons because they provide rooms to rent during the off-season and for strategic reasons since Hooge and Langeneß are the largest *Halligen* with the highest population of all *Halligen* (Biosphäre Die Halligen, 2017).

Overall, I conducted 13 interviews with 14 residents (eight interviews on Langeneß and five on Hooge). I randomly sampled all participants. I chose the random or convenience sampling strategy because the sample universe was demographically and geographically local, being restricted to two *Halligen* with approximately 100 residents each. Furthermore, by not determining any categories a priori, I upheld the possibility of generalising the research findings (Robinson, 2014).

The average interview was approximately one hour long, with the shortest interview taking 20 minutes and the longest two hours. I recorded the interviews on my phone.

An *aide-memoire* guided the interview process. It ensured a certain consistency across different interviews and helped to maintain the research focus during the interview (Minichiello et al., 2008). An *aide-memoire* functions as a reminder and overview of topics and issues that the researcher could address (Minichiello et al., 2008; Zhang & Wildemuth, 2009). The *aide-memoire* that I used during the interviews consisted of the following topics:

- Raising of the terps
- Participation during CCA
- Participant's Influence on the CCA process
- Participant's perception of CCA participation
- Climate change

Most interviews began with a descriptive question. During the interview, I mostly raised questions through reflections and probing the comments the participant had just made. I reflected my interest and attention during the interviews by making encouraging sounds.

#### ***4.2.2 Second Phase – Interviews with Representatives from the Responsible Authorities***

The participating authority representatives were purposefully sampled based on which authorities residents mentioned and which authorities are involved in terp reinforcements. As a result, three authorities were identified, namely the MELUND, LKN and UNB.

Overall, I conducted four representative interviews: two with MELUND representatives and one each with LKN and UNB representatives. The interviews lasted between 20 and 30 minutes.

#### **4.3 Data Analysis Methods**

I decided to analyse the qualitative data through conventional content analysis. This content analysis approach is used for studies that aim to describe a social phenomenon. The aim of this approach and this study is to develop a deeper understanding of certain social phenomena that can then inform concepts and existing theories (Hsieh & Shannon, 2005).

Using the conventional content analysis approach for qualitative data involves systematic coding to identify themes and patterns (Hsieh & Shannon, 2005). I chose two successive coding techniques that are especially useful in theme identification: open coding and axial coding (Bryman, 2012; Saldaña, 2013).

A code “symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data” (Saldaña, 2013, p. 3). By coding their data, researchers ascribe interpreted meaning to individual segments in the data. These interpretations are later used to detect patterns, categories and themes or for theory building or another analytical processes (Bernard, 2006; Saldaña, 2013). Therefore, coding is a first step in the analysis and is the foundation for the subsequent evaluation. Charmaz (2006) describes coding as “generat[ing] the bones of your analysis ... integration will assemble those bones into a working skeleton.” (p. 45). To use coding as an analysis tool implies the understanding that multiple realities exist and that every analytical decision and interpretation is subject to every researcher’s personality, predisposition and subjectivities (Saldaña, 2013; Sipe & Ghiso, 2004).

I used open coding as a first-cycle coding technique for this study.<sup>8</sup> Open coding is intended to remain receptive to indications in the data that might direct the researcher in a new theoretical direction. Charmaz (2006) and Saldaña (2013) thus suggest line-by-line coding as the first step. I followed this suggestion and therefore divided the transcribed interview data line by line into discrete categories. In allowing categories to emerge from the data, I was able to gain information directly from the participants without forcing predefined theoretical perspectives upon the data. As the last step of open coding, I compared these categories for similarities and differences and recategorised them. This first cycle resulted in 300 data references being coded into 36 categories. However, a second cycle of coding was needed to further understand the connection between categories and elicit themes from the data. I chose axial coding to extend my analytical work.

The goal for axial coding is to reassemble the data that was separated into different categories and to select relevant codes to understand the connection between categories (Boeije, 2010; Saldaña, 2013). By continuously comparing and reevaluating my initial categories, I could discern connections between them and identify emerging themes. While a category represents a rather explicit description of a data segment, themes are neither directly coded nor symbolise a direct description. Instead, themes or concepts are more general and abstract (Saldaña, 2013). Multiple categories are therefore combined under one theme to tell the same story. Analysing how themes interrelate results in the development of concepts and represents the core of content analysis (Hsieh & Shannon, 2005; Saldaña, 2013).

Using axial coding for the second cycle resulted in 279 references divided into 26 categories and five themes (see Appendix B and C). I organised these themes and categories into a tree diagram to

---

<sup>8</sup> Open coding is also referred to as "Initial coding" (Charmaz, 2006; Saldaña, 2013).

illustrate their connection (see Appendix D). Thereafter, I compared the themes for similarities and differences to discern patterns and understand the participants' experienced reality.

How participants understand and interpret their social reality was the focus throughout the data collection and analysis process. Therefore, the results of this study are deeply grounded in an interpretive understanding of knowledge and the world. Thus, the following chapters do not depict every possible interpretation of reality but are limited to those of the participants and myself.

## 5 Results and Analysis

This chapter presents the findings I gathered during the fieldwork regarding how traditional knowledge and power relations influence participation in and outcomes of CCA processes on the North Frisian *Halligen* in Germany. Sections 5.1, 5.2 and 5.3 answer the first research question. Section 5.4 answers the second research question while Section 5.5 answers the third research question.

### 5.1 Residents' Perception of Climate Change

*(RQ1) How do residents of the North Frisian Halligen perceive their role in CCA processes?*

The residents of the *Halligen* have long been exposed to *Land unter* and strong storm surges. Living near the sea has resulted in these residents having a unique understanding of the elements:

We live this reality; we live with the water and the North Sea. *Land unter* and storm surges are for now nothing to be scared of. We have known this for a long time and have learned to live with it. We are always prepared; we have enough food and always store away our belongings in a storm-proof way. (R5)<sup>9</sup>

The relationship between the North Sea and the residents is not a relationship that is tainted by fear, as Participant R5 said. The relationship can instead be understood as one of respect. When R13 was asked if her experience with major storm surges has changed her attitude towards *Land unter* and storm surges, she said,

Not really, but it has in the sense that you have more respect for the natural forces. It is like that you do not simply abide it and think nothing of it, but rather you understand that this is a natural force and that there is power behind it.

This feeling of respect and an understanding of the natural environment was also discernible when *Hallig* residents discussed climate change. For example, Participant R1 stated, "Everyone knows what will be going on here in 50 years when you look at the prognosis for sea-level rise". This view and understanding that climate change and rising sea levels are real and will impact the *Halligen* were directly or indirectly conveyed in almost every interview (see R1, R2, R4, R5, R6, R7, R9, R10, R11).

---

<sup>9</sup> Individual interviews will be referenced with a number and either a capital R (for Hallig residents) or capital G (for government representatives). Transcribed interviews can be viewed in a non-public file or on request to ensure the anonymity of the participants.

However, fear of climate change is not present among the residents: “Nobody here is panicked; we prepare for the future, but we live in the here and now” (R1). Based on knowledge acquired on the *Halligen*, my observations and data analysis, I understand this statement to summarise the way of life on the *Halligen* very well: despite the frequent and imminent danger of *Land unter* and storm surges, people go about their daily business. However, they do not do so blindly or incautiously but rather with a preparedness level that allows them to live their lives without constraints.

## 5.2 Attitudes Towards Climate Change Adaptation

Wanting to prepare for storm surges and *Land unter* has resulted in the *Hallig* residents’ constant adaptation to changes in the natural forces that shape their surroundings. The most critical adaptation measures are the terp reinforcements, the *Halligen*’s height growth through sedimentation and the protection of the coastline against erosion (see Chapter 2). Of these, terp reinforcement is given the highest priority (G4).

Plans for how terps will be reinforced in the future are met with mixed opinions. As mentioned in Chapter 2, future terp reinforcements will be constructed without a ring dike. Instead, the top of terp will be at the same level like a plateau. Participants reported mixed feelings towards this decision: one participant expressed his agreement with this decision but also voiced his concern that “a plateau does not protect until everyone lives on the same plateau elevation, and that is a multigenerational process.” (R10). Another participant voiced his agreement that ring dikes built too high can transform the terp into a “bathtub” (R8). However, he also expressed his concern that the raised terps will need too much base area and that this could become an issue with nature protection. He added, “I work for the LKN, but I do not know how it will work with the bigger terps” (R8).

Residents’ concerns and worries extend beyond the feasibility of building climate change-proof terps. Participants R1, R5 and R9 voiced the fear that government subsidies for terp reinforcements could be diverted away from the *Halligen*. The following statement from Participant R5 exemplifies their uncertainty:

And what will happen if war breaks out in Ukraine and they [the government] have to use the money somewhere else? What happens if it [terp reinforcement] takes too long and is too difficult for them [the government]? What if we then get less [money]?<sup>10</sup>

---

<sup>10</sup> This interview was conducted on the 15<sup>th</sup> of February, nine days before the outbreak of war in Ukraine.

All three participants raised their concerns about the reliability of the government, indicating a sense of mistrust. One participant voiced the fear that the responsible authorities do not have a plan to address the increased frequency of *Land unter* yet (R3). He said that this uncertainty and lack of leadership means that the *Hallig* people have to “keep a stiff upper lip and hope for the best” (R3).

Trust in the workings of the government has not increased during the construction process of the reinforced terps on Hooge and Langeneß. Mistakes during the planning process have resulted in a more expensive and more time-intensive construction of Hanswarft on Hooge and Treuberg on Langeneß (Knauer, 2021). Participants R10 and R9 observed that some residents of Hooge now say that they would not agree to a reinforcement of their terp considering the process on Hanswarft. Participant R11 made the same observations on Langeneß. I recorded one negative attitude towards future terp reinforcements when I asked Participant R5 what he would say to the raising of his terp. He answered, “No. I am not signing that. They can shove it.” Participant R5 was motivated by his perception that the authorities only listen to scientists and by negative experiences with reinforcement of his terp in the past. The lack of appreciation for traditional knowledge is discussed later in this chapter.

Instances when construction failure could have been prevented if local observations had been incorporated have resulted in frustration among the residents. Participants R10 and R11 reported construction failure at Hanswarft which could have been prevented if the authorities had considered and incorporated the residents’ assessment. The residents had communicated their concern that the driveways on the southern side of Hanswarft were planned to be too steep. They feared that this steepness would make it difficult to walk, would increase the risk of falling on black ice (R10, R11) and would enhance “the danger that waves will damage a steep terp stronger than a flat one” (R10). Therefore, the residents proposed raising the street on the southern side to decrease the incline. The authorities rejected this idea (R10). Participant R10 further reported that considerable damages occurred on the southern side in the months following this side’s completed reinforcement. The authorities eventually followed the residents’ proposal and raised the street (R10). Participant R11 summarised the attitude of the LKN as follows: “We are the authority; we know what is good for you”, which means that the authorities do not always incorporate the residents’ experience and knowledge into CCA development (R11).

Participant R9 stated another instance when the authorities decided against the local advice. Only three sides of the Hanswarft terp on Hooge have been reinforced: north, south and west. The eastern side has not been raised. The decision was explained by saying that when Hanswarft flooded, water could quickly run off over the lower eastern side (G2).



However, Participants R9 and R10 independently reported that older residents of Hanswarft expressed concerns about not raising the eastern side from the beginning of the planning process. Whenever water would flood the *Hallig* from the west, water would hit the terp on the west, flow around it, come together in the east and thus run up the terp on the eastern side. This means that water comes very close to houses and could flood the terp from the eastern side (R9, R10). I was unable to talk to an older resident of Hanswarft, but I observed how close the drift line was to the houses on the eastern side when I visited Hooge after Storm Zeynep<sup>11</sup> (see Figure 12 and 13 ).



**Figure 12. Drift line on the northern side of Hanswarft.** Drift line on the reinforced northern side of Hanswarft on Hooge. The drift line is half way up the terp. Picture taken on the 25<sup>th</sup> of February 2022. Own work.

---

<sup>11</sup> Storm Zeynep is the German name for the storm in the North Sea between the 18<sup>th</sup> and 19<sup>th</sup> of February 2022. The storm is known as Storm Eunice in the United Kingdom and Ireland and known as Storm Nora in Denmark.



**Figure 13. Drift line on the eastern side of Hanswarft.** The picture shows the drift line on the not reinforced, eastern side of Hanswarft on Hooge. The drift line is three-quarter up the terp. Picture taken on the 25<sup>th</sup> of February 2022. Own work.

This development has created further frustration among the residents of Hooge (R9, R10) and has resulted in ineffective adaptation, meaning that the measure had neither positive or negative impacts on the residents (Schipper, 2020).

### **5.3 Perception of Residents' Role in Climate Change Adaptation Processes**

#### ***5.3.1 The Role of Traditional Knowledge***

Various participants discussed whose knowledge, experience and observation count. The consensus among the residents was that they perceived their knowledge and observations as less appreciated and incorporated in CCA development than scientific knowledge.

Participants stated that decisions are being made detached from people's lived reality because authorities do not listen to local observations and do not know the local conditions well enough. Participant 13 stated, "We live this reality, and we live the authority's decisions." She said that this is not always easy because decisions are being made behind a desk and "people sometimes have no idea how it looks like on-site." Participant R6 recalled an idea that the LKN expressed to increase the height growth of the *Halligen*: floodgates should be kept open more often and longer to increase the sedimentation rate by having the *Halligen* flooded longer. The participant countered this idea as being

not compatible with the way of life on the *Halligen*, saying, “Where are my cows supposed to go? How am I supposed to drive on the streets? How am I supposed to pick up guests? How is this supposed to work?” (R6). Other participants explained that authority representatives only briefly visit the *Halligen* when the sun is shining and thus lack an understanding of the effects of *Land unter* and storm surges (R1, R3, R5).

Participant R10 shared that understanding and emphasised that local observations are therefore important because it is “something entirely different to live here than to just look at it.” He added that while the residents’ observations are not scientifically sound, they are nevertheless observations made over a long period of time (R10). Participant R9 voiced a similar understanding when he said that the authorities should listen more to the *Hallig* residents than their “calculations and simulations that they run on the mainland because the real life on *Halligen* ultimately depicts everything better than any calculation can. The experience of people is more important, and it should be heard.” A statement by Participant R5 mirrors the perspective of Participants R9 and R10. Participant 5 said, “I wish that the authorities would trust us more and that they believe us when we say something is this way, it also is the way we said.” A great deal of frustration and resignation was conveyed when participants discussed their knowledge and how it seems to be disregarded by the authorities.

Different residents shared the understanding that scientific knowledge is the sole origin for any CCA decision. One resident said, “But when they [scientific institutes] write something, then that is believed” (R6). When I asked him to clarify if he was implying that the authorities trust science more than the residents, he said, “Yes.” The same understanding was voiced by Participant R5. A case where the LKN and MELUND did not incorporate the residents’ observations was presented in Section 4.2. As mentioned, the eastern side of the Hanswarft on Hooge was not raised despite the residents’ observations and experience that water can run up high on that side and thus threaten people (R9, R10).

Another instance when the named authorities did not take local observations into account is the observation of how the water and wave movement has changed during *Land unter*. Participant R10 stated that floods used to come from the northwestern or western side of Hooge. However, today, residents observe that water floods Hooge unrestrained from the *Hallig’s* southern side (R10). The southern side has fewer groynes and the water therefore cannot be slowed down. The unrestrained

waves and water speed results in increased terp damages on Hooge (R10). More aggressive waves were also observed on Langeneß (R5, R7).

However, Participant G3, who works for the Division of Flood Defence, Coastal Protection and Harbours within the MELUND, stated:

Many people from the *Halligen* currently mention that the wave movement has become short and strong and that it looks threatening during storm surges. We cannot detect that when we use our measuring devices, so I have to say that there are different perceptions and different truths. When we plan something, we ultimately have to originate from data that can be measured.

Scientific observations about the wave movement within the *Halligen* might currently show no changes. However, they cannot account for long-term changes, as Participant G4, who works for the MELUND in the Division of Water Management, Ocean and Coastal Protection, stated. According to him, it has only been possible to collect data on the wave movement when the *Halligen* are flooded for the past two to three years (G4). This means that decade-long changes are not reflected in the data. Passed-on knowledge about how to detect such changes and interpret them can reach back decades and thus report such changes (R13). Participant R13 has married into a family that has lived on Langeneß for over 300 years. She stated, “It is not being paid attention to what the people say who are on-site and have decades worth of experience; they are not being asked” (R13). She wishes that the authorities would give the residents a chance to speak and use the residents’ experience more (R13). Participant G3 acknowledged the value of passed-on, experience-based knowledge, but only in the construction of groynes and not regarding the detection of changes in the residents’ physical surroundings.

As previously mentioned, a general understanding among interviewed *Hallig* residents is that their knowledge, experience and observations are not appreciated by the authorities but that they wish it were (see R5, R6, R8, R9, R10, R11, R13). Participant R11 expressed this wish by saying, “What the *Hallig* residents constantly say or rather we all constantly say is that you [the authorities] have to listen to the experience of *Hallig* residents and that it needs to be incorporated. The LKN has not always considered this; they sit on their high chairs like ‘We are the authority; we know what is good for you’” (R11). In this statement, Participant R11 referred to the defective construction of the driveways on Hanswarft (see Section 4.2) when saying that the LKN has not always incorporated residents’ experiences. Participant R6 voiced a similar impression of the authorities: “The *Hallig* people need to be more involved, but no, they have studied, which isn’t bad, but they need to get in touch with the residents and accept tips or suggestions. This is sometimes a bit neglected.”

### **5.3.2 Ability to Influence Decisions**

The residents not only perceive the incorporation of their knowledge and observations as limited but also feel restrained in their ability to influence decisions. Multiple participants expressed the feeling that their situation can only partly be influenced by themselves (R1, R5, R7, R8). These participants stated that decisional power regarding terp reinforcement and coastal protection does not lie with the *Hallig* residents but rather with the authorities. As one resident stated, “In the end, the authorities do whatever they want. They have the money; therefore, they decide” (R5).

The feeling of financial dependence was voiced in regard to CCA as well as agriculture. One participant said, “Of course, we have to be grateful that they pump so much money in here for the terp reinforcement but also agriculture subsidies” (R7). Participant R9 stated in regard to CCA,

Well, the problem with the first topic [terp reinforcement] is that we are always dependent on others regarding any coastal protection measure. This means that we cannot finance this whole thing [terp reinforcement] with our own funds. We are always dependent on the financial resources from the state, who finance this for the most part, because we cannot manage it on our own.

Multiple participants voiced gratitude towards the authorities for supporting the *Halligen* (R1, R3, R5, R7, R9, R10, R13). However, the residents also expressed a strong feeling of being at the mercy of the authorities because of their financial support.

### **5.4 The Role of Resistance in Climate Change Adaptation Processes**

*(RQ2) What role does resistance play in shaping CCA on the Halligen?*

Residents’ resistance can play a role in preventing undesired adaptation measures, but the fear of losing financial support restricts resistance. This financial dependence takes away residents’ autonomy and limits their ability to resist. *Hallig* residents have to work in accordance with government guidelines, and resisting these is not possible, as one resident stated, “If we would just resist [the guidelines] then we would lose our subsidies, and doing agriculture is not possible without it” (R13). Participant R1 expressed the same sentiment when he explained that *Hallig* people talk off the record among themselves and not with authority representatives because of their financial dependence on the government. Participant R5 voiced a similar understanding, saying, “We wouldn’t be any more without their money. If they [the government] ever cut off the money supply, then we have to go.” Financial dependence on the government for subsidies therefore removes residents’ agency and results in a feeling of powerlessness.

The government holds power over the residents by making the obtaining of livelihoods and adaptation measures directly dependent on the government's financial contribution. Resistance could push back against the government's power over the residents (Woroniecki et al., 2019), but as explained, financial dependence restricts this. I could only observe resistance against specific adaptation measures. Elastocoast is a material which consists of polyurethane and was first introduced on Langeneß in 2008. It was used as an alternative to the traditional revetment material (Häußling et al., 2016). Participant R5 has worked for the LKN as a foreman for coastal protection. He stated with regard to working with Elastocoast, "I have looked at it and then refused to work with it. My other colleague ... also refused. It was obvious to us that this could not be good and does not fit on the *Halligen*." The participant rejected orders and thus the government's power over him by not working with Elastocoast.

Another participant discussed resistance in regards to the traditional revetment. The LKN wanted to raise the stone revetment further, which reduces the frequency of *Land unter* events and thus reduces the height growth of the *Halligen* by inhibiting sedimentation (R11). The participant stated that this development could be prevented, saying, "For example, the raising of the stone revetment on Langeneß, it only didn't happen because of our resistance. Otherwise, they would further put stones on the revetment. It's only possible with resistance. The LKN cannot listen" (R11). When asked how the residents resisted, she reported direct confrontations and active statements of their rejection of the intervention.

## 5.5 Participation of *Hallig* Residents in Climate Change Adaptation

*(RQ 3) How is Hallig residents' participation in adaptation processes shaped by their CCA perception and resistance?*

All interviewed government representatives stressed the importance of incorporating the residents in the planning processes. One government representative stated, "When we are talking about terp reinforcement or general overarching topics, it is evident that we are in communication with the residents" (G1). She assessed the communication between the residents and the UNB as very close.

When asked how the LKN includes the residents in their planning process, Participant G2, who works for the LKN, answered, "Well, we do not go from house to house and tell them how it is, but we inform the municipality what we find useful." Both Participants G3 and G4 described a more profound approach to participation. Table 1 lists the committees which are supposed to ensure the involvement of the residents in CCA matters.

**Table 1. List of participation committees regarding climate change adaptation on *Halligen*.** This table lists participation committees to engage the residents of the *Halligen* in CCA processes. For every committee, the participants, their aim, and their meeting frequency are stated. The 'Roundtable Halligen' has the most members while also addressing the broadest topic range. 'Working Group Hallig 2050' is the oldest committee and is solely focused on climate change adaptation. The last two committees, 'Mayor Dialogue' and 'Hallig Inspection', are even more specialised, with the former focusing just on terp enforcement and the latter focusing on coastal protection. Own work, based on the statements from the interviews G3 and G4.

| <b>Name of the committee</b>     | <b>Participants</b>   | <b>Aim of the committee</b>   | <b>Frequency of meetings</b>         |
|----------------------------------|---|---|--------------------------------------|
| <b>Working Group Hallig 2050</b> | MELUND, Hallig mayors, NGOs (such as WWF), LKN  | Understand how a changing climate will affect the Halligen, find ways to adapt the Halligen to these changes. | Two to three times a year since 2009 |
| <b>Mayor Dialogue</b>            | Hallig mayors, MELUND, LKN  | Develop terp enforcement programme  | Twice a year since 2015              |
| <b>Roundtable Halligen</b>       | Minister of Environment of Schleswig-Holstein, MELUND, LKN, Hallig mayors, municipal administration | Discuss topics that are of importance to the Halligen (beyond climate change adaptation)                      | Twice a year                         |
| <b>Hallig Inspection</b>         | LKN, Hallig mayors and residents  | All Halligen are examined in regards to their coastal protection  | Once a year                          |

Participants G3 and G4 reported that these four committees are the tool through which the *Hallig* residents are involved in the planning and execution phase of CCA measures. However, *Hallig* residents are only directly involved in the *Hallig* inspection during which people can voice observations or concerns they have regarding coastal protection or the state of their terp (G3).

*Hallig* mayors and the municipality administration are responsible for communicating residents' information to the committees and back. Communal assemblies are used as the location for information exchange (G4).

Participant G4 emphasised that no other municipality receives as much attention and financial support as the *Halligen*. All interviewed government representatives wish that the *Hallig* residents would

acknowledge that everything the government does is done in the residents' best interest and for them (G1, G2, G3, G4).

Despite the authorities' best intentions for the residents, Participants R1, R9 and R12 described a feeling of being left behind among the *Hallig* residents because they do not feel involved in decision making and cannot directly address their concerns and knowledge in CCA participation committees. Participant G4 countered this argument, saying,

Well, first of all, we are dealing with very independent characters on the *Halligen*. This first: they are not shy to tell us bluntly if they differ in opinion, and when we then disagree, they feel not appreciated or at least not considered. When we do not incorporate their advice, then they reflexively say, "You see", "I have the experience", "They do not want that", "Now you can see", and "That cannot be anything good".

The reasonableness of feeling left behind was also questioned by Participant G3, who stated,

When I am looking at a heavy rainfall incident at my home, then I am of course more worried than is maybe appropriate, I'll just say it like that. You are then personally affected, and you have a different perception.

Feeling unable to influence the decision making, feeling left behind and feeling like their knowledge is not included in CCA decisions has resulted in *Hallig* residents not participating in surveys and communal assemblies (R1, R8, R9, R10, R11). Participant R5's stated: "I have worked 30 years in coastal protection, and I am not being heard. Why should I get involved anywhere?". Another participant reported similar noncompliance by stating that she does not contribute to surveys anymore because she does not know if and how they are being used (R7). Finally, Participant R9 explained why feeling involved in CCA and thus participating in the process is important, saying,

People's experience is sometimes worth more; it should be listened to more, because if you listen more, that ultimately results in people feeling taken along, which would then lead to better acceptance of measures that might be hurtful to some, as long as you were part of it.



## 6 Discussion

### 6.1 Summary of the Main Findings

*Hallig* residents communicated a sincere awareness of the reality of climate change and indicated a perception of the risks the *Halligen* are expected to face, namely rising sea levels. Living in close proximity to the North Sea and thus needing to constantly adapt to changes in the environment has resulted in a strong consensus that CCA is needed; not one of the residents questioned this. While the necessity of CCA was not questioned, a lack of knowledge and information about how the planned terp reinforcements are realisable has resulted in a feeling of unease among the residents. This feeling has been reinforced by the fear that government subsidies for CCA could be withdrawn. The residents' feelings of unease and mistrust were furthered when construction errors occurred that could have been prevented if the residents' knowledge and observation had been incorporated during the public participation. Not including local expertise and using coproduced knowledge has resulted in CCA that is partially ineffective due to not addressing every resident's exposure to floods on Hanswarft.

Residents agreed that CCA decisions are being made detached from people's lived reality and do not incorporate knowledge of the social setting of the *Halligen*. Instead of coproducing this knowledge, authorities solely rely on scientific information for decision-making, thus limiting the residents' influence on CCA decisions. Their influence on decision-making is further limited by a strong financial dependence on the government.

This financial dependence not only directly reduces residents' decision-making power but also diminishes their agency and potential to change the power relations through resistance. Resistance was only apparent in opposing concrete CCA measures when resisting would not risk the loss of subsidies and financial support. It is therefore not surprising that residents do not resist during public participation but rather refuse to participate. This refusal is motivated by the lack of knowledge coproduction and the authorities' failure to acknowledge the residents as experts on their own reality.

## **6.2 Integration of Findings from the Body of Existing Knowledge and Implications for Climate Change Adaptation on the *Halligen***

### **6.2.1 Participation and the Role of Traditional Knowledge in Climate Change Adaptation**

The current CCA on the *Halligen* is not comprised of reactive or autonomous measures (Fankhauser et al., 1999). While CCA on the *Halligen* is undoubtedly urgent, terp reinforcement is an anticipatory and planned intervention. My findings align with those of Patel et al. (2020), Shakya et al. (2019) and Soanes et al. (2019) that CCA decisions are still being made removed from the implementation site and lack vital knowledge about the local context. This highlights that meaningful incorporation of local context knowledge is not a given in policymaking or science.

Barnett and O'Neill (2010) and Schipper (2020) report that CCA implementation without adequate knowledge of the social and ecological context can result in maladaptation. Maladaptation refers to processes of CCA that make people more likely to face negative consequences of climate change than they are now (Schipper, 2020). Determining if a CCA was successful or even effective is difficult, especially as the climate continues to change (Schipper, 2020). While a final judgement cannot be made now, my observations and reports of the citizens show how CCA on Hooge has left residents with no change in their exposure to floods. At present, not reinforcing the eastern side of Hanswarft has neither positive nor negative impacts on the citizens, but this decision could result in maladaptation in the future (Schipper, 2020).

I observed more distrust than trust in the government. For some residents, this mistrust has resulted in the rejection of their own future terp reinforcement. This finding thus highlights the importance of Davies' (2001a, 2001b, 2005) conclusion that the acceptance of CCA depends on people's trust in the authorities.

Trust could be built through knowledge coproduction and following its prerequisite (Berkes, 2009; Djenontin & Meadow, 2018; Hügel & Davies, 2020), which is seeing people as experts on their own lived reality (Hügel & Davies, 2020). This is not done in the case of the *Halligen*. Instead, authorities diminish residents' observations and question the adequacy of their feelings. Furthermore, despite a scientific agreement that balancing local knowledge with scientific information and local needs with national interest is crucial for effective CCA (Djenontin & Meadow, 2018; Rahman & Hickey, 2019; Schipper, 2020), scientific knowledge is preferred, further increasing mistrust.

### **6.2.2 Power in Climate Change Adaptation**

When examining CCA on the *Halligen* through an actor-oriented power lens, the exercise of power can be clearly determined. Power moves between the residents and the government authorities. It is also exercised between these two parties, but that was not the focus of this study. I observed government authorities exercising power by imposing regulations, holding the financial resources to fund CCA and controlling how participation is implemented. The residents exercise power by voicing their observations and opinions. The residents exercise of resistance to push back against the authorities' power is discussed in Section 6.2.3.

Different expressions of power and power dynamics, as described by Woroniecki et al. (2019) and introduced in Chapter 3, could be observed. Similar to Woroniecki et al.'s (2019) findings, the insufficient consideration of the social and ecological context of the *Halligen*, the authorities' distrust of the locals' expertise on their reality and the authorities setting the agenda and enabling adaptation constitute "power over". On the *Halligen*, "power over" is exercised through inadequate participation and "disempowerment" (Woroniecki et al., 2019).

Furthermore, "power over" has been further fortified by only including the mayors as representatives of the *Hallig* residents in CCA participation. As Sova et al. (2017) explain, only incorporating a few representatives who also hold more power than the rest of the people does not challenge the system but instead reinforces the hierarchical structures and thus amplifies "disempowerment". Participation, which is meant to provide "power to" the residents is thereby transformed into "power over". Hence, participation does not always lead to "power to" and "empowerment" but can also result in "power over" and "disempowerment". Therefore, this study echoes Woroniecki et al.'s (2019) call to not automatically understand participation as just and unproblematic. Critical observation and evaluation of the participation process are needed.

The lack of local representation in decision-making further amplifies "disempowerment" (Buggy & McNamara, 2016). As Burnham and Ma (2017) and Lebel (2013) show, dependency on the more dominant actor fosters "disempowerment". On the *Halligen*, there is both financial dependence of the residents on the state regarding CCA and a lack of representation. My findings thus support existing knowledge.

Examining CCA through an actor-oriented power perspective highlights the importance of considering how power might constrain people and makes CCA unjust. My observations also show that power problems are not just occurring in the Global South but also in the Global North.

This implies for the *Halligen*: “power to” and “empowering” the residents means giving residents access to recourses and reducing dependencies; involving *Hallig* residents and not just mayors in participation committees; and allowing knowledge transfer and coproduction of knowledge, such as through participatory modelling. As Djenontin and Meadow (2018) and Hügel and Davies (2020) report, understanding participatory adaptation based on collaborative agency as a mechanism to enable empowerment and residents to exercise power could increase the acceptance, equity and effectiveness of CCA on the *Halligen*. This should be the aim of CCA.

### **6.2.3 Resistance in Climate Change Adaptation**

Resistance is also a form of power expressed by pushing back against power (Hollander & Einwohner, 2004; Woroniecki et al., 2019). Its exercise can be loud and obvious as in protests or subtle and quiet as in foot-dragging (Hollander & Einwohner, 2004; Scott, 1986). My findings show two instances of resistance.

Both the noncompliance with following work instructions and the direct confrontation work against measures that were seen as undesirable. Resistance has thus worked against an exercise of “power over” (Hollander & Einwohner, 2004). However, resistance is not just a mechanism to counter “power over”, it is also a representation of “power to” and “empowerment” (Woroniecki et al., 2019). This case illustrates Woroniecki's et al. (2019) finding when looking at the sharp contrast between the disempowering effect of the authorities’ “power over” the residents and how openly and empowered some residents can resist. This finding is thus in line with Hollander and Einwohner's (2004) conclusion that resistance accommodates different forms of power and is inherently complex.

Resistance enables a more complex theorisation of power, however it cannot account for all aspects of power. The concept of refusal was developed to accommodate aspects of power which resistance was missing (McGranahan, 2016). While resistance is the opposing of a more dominant actor within unbalanced power relationships, refusal is the rejection of the unbalanced power relationship, which reconfigures the relationship and thus levels out “power over”. This act is often part of the fight for recognition and rejection of specific structures (McGranahan, 2016). Refusal marks when people have reached a point at which they say, “*We refuse to continue on this way*” (McGranahan, 2016, p. 320 original emphasis). This is what I understand in some residents’ refusal to continue to participate in any CCA. These people will not continue to participate without change becoming apparent. Refusal can thus be seen as a stoppage and complete breaking of relationships (McGranahan, 2016). However, I agree with Erica Weiss (2014) that a new political space is forged by abstaining from interacting with the state. The *Hallig* residents can generate and form a new political space to plan CCA that might be more equitable and is based on meaningful collaboration.

### 6.3 Research Limitations and Reflexivity

A researcher, together with research participants, produces knowledge. This is an active process in which a researcher “should constantly take stock of their actions and their role in the research process” (Mason, 2002, p. 7). The research area of interest, which research questions are asked, which ones are not and who is included in and excluded from a study is governed by a researcher’s values. How researchers interpret their findings and present them is governed by their world understanding. Therefore, it is essential to scrutinise and acknowledge how a researcher’s action and role have permeated the research process and impeded the findings (Guillemin & Gillam, 2004).

During my fieldwork, I was sometimes an “insider” to the community, and sometimes an “outsider”. Hesse-Biber and Leavy (2007) describe being an insider and outsider while interviewing fitness trainers: the researchers were insider because they belonged to the same gym as the interviewee but were also outsider because they are researchers and thus lives in a different social world. I was an insider during my data collection because I am from the North of Germany, am familiar with the North Sea and North Frisia and understand the regional dialect of Low German to an extent. This means that the participants could express themselves in the way they are comfortable with without worrying if a language barrier would separate us. But me being an insider and me understanding myself as an insider in some aspects, may have biased my analysis by interpreting results to fit my prescribed understanding (Bryman, 2012).

Being from the mainland made me an outsider to the community. My time on the *Halligen* was ultimately too short to gain a profound understanding of all the struggles imposed on people due to living on small islands that are regularly flooded. In a few instances, I felt that participants apologised when criticising government representatives for not knowing the reality of the *Halligen* in an attempt not to offend me and my lack of knowledge. I cannot determine if this influenced the participants’ answers, but I cannot rule out the possibility that participants may have said something or not said something based on the effect I had on them.

As mentioned in Chapter 1, previous research on power and participation in CCA on the *Halligen* is minimal. This research had a relatively small foundation upon which to form concise research questions, meaning that while I could cover a broader range of topics, in-depth analysis could not be conducted to the desired level.

Part of not reaching the study’s desired depth might be ascribed to the chosen data collection methodology. Unstructured interviews allow participants to raise new topics and are thus an adequate tool for a relatively unresearched topic. However, they also make comparisons and the exploration of one specific topic difficult (Zhang & Wildemuth, 2009). The unstructured interviews have thus not

sharpened the topic of this research further but have instead broadened it and therefore made an in-depth analysis of a specific topic more complicated. Unstructured interviews generally reduce the risk of biases by allowing the participant to talk freely and by asking few to none directive questions which reduces the risk that participants answer in a way they think is socially desirable. However, whenever directive questions are being asked, the risk is great to lead the participant's answer to a desired direction (Bryman, 2012; Zhang & Wildemuth, 2009). I have tried to keep directive questions to a minimum but I cannot rule out that these questions have steered the participant to answer in a way I thought was desirable.

Despite multiple attempts, I was unable to conduct an interview with a *Hallig* mayor. This might be one of the greatest limitations of this thesis. *Hallig* mayors play a critical part in communicating between the authorities and the residents. Understanding how this is done could have shed new light on the rest of the thesis and given it more profundity.

#### **6.4 Future Research**

This study furthered the limited scientific knowledge on the social context of CCA on the *Halligen*, but research needs to be extended to ensure that CCA is effective and will be accepted by the residents in the future.

As previously mentioned, the unjust and unequal exercise of power is not only a problem that occurs in the Global South. If anything, this study highlights the need to understand power dynamics in CCA in the Global North. This is especially important for places like the *Halligen*, where effective and just CCA is a question of survival. Therefore, new and extended research on the power dynamics on the *Halligen* is needed.

As McGranahan (2016) states, the concept of refusal is relatively new and even less researched than resistance. Therefore, it would be interesting to better understand how and if refusal can generate political spaces to plan equitable, sustainable and effective CCA.

## 6 Conclusion

This thesis aimed to understand how power and public participation influence CCA and how power shapes participation on the *Halligen*. Guided by interpretivism and thus the aim of gaining a deeper understanding of social phenomena, this study employed unstructured interviews with the residents from two *Halligen* and semistructured interviews with representatives from responsible authorities to collect data. This data was analysed using conventional content analysis and open and axial coding. The analysis results were then used to understand how *Hallig* residents perceive their role in CCA (RQ1), how resistance shapes CCA on the *Halligen* (RQ2) and how the residents' participation in CCA processes is shaped by their CCA perception and resistance (RQ3).

This study has shown that the *Hallig* residents understand the risks the *Halligen* are projected to face with climate change. The residents have shown a strong consensus that CCA is needed. However, mistrust toward the authorities, lack of information on future CCA and construction failure on recent terp reinforcement have resulted in some residents' rejection of future terp reinforcements. This finding illustrates the importance of participation and knowledge coproduction to increase the robustness and acceptance of CCA. However, knowledge coproduction is missing on the *Halligen*. Not including local observations and traditional knowledge in CCA development by the authorities has resulted in construction failures and ineffective CCA.

The financial dependence of the *Hallig* residents on the government was shown to restrict resistance. Successful and attempted resistance could only be recorded regarding concrete CCA measures. These undesired measures could be prevented through the residents' exercise of resistance. However, resistance could not change the power relations between the residents and the authorities; successful resistance remained within the existing power dynamic.

Refusal, however, rejects the current power relations between the state and the residents. Refusal was exercised in residents' decision to not participate in CCA development anymore. This refusal may create a new political space for the *Hallig* residents through which accepted and effective CCA can be developed.

This thesis has shown that not taking power relations, local observations and traditional knowledge into account during the public participation of CCA does not result in effective and accepted CCA. Climate change creates the need for accepted and robust adaptation. Now is the time to develop these by incorporating power relations, local observations and traditional knowledge.

## 7 References

- Adams, W. (2015). Conducting Semi-Structured Interviews. In K. E. Newcomer, H. P. Hatry, & J. S. Wholey (Eds.), *Handbook of practical program evaluation* (Fourth edition, pp. 492–505). Jossey-Bass & Pfeiffer Imprints, Wiley.
- Arnstein, S. R. (1969). A Ladder Of Citizen Participation. *Journal of the American Institute of Planners*, 35(4), 216–224. <https://doi.org/10.1080/01944366908977225>
- Barnett, J. (2020). Global environmental change II: Political economies of vulnerability to climate change. *Progress in Human Geography*, 44(6), 1172–1184. <https://doi.org/10.1177/0309132519898254>
- Barnett, J., & O’Neill, S. (2010). Maladaptation. *Global Environmental Change*, 20(2), 211–213. <https://doi.org/10.1016/j.gloenvcha.2009.11.004>
- Bassett, T. J., & Fogelman, C. (2013). Déjà vu or something new? The adaptation concept in the climate change literature. *Geoforum*, 48, 42–53. <https://doi.org/10.1016/j.geoforum.2013.04.010>
- Berkes, F. (2009). Indigenous ways of knowing and the study of environmental change. *Journal of the Royal Society of New Zealand*, 39(4), 151–156.
- Bernard, H. R. (2006). *Research methods in anthropology: Qualitative and quantitative approaches* (4th ed). AltaMira Press.
- Biosphäre Die Halligen. (2017). *Die Halligen im Überblick [An overview of the Halligen]*. <https://halligen.de/halligwelt/halligen-erleben/halligen-im-ueberblick>
- Boeije, H. (2010). *Analysis in qualitative research*. SAGE.
- Boyd, E. (2017). Holistic thinking beyond technology. *Nature Climate Change*, 7(2), 97–98.



<https://doi.org/10.1038/nclimate3211>

Bryman, A. (2012). *Social research methods* (4th ed). Oxford University Press.

Buggy, L., & McNamara, K. E. (2016). The need to reinterpret “community” for climate change adaptation: A case study of Pele Island, Vanuatu. *Climate and Development*, 8(3), 270–280. <https://doi.org/10.1080/17565529.2015.1041445>

Bundesamt für Kartographie und Geodäsie. (2022). *Das deutsche Höhenreferenzsystem [The German Height Reference System]*. <https://www.bkg.bund.de/DE/Ueber-das-BKG/Geodaesie/Integrierter-Raumbezug/Hoehe-Deutschland/hoehe-deutsch.html>

Bundesministerium des Inneren und für Heimat. (2022). *Nationale Minderheiten in Deutschland [National Minorities in Germany]*. <https://www.bmi.bund.de/DE/themen/heimat-integration/minderheiten/minderheiten-in-deutschland/minderheiten-in-deutschland-node.html>

Burby, R. J., & May, P. J. (2009). Command or cooperate? Rethinking traditional central governments’ hazard mitigation policies. In Fra. Paleo (Ed.), *Building Safer Communities. Risk Governance, Spatial Planning and Responses to Natural Hazards* (pp. 21–33).

Burgess, R. G. (2002). *In the Field: An Introduction to Field Research* (0 ed.). Routledge. <https://doi.org/10.4324/9780203418161>

Burnham, M., & Ma, Z. (2017). Climate change adaptation: Factors influencing Chinese smallholder farmers’ perceived self-efficacy and adaptation intent. *Regional Environmental Change*, 17(1), 171–186. <https://doi.org/10.1007/s10113-016-0975-6>

Burrell, G., & Morgan, G. (2016). *Sociological paradigms and organisational analysis: Elements of the sociology of corporate life* (Reprint). Routledge.

Charmaz, K. (2006). *Constructing grounded theory*. Sage Publications.

- Clark, W. C., & Harley, A. G. (2020). Sustainability Science: Toward a Synthesis. *Annual Review of Environment and Resources*, 45(1), 331–386. <https://doi.org/10.1146/annurev-environ-012420-043621>
- Convention on Biological Diversity. (2021). *Traditional Knowledge and the Convention on Biological Diversity*. [www.cbd.int/traditional/intro.shtml](http://www.cbd.int/traditional/intro.shtml)
- Cooke, P. B., & Kothari, U. (2001). *Participation: The new tyranny?* (1st ed). Zed Books.
- Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. Sage Publications.
- Dahl, R. A. (1957). The concept of power. *Behavioral Science*, 2(3), 201–215.  
<https://doi.org/10.1002/bs.3830020303>
- Davies, A. R. (2001a). Hidden or hiding?: Public perceptions of participation in the planning system. *Town Planning Review*, 72(2), 193–216. <https://doi.org/10.3828/tpr.2001.72.2.193>
- Davies, A. R. (2001b). What Silence Knows—Planning, Public Participation and Environmental Values. *Environmental Values*, 10(1), 77–102. <https://doi.org/10.3197/096327101129340750>
- Davies, A. R. (2005). Local action for climate change: Transnational networks and the Irish experience. *Local Environment*, 10(1), 21–40.  
<https://doi.org/10.1080/1354983042000309298>
- Denton, F., Wilbanks, T. J., Abeysinghe, A. C., Burton, I., Goa, Q., Lemos, M. C., Masui, T., O'Brien, K. L., & Warner, K. (2014). Climate-Resilient Pathways: Adaptation, Mitigation, and Sustainable Development. In C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, & M. D. Mastrandrea (Eds.), *Climate Change 2014 Impacts, Adaptation, and Vulnerability* (pp. 1101–1131). Cambridge University Press.  
<https://doi.org/10.1017/CBO9781107415379.025>

- Denzin, N. K. (2017). The Sociological Interview. In *The Research Act: A Theoretical Introduction to Sociological Methods* (1st ed.). Routledge. <https://doi.org/10.4324/9781315134543>
- Djenontin, I. N. S., & Meadow, A. M. (2018). The art of co-production of knowledge in environmental sciences and management: Lessons from international practice. *Environmental Management*, *61*(6), 885–903. <https://doi.org/10.1007/s00267-018-1028-3>
- Dowding, K. (2008). Agency and structure: Interpreting power relationships. *Journal of Power*, *1*(1), 21–36. <https://doi.org/10.1080/17540290801943380>
- Engelstad, F. (Ed.). (1999). *Om makt: Teori og kritikk* (1. utg). Ad Notam Gyldendal.
- Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2015). Reframing adaptation: The political nature of climate change adaptation. *Global Environmental Change*, *35*, 523–533. <https://doi.org/10.1016/j.gloenvcha.2015.09.014>
- European Environment Agency. (2021, 11). *Past trend and projected change in relative sea level across Europe*. <https://www.eea.europa.eu/data-and-maps/figures/past-trend-at-selected-tide-1>
- Fankhauser, S., Smith, J. B., & Tol, R. S. J. (1999). Weathering climate change: Some simple rules to guide adaptation decisions. *Ecological Economics*, *30*(1), 67–78. [https://doi.org/10.1016/S0921-8009\(98\)00117-7](https://doi.org/10.1016/S0921-8009(98)00117-7)
- Federal Environmental Agency [Germany]. (2015). *Germany's vulnerability to Climate Change—Summary*.
- Fischer, F. (2000). *Citizens, Experts, and the Environment: The Politics of Local Knowledge*. Duke University Press. <https://doi.org/10.1515/9780822380283>
- Fröhlich, J., & Rösner, H.-U. (2018). *Land unter im Wattenmeer: Auswirkungen des Meeresspiegelanstiegs auf die Natur der Halligen und Möglichkeiten zur Anpassung:*

*Naturschutz, Küstenschutz, Klimawandel [Land submerged in the Wadden Sea: Consequences of sea level rise on the nature of the Halligen and possibilities to adapt: nature protection, coastal protection, climate change ]*. WWF Deutschland.

Guillemin, M., & Gillam, L. (2004). Ethics, Reflexivity, and “Ethically Important Moments” in Research. *Qualitative Inquiry*, 10(2), 261–280. <https://doi.org/10.1177/1077800403262360>

Häußling, R., Ziesen, N., Dorgeist, M., & Kaip, E. (2016). Eine partizipative und interdisziplinäre Gestaltung von Küstenschutzmaßnahmen auf den Halligen [A participative and interdisciplinary design of coastal protection measures on the Halligen ]. *Die Küste*, 84, 46–65.

Henrique, K. P., & Tschakert, P. (2019). Contested grounds: Adaptation to flooding and the politics of (in)visibility in São Paulo’s eastern periphery. *Geoforum*, 104, 181–192. <https://doi.org/10.1016/j.geoforum.2019.04.026>

Hesse-Biber, S., & Leavy, P. (2007). *Feminist Research Practice*. SAGE Publications, Inc. <https://doi.org/10.4135/9781412984270>

Hofstede, J. (2008). Coastal Flood Defence and Coastal Protection along the North Sea Coast of Schleswig-Holstein. *Die Küste*, 74. <https://hdl.handle.net/20.500.11970/101599>

Hollander, J. A., & Einwohner, R. L. (2004). Conceptualizing Resistance. *Sociological Forum*, 19(4), 533–554.

Hsieh, H.-F., & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. *Qualitative Health Research*, 15(9), 1277–1288. <https://doi.org/10.1177/1049732305276687>

Hubacek, K., Ravera, F., Tarrasón, D., & Prell, C. (2017). Participatory Modeling. In D. Richardson, N. Castree, M. F. Goodchild, A. Kobayashi, W. Liu, & R. A. Marston (Eds.), *International Encyclopedia of Geography: People, the Earth, Environment and Technology* (pp. 1–8).

John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781118786352.wbieg0293>

Hügel, S., & Davies, A. R. (2020). Public participation, engagement, and climate change adaptation: A review of the research literature. *WIREs Climate Change*, 11(4).

<https://doi.org/10.1002/wcc.645>

Hughes, J. A., & Sharrock, W. W. (1997). *The philosophy of social research* (3rd ed). Longman.

IPCC. (2007). *Climate change 2007: Impacts, adaptation and vulnerability: contribution of Working Group II to the fourth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.

IPCC. (2018). IPCC, 2018: Summary for Policymakers. In *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*.

IPCC. (2019). *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)].

IPCC. (2021). Summary for Policymakers. In V. Masson - Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Chaud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekci, R. Yu, & B. Zhou (Eds.), *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*.

- IPCC. (2022). IPCC, 2022: Summary for Policymakers. In H.-O. Pörtner, D. C. Roberts, E. S. Poloczanska, K. Mintenbeck, M. Tignor, A. Alegria, M. Craig, S. Langsdorf, S. Löscke, V. Möller, & A. Okem (Eds.), *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löscke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press.
- Jensen, J., Frank, T., & Wahl, T. (2011). Analyse von hochaufgelösten Tidewasserständen und Ermittlungen des MSL an der deutschen Nordseeküste (AMSeL) [Mean sea level and tidal analysis along the German North Sea coastline /AMSeL]. *Die Küste*, 78, 59–163.
- Jerneck, A., Olsson, L., Ness, B., Anderberg, S., Baier, M., Clark, E., Hickler, T., Hornborg, A., Kronsell, A., Lövbrand, E., & Persson, J. (2011). Structuring sustainability science. *Sustainability Science*, 6(1), 69–82. <https://doi.org/10.1007/s11625-010-0117-x>
- Johansson, A., & Vinthagen, S. (2016). Dimensions of Everyday Resistance: An Analytical Framework. *Critical Sociology*, 42(3), 417–435. <https://doi.org/10.1177/0896920514524604>
- Kabeer, N. (1999). Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Development and Change*, 30(3), 435–464. <https://doi.org/10.1111/1467-7660.00125>
- Klöck, C. (2019). Dealing with climate change in the German Wadden Sea: Perceptions, measures, and contestation on Hallig Hooge. *Ocean & Coastal Management*, 179, 104864. <https://doi.org/10.1016/j.ocecoaman.2019.104864>
- Knaggård, Å., Ness, B., & Harnesk, D. (2018). Finding an academic space: Reflexivity among sustainability researchers. *Ecology and Society*, 23(4), art20. <https://doi.org/10.5751/ES-10505-230420>

- Knauer, L. (2021, October 19). Eine 'Klimawarft' mit Supermarkt. *Tagesschau*.  
<https://www.tagesschau.de/inland/mittendrin/mittendrin-langeness-klimawandel-101.html>
- Kumbruck, N., Fröhle, P., & Jensen, F. (2022). *Holm (Hallig) revetment as a protection against waves and erosion – dimension and design*.
- Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein. (n.d.-a).  
*Fachplan Küstenschutz Halligen*. [https://www.schleswig-holstein.de/DE/Fachinhalte/K/kuestenschutz\\_fachplaene/Dossier/\\_functions/teaser\\_tabelle\\_Halligen.html](https://www.schleswig-holstein.de/DE/Fachinhalte/K/kuestenschutz_fachplaene/Dossier/_functions/teaser_tabelle_Halligen.html)
- Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein. (n.d.-b).  
*Hanswarft für die Zukunft gerüstet [Hanswarft prepared for the future]*.  
[https://www.schleswig-holstein.de/DE/Landesregierung/LKN/\\_documents/pdf/2021/Hooge\\_Hanswarft.html](https://www.schleswig-holstein.de/DE/Landesregierung/LKN/_documents/pdf/2021/Hooge_Hanswarft.html)
- Landesbetrieb für Küstenschutz, Nationalpark und Meeresschutz Schleswig-Holstein. (2019).  
*Langeneß*. [https://www.schleswig-holstein.de/DE/Fachinhalte/K/kuestenschutz\\_fachplaene/Halligen/3\\_BishKuestenschutz/3\\_9\\_01\\_Langeness.html#docc3245ce5-ffef-4b20-b732-76579b5e72dfbodyText12](https://www.schleswig-holstein.de/DE/Fachinhalte/K/kuestenschutz_fachplaene/Halligen/3_BishKuestenschutz/3_9_01_Langeness.html#docc3245ce5-ffef-4b20-b732-76579b5e72dfbodyText12)
- Lebel, L. (2013). Local knowledge and adaptation to climate change in natural resource-based societies of the Asia-Pacific. *Mitigation and Adaptation Strategies for Global Change*, 18(7), 1057–1076. <https://doi.org/10.1007/s11027-012-9407-1>
- Mason, J. (2002). *Qualitative researching* (2nd ed). Sage Publications.
- McGranahan, C. (2016). Theorizing Refusal: An Introduction. *Cultural Anthropology*, 31(3), 319–325.  
<https://doi.org/10.14506/ca31.3.01>

Minichiello, V., Aroni, R., & Hays, T. N. (2008). *In-depth interviewing: Principles, techniques, analysis* (3rd ed). Pearson Education Australia.

Ministerium für Energiewende, Landwirtschaft, Umwelt, ländliche Räume des Landes Schleswig-Holstein. (2014). *Bericht der Arbeitsgruppe HALLIGEN 2050: Möglichkeiten zur langfristigen Erhaltung der Halligem im Klimawandel [Report of the working group HALLIGEN 2050: Possibilities to ensure the long-term preservation of the Halligen with climate change]*. Ministerium für Energiewende, Landwirtschaft, Umwelt, ländliche Räume des Landes Schleswig-Holstein.

Naess, L. O. (2013). The role of local knowledge in adaptation to climate change: Role of local knowledge in adaptation. *Wiley Interdisciplinary Reviews: Climate Change*, 4(2), 99–106. <https://doi.org/10.1002/wcc.204>

Nightingale, A. J. (2017). Power and politics in climate change adaptation efforts: Struggles over authority and recognition in the context of political instability. *Geoforum*, 84, 11–20.

O'Brien, K., & Hochachka, G. (2010). Integral adaptation to climate change. *Journal of Information Science Theory and Practice*, 89–102.

Pansardi, P. (2012). Power to and power over: Two distinct concepts of power? *Journal of Political Power*, 5(1), 73–89. <https://doi.org/10.1080/2158379X.2012.658278>

Patel, S., Soanes, M., Rahman, M. F., Smith, B., Steinbach, D., & Barrett, S. (2020). *Good climate finance guide*. IIED.

Patton, M. Q. (2015). *Qualitative research & evaluation methods: Integrating theory and practice* (Fourth edition). SAGE Publications, Inc.

Pickering, S. (2000). Women, the Home and Resistance in Northern Ireland. *Women & Criminal Justice*, 11(3), 49–82. [https://doi.org/10.1300/J012v11n03\\_03](https://doi.org/10.1300/J012v11n03_03)



- Puppim de Oliveira, J. A., & Fra.Paleo, U. (2016). Lost in participation: How local knowledge was overlooked in land use planning and risk governance in Tōhoku, Japan. *Land Use Policy*, 52, 543–551. <https://doi.org/10.1016/j.landusepol.2014.09.023>
- Rahman, H. M. T., & Hickey, G. M. (2019). What Does Autonomous Adaptation to Climate Change Have to Teach Public Policy and Planning About Avoiding the Risks of Maladaptation in Bangladesh? *Frontiers in Environmental Science*, 7, 2. <https://doi.org/10.3389/fenvs.2019.00002>
- Reisinger, A., Howden, M., Vera, C., & et al. (2020). *The Concept of Risk in the IPCC Sixth Assessment Report: A Summary of Cross-Working Group Discussions*. Intergovernmental Panel on Climate Change.
- Repko, A., Newell, W., & Szostak, R. (2012). *Case Studies in Interdisciplinary Research*. SAGE Publications, Inc. <https://doi.org/10.4135/9781483349541>
- Robinson, O. C. (2014). Sampling in Interview-Based Qualitative Research: A Theoretical and Practical Guide. *Qualitative Research in Psychology*, 11(1), 25–41. <https://doi.org/10.1080/14780887.2013.801543>
- Saldaña, J. (2013). *The coding manual for qualitative researchers* (2nd ed). SAGE.
- Sarantakos, S. (2013). *Social research* (4th edition). Palgrave Macmillan.
- Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). Understanding research philosophies and approaches. In *Research methods for business students* (Eighth Edition, pp. 122–161). Pearson.
- Schindler, M., Karius, V., Arns, A., Deicke, M., & von Eynatten, H. (2014). Measuring sediment deposition and accretion on anthropogenic marshland – Part II: The adaptation capacity of the North Frisian Halligen to sea level rise. *Estuarine, Coastal and Shelf*

*Science*, 151, 246–255. <https://doi.org/10.1016/j.ecss.2014.08.027>

Schindler, M., & Willim, K. (2015). *Berechnung langjähriger Überflutungshäufigkeiten für die Halligen Hooge, Langeneß und Nordstrandischmoor auf Basis regionaler Pegelraten [Calculations of long-term flooding frequency for the Halligen Hooge, Langeneß und Nordstrandischmoor based on regional water gauge data]*.

Schipper, E. L. F. (2020). Maladaptation: When Adaptation to Climate Change Goes Very Wrong. *One Earth*, 3(4), 409–414. <https://doi.org/10.1016/j.oneear.2020.09.014>

Schüttrumpf, H. (2013). Sturmflutschutz auf den nordfriesischen Halligen [Storm protection on the North Frisian Halligen]. *Technischer Und Organisatorischer Hochwasserschutz-Bauwerke, Anforderungen Modelle*, 48, 339–348.

Scott, J. C. (1986). Everyday forms of resistance. *The Copenhagen Journal of Asian Studies*, 4, 33–62.

Seymour, S. (2006). Resistance. *Anthropological Theory*, 6(3), 303–321.  
<https://doi.org/10.1177/1463499606066890>

Shakya, C., Soanes, M., & Smith, B. (2019). Calling for business unusual: Reforming climate finance. *IIED Briefing Paper*.

Simpson, A. (2007). Ethnographic Refusal: Indigeneity, 'Voice' and Colonial Citizenship. *Junctures: The Journal for Thematic Dialogue*, 9, 67–80.

Sipe, L. R., & Ghiso, M. P. (2004). Developing Conceptual Categories in Classroom Descriptive Research: Some Problems and Possibilities. *Anthropology and Education Quarterly*, 35(4), 473–485.

Smit, B., Burton, I., Klein, R. J. T., & Wandel, J. (2000). An anatomy of adaptation to climate change and variability. *Climatic Change*, 45(1), 223–251.  
<https://doi.org/10.1023/A:1005661622966>

- Soanes, M., Shakya, C., Walnycki, A., & Greene, S. (2019). *Money where it matters: Designing funds for the frontier*. IIED.
- Sova, C. A., Thornton, T. F., Zougmore, R., Helfgott, A., & Chaudhury, A. S. (2017). Power and influence mapping in Ghana's agricultural adaptation policy regime. *Climate and Development, 9*(5), 399–414. <https://doi.org/10.1080/17565529.2016.1154450>
- Spradley, J. P. (1979). *The ethnographic interview*. Holt, Rinehart and Winston.
- Sprain, L. (2017). Paradoxes of Public Participation in Climate Change Governance. *The Good Society, 25*(1), 62–80. <https://doi.org/10.5325/goodsociety.25.1.0062>
- Staatskanzlei Schleswig-Holstein. (n.d.-a). *Klimawandel [Climate Change]*. <https://www.schleswig-holstein.de/DE/Fachinhalte/K/klimaschutz/klimawandel.html>
- Staatskanzlei Schleswig-Holstein. (n.d.-b). *Minderheiten in Schleswig-Holstein—Friesen [Minorities in Schleswig-Holstein—Frisians]*. [https://www.schleswig-holstein.de/DE/Fachinhalte/M/minderheiten/minderheiten\\_friesen.html](https://www.schleswig-holstein.de/DE/Fachinhalte/M/minderheiten/minderheiten_friesen.html)
- Strack, H., & Jensen, F. (2014). ZukunftHallig C. In *KFKI-Projekt ZukunftHalligen [KFKI-Project FutureHalligen]* (pp. 441–480).
- Svarstad, H., Benjaminsen, T. A., & Overå, R. (2018). Power in political ecology. *Journal of Political Ecology, 25*, 350–363.
- United Nations. (1992). *Report of the United Nations Conference on Environment and Development*.
- Wamsler, C. (2017). Stakeholder involvement in strategic adaptation planning: Transdisciplinarity and co-production at stake? *Environmental Science & Policy, 75*, 148–157. <https://doi.org/10.1016/j.envsci.2017.03.016>
- Wamsler, C., & Riggers, S. (2018). Principles for supporting city–citizen commoning for climate

adaptation: From adaptation governance to sustainable transformation.

*Environmental Science & Policy*, 85, 81–89.

<https://doi.org/10.1016/j.envsci.2018.03.021>

Weiss, E. (2014). *Conscientious Objectors in Israel: Citizenship, Sacrifice, Trials of Fealty*. University of Pennsylvania Press. <https://doi.org/10.9783/9780812209426>

White, G. F. (1975). *Flood Hazard in the United States: A Research Assessment*. University of Colorado.

Whyte, W. F. (1994). Interviewing in Field Research. In R. G. Burgess, *Field research: A sourcebook and field manual* (Reprinted). Routledge.

Wiedemann, P. M., & Femers, S. (1993). Public participation in waste management decision making: Analysis and management of conflicts. *Journal of Hazardous Materials*, 33(3), 355–368. [https://doi.org/10.1016/0304-3894\(93\)85085-S](https://doi.org/10.1016/0304-3894(93)85085-S)

Wöffler, T., Schüttrumpf, H., Arns, A., Von Eynatten, H., Häußling, R., Jensen, J., & Schindler, M. (2012). DEVELOPMENT OF COASTAL PROTECTION MEASURES FOR SMALL ISLANDS IN THE WADDEN SEA USING A RISK-BASED APPROACH. *Coastal Engineering Proceedings*, 1(33), 48. <https://doi.org/10.9753/icce.v33.management.48>

Woroniecki, S., Krüger, R., Rau, A., Preuss, M. S., Baumgartner, N., Riggers, S., Niessen, L., Holländer, L., Beyers, F., Rathgens, J., Wagner, K. C., Habigt, L., Krause, T., Wamsler, C., von Wehrden, H., & Abson, D. (2019). The framing of power in climate change adaptation research. *WIREs Climate Change*, 10(6). <https://doi.org/10.1002/wcc.617>

WWF. (2022) Klimawandel bedroht Halligen [Climate Change threatens Halligen]

Zhang, Y., & Wildemuth, B. M. (2009). Unstructured interviews. In *Applications of social research methods to questions in information and library science* (pp. 222–231).

Appendix

**Appendix A. Interview Guide for Semistructured Interviews.** The table shows the questions which were posed to all government representatives. Own work.

| Question  | Intention and theoretical foundation   |
|---|--|
| Please describe the work the authority you work for is doing on the North Frisian Halligen.   | Question one was intended as a descriptive introductory question and allowed the participant to highlight the work they perceived as most important. Furthermore, an easy descriptive question helps to establish rapport between the participant and researcher and is thus very suitable as a first question (Adams, 2015).  |
| How do you incorporate the Hallig residents in your work?   | The second question was intended to lead over to the main part of the interview and to grasp how the participants understand participation. Positive or at least neutral sides of the research topic should be addressed in the beginning of the interview as participants can feel more comfortable sharing critiques if they have already voiced something positive (Adams, 2015).   |
| How do you perceive the collaboration?<br><br>What are examples where you and your authority are in accordance with the residents? What are examples where you and your authority are in disagreement with the residents? | Controversial questions that address failures, disappointments or areas that need improvement should be raised towards the end of the interview. Rapport is usually established at this point and participants feel safer voicing their understandings and perceptions (Adams, 2015). The third, fourth and fifth questions were intended to contrast the perception of the authority to the perception of the residents. Question four is the most controversial question. It is followed by a less controversial question to ensure that the participant feels safe for the rest of the interview. |
| How do you ensure that what you plan is realistic and realisable on the Halligen?   |  |
| Is there something you wish that the Hallig residents would understand about you, your authority and your work?   | To end the interview on a positive yet substantive note, researchers are recommended to return to a question that is preferably related to the participant's area of expertise or work (Adams, 2015). The last question thus resembles the last question of the unstructured interviews with the residents and gives the participant the room to elaborate on topics that are important to them and their understanding of themselves.   |

**Appendix B. Theme description.** This table shows the themes and their description that were coded during the second coding cycle. Own work.

| Code                                     | Description  |
|--|--|
| Climate Change Adaptation                | Reports regarding climate change adaptation - past, present, future  |
| Environmental and Climate Change         | Reports regarding observed changes in the climate, changes in the landscape of the <i>Halligen</i> , storm surges, climate change. |
| Legislative                              | Reports regarding the authorities.   |
| Traditional Knowledge and Culture        | Reports about aspects of <i>Hallig</i> culture and traditional knowledge.  |
| Participation of <i>Hallig</i> residents | Reports regarding how participation works on the <i>Halligen</i> and how residents interact with participation.                    |

**Appendix C. Category description.** Table shows the description of the categories and their corresponding theme. Overall, 26 categories correspond to five themes. Own work.

| Code                               | Corresponding Theme               | Description   |
|------------------------------------|-----------------------------------|---|
| Terp reinforcement                 | Climate Change Adaptation         | Reports regarding terp reinforcement  |
| Failed measures                    | Climate Change Adaptation         | Reports regarding failed adaptation measures  |
| Adaptation                         | Climate Change Adaptation         | Reports of other adaptation measures than terp reinforcement                              |
| Financial dependence               | Climate Change Adaptation         | Reports on financial dependence of the residents on the authorities                       |
| Local practices                    | Climate Change Adaptation         | Reports of how climate change adaptation was conducted in the past on the <i>Halligen</i> |
| Uncertainty                        | Climate Change Adaptation         | Voiced concerns and unease regarding climate change adaptation.                           |
| Climate Change                     | Environmental and Climate Change  | Reports on observed climate change.   |
| Risk perception                    | Environmental and Climate Change  | Reports on perceived climate change risk.   |
| Land unter                         | Environmental and Climate Change  | Reports on experience and handling of <i>Land unter</i>                                   |
| Storm surge                        | Environmental and Climate Change  | Reports on experience and handling of storm surges  |
| Bureaucracy                        | Legislative                       | Description of bureaucratic requirements.   |
| Authorities                        | Legislative                       | Reports of interaction with authorities.  |
| Nature Protection                  | Legislative                       | Reports of interaction with UNB and nature protection laws.                               |
| Decisional power                   | Legislative                       | Reports of decision-making processes and perception of power imbalance.                   |
| Unrealistic                        | Legislative                       | Requirements stated by authorities that are perceived as being unrealistic.               |
| Not trusting traditional knowledge | Traditional Knowledge and Culture | Reports on instances when authorities have not trusted traditional knowledge              |
| Perception of residents            | Traditional Knowledge and Culture | Stated perceptions of the <i>Hallig</i> residents' character                              |
| Knowledge                          | Traditional Knowledge and Culture | Reports on traditional knowledge  |

|                        |  |  |
|------------------------|--|--|
| Conflict               | Traditional Knowledge and Culture        | Reports on conflict between residents and between residents and the authorities in relation to traditional knowledge |
| Observations           | Traditional Knowledge and Culture        | Reports of local observations in connection to traditional knowledge   |
| Everyday life          | Traditional Knowledge and Culture        | Reports on how everyday life is different than life on mainland.   |
| Persistence            | Traditional Knowledge and Culture        | Description of residents' persistence despite negative externalities.  |
| Participation          | Participation of <i>Hallig</i> residents | Reports on how participation is conducted on the <i>Halligen</i>   |
| Refusal to participate | Participation of <i>Hallig</i> residents | Reports of how and why participation is refused  |
| Resistance             | Participation of <i>Hallig</i> residents | Reports on resistance  |
| Cooperation            | Participation of <i>Hallig</i> residents | Reports on how cooperation between residents and the authorities works   |



**Appendix D. Coding tree diagram.** This diagram shows all identified themes, categories and subcategories that belong to 'Adaptation on the Halligen'. Five themes were identified: Climate Change Adaptation, Environmental and Climate Change, Legislative, Local Knowledge and Culture, Participation of Hallig residents. These themes have four to seven corresponding categories. Own work.

