



“We live here because of nature”: transformation towards better flood resilience on small Danish islands

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Abstract

Climate change is increasing the threat of flooding on small Danish islands. This article presents the results of a qualitative case study of flood risk perceptions and adaptive actions on three small Danish islands. The study explores how an empirical study of the islanders’ sense of place can contribute to a transformation towards better flood resilience. It finds that sense of place is closely connected to living close to nature, but also it highlights that the meaning given to ‘nature’ varies among the islanders. For some, nature is an uncultivated, wild landscape; for others, it is the present, cultural landscape. Another difference concerns whether the islands are described as a place to make a living or as a place to get away from everyday life. For some, farming and grazing are central to how they make a living on the islands; for others, these activities belong to the past. This insight into differences in the islanders’ sense of place contributes to understanding different perspectives regarding what is worth protecting, and what it is possible to protect from flooding, as well as why it is difficult for the islanders to reach agreement on the subject. This understanding has transformative potential, as it can give the islanders themselves, as well as authorities responsible for flood protection, a valuable insight into what drives and hinders actions to manage or reduce flood risk on small islands.

Keywords Climate adaptation · Sense of place · Transformation · Flood mitigation · Small islands · Denmark

Introduction

In Denmark, rising sea levels, combined with predictions of more frequent storm surges, make coastal flooding a key climate change concern (Danish Meteorological Institute 2024). Research has focused on how densely populated areas, especially larger cities, can adapt to climate change (Heidrich et al. 2016; Heikkinen et al. 2020), and many planned projects are already underway (Copenhagen Municipality 2017; Aarhus Municipality 2020). However,

while less densely populated areas face similar challenges, they lack the resources to respond (Amundsen 2015; Baron 2020; Taarup-Esbensen 2022).

Denmark has more than 440 named islands, and 8750 km of coastline. Twenty-seven islands have a permanent population of less than 1200 people, and are only connected to the mainland by ferries (Association of Danish Small Islands 2023). Many of these islands are also at elevations not much higher than sea level (Danish Coastal Authority 2023). Unlike most other northern European countries (Thaler and Hartmann 2016; Bubeck et al. 2017), coastal flood protection is the responsibility of private property owners (Danish Ministry of Environment 2019). In some larger cities, the municipality takes responsibility (Copenhagen Municipality 2017; Aarhus Municipality 2020), but along less-populated coasts, including the country’s small islands, local people have to plan, finance, and maintain flood protection measures, with no financial support from either local or national government. Furthermore, only limited public support is provided in the event of a flood. During floods, emergency management services prioritise more densely populated areas, and ferry transport is one of the first casualties, meaning that small

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islands are cut off from help from the mainland. Denmark's small islands are therefore at particular risk of experiencing the negative effects of climate change, notably increased flooding (Lund 2023; Danish Meteorological Institute 2024). It is for these reasons, there needs to be a transformation in how they mitigate and manage flood risk.

In this article, we present the results of a qualitative case study of how islanders perceive and seek to reduce flood risk on three small Danish islands. On the background of our empirical data, we aim to understand how a focus on *sense of place* can contribute to transforming islanders' flood resilience. In this way, we wish to contribute to the field of climate change research by exploring how empirical studies of sense place can provide new insight into what drives or hinders climate change adaptation processes and actions. The case study aims to provide insight into the values that today's islanders associate with the place they live. It is crucial to understand the social, material, and practical connections that people have to a place (Devine-Wright and Quinn 2020; Fornara et al. 2020), to fully understand what initiate transformation towards more community-driven climate adaptation (Amundsen 2015; De Dominicis et al. 2015; Stedman 2016; Bonaiuto et al. 2016; Masterson et al. 2017).

We begin by outlining why the concept of sense of place is relevant in an empirical climate adaptation study. Then, we present the natural and demographic characteristics of the three islands that are the subject of our investigation, describe their present and future flood risk, and justify our decision to use the qualitative case study method. We argue that different aspects of sense of place exist among the islanders, and show how this can provide a more comprehensive understanding of different perspectives regarding the level of risk, and possible flood protection measures. In the last section, we discuss our findings. In particular, we examine how they can contribute to driving transformation by supporting future capacity-building processes on small islands, and in similar communities in other Nordic countries.

Sense of place as a theoretical framework

Much recent climate adaptation research has demonstrated that there is no direct link between calculated, climate-related risk, and the motivation to take protective actions among people exposed to this risk (IPCC 2022). Or in other words, knowing that you live in an area with increased flood risk does not necessarily translate into climate adaptation actions (Koerth et al. 2013; Amundsen 2015; Kuhlicke et al. 2016; Quinn et al. 2019; Baron 2020). To understand this, a growing number of studies have moved the focus to the meaning- or sense-making of people living in high-risk areas (Devine-Wright 2013; Stedman 2016; Masterson et al. 2017).

Researchers have investigated the meanings people connect to the place they live, in an effort to understand their reason for living in high-risk areas. At the same time, there is an ongoing, broader debate within climate change adaptation research, which argues that when making decisions that seek to reduce exposure to extreme weather events, the starting point should be the concerns and perspectives of the people who are affected (Schipper 2020; Gaillard and Raju 2022). This line of thinking recommends a stronger focus on the meaning-making of affected people; it is driven not only by a rationale that supports democracy and equity, but also by the need for research to support climate adaptation-related transformations (Masterson et al. 2017, 2019a). Understanding how people give meaning to their actions and perceptions is essential to support this transformation (Stedman 2008, 2016; Masterson et al. 2017, 2019a).

The theoretical concept of sense of place helps to shift the focus from calculated risk to the meaning people attach to the place they live (Stedman 2016; Masterson et al. 2017, 2019a; Quinn et al. 2019). This study therefore applies the concept as a theoretical framework to analyse our empirical findings, as it can help to understand the role of place-related meaning-making, and thereby provide a deeper insight into the barriers and drivers of climate adaptation actions. *Sense of place* draws attention to the social, emotional, material, and practical connections people can have to a physical place. In the literature, several similar concepts have been used interchangeably, notably *place meaning*, *place attachment*, and *belonging* (Trentelman 2009; Masterson et al. 2017; William and Miller 2020). However, Masterson et al. (2017) suggest sense of place as an overall concept that encompasses the concepts of place attachment and place meaning. *Place attachment* draws attention to the dependency that people can have on a place (not only how they make their living, but also as somewhere where they do the things they enjoy, or somewhere that is connected to their identity). Therefore, as defined by Masterson et al. (2017), place attachment consists of both *place dependency* and *place identity*. *Place meaning* "stands in contrast to attachment in that they are descriptive statements (cognitions, in social psychology terms) about what a place is, what it is like, and the kinds of images it conveys" (Masterson et al. 2017, p. 3). We acknowledge that there are other definitions and interpretations (Raymond et al. 2021); however, in this article, we build on the understanding developed by Masterson et al. (2017).

Sense of place, as a tool, can be used to understand the meanings that both drive and hinder transformation (Stedman 2003; Quinn et al. 2019). A strong sense of place can drive adaptive actions, as people seek to protect a place they care about; however, it can also hold back transformation (Bonaiuto et al. 2016; Masterson et al. 2019a). It can create so-called socio-ecological traps, where the meaning people connect to the place they live creates a barrier for adjusting

to ecological transformation (Stedman 2016; Masterson et al. 2017). An example is the desire for local communities to remain unchanged, which can increase vulnerability to extreme weather risks as the community does not adapt to the changing conditions. Several studies have highlighted that the subjectivity of sense of place means that multiple meanings and types of attachment coexist, even within small communities (Amundsen 2015; Quinn et al. 2019). This is typically connected to differences in people's historical connection to the place, and how the place supports how they make a living, or their lifestyle in general (Nedergaard and Baron 2023; Kongsager and Baron 2024). Adaptation actions that support the meaning or functionality that a person connects to a place (e.g. flood protection measures that make it possible to maintain farming activities) will most likely be met with support by this person. In contrast, actions that fundamentally change the place's meaning or function (e.g. transforming farmland to wetland) are likely to be opposed. This type of conflict is seen in the context of many current Danish climate adaptation projects (Christensen et al. 2019; Baron 2020). The three communities studied in this article provide several illustrations of this type of conflict or disagreements in relation to flood protection measures.

Empirical studies of sense of place can draw those different meanings out into the open, and, consequently, make it possible to challenge and change them (Stedman 2016; Enqvist et al. 2016; Masterson et al. 2019b), potentially overcoming disagreements Masterson et al. (2019a, b) argue that finding and questioning dominant place meanings can be a concrete way to escape socio-ecological traps, and support adaptive transformation. Against this background, our aim with this article is to analyse our empirical data with a focus on sense of place, and thereby support the transformation toward more flood-resilient communities on the three islands. Further, we wish to contribute to field of climate change adaptation research, by illustrating the types of insights empirical studies of sense of place can contribute with.

Case study description

The three islands included in this study were chosen in cooperation with the Association of Danish Small Islands. The Association represents the interests of all small Danish islands that have a permanent population of less than 1200 people, are not physically connected to the mainland, and are not privately owned (Association of Danish Small Islands 2023). In order to represent a broad sample of the different challenges and opportunities that island residents face, the selected islands vary in terms of size, demographics, and flood risk, and, as such, are representative of most small Danish islands (Neergaard 2007). The islands are Skarø, Drejø, and Birkholm (Fig. 1). All are located in the southern part of Denmark.

Flood risk

Many communities along the Danish coast are experiencing increasing flood risk as a result of climate change, and many small islands are especially vulnerable, because a large number of them lie at an elevation that is not much higher than sea level. In recent years, the problem has been receiving growing attention from both the Association of Danish Small Islands (Terkelsen 2022), and broader Danish society (Engelbrecht 2022; Lund 2023).

The Danish Meteorological Institute predicts a mean sea level rise of 35–70 cm, with a variation of up to 1.3 m within the next 80 years for the coast surrounding the three case study islands, depending on global change in CO₂ levels (Danish Meteorological Institute 2024). This, combined with a prediction of more storm surge events, means that in the future, water levels more than 2 m above mean sea level (AMSL) can be expected several times a year, while today this is seen as an extreme event (Danish Coastal Authority 2023; Lund 2023).

In recent years, storm surges have damaged houses, infrastructure, and farmland on the islands. In 2017, the water rose to 1.7 m AMSL in the area (The Danish Coastal Authority 2020), in 2019 to 1.6 m AMSL, and the latest incident (in 2023) was approximately 2 m AMSL (Danish Coastal Authority 2024). The most damaging flood in recorded history took place in November 1872, when the water level was between 2.5 and 3.5 m AMSL in the case study area (Colding 1881). The storm surge in 1872 is used as a reference for coastal flood risk assessments (Danish Coastal Authority 2018, 2020). Historic levels, combined with climate change predictions, make a 3-m flood a realistic scenario, and, therefore, an event the islanders should prepare for. Today, a storm surge event causing a 3-m AMSL water level will lead to extensive damage on all three islands.

Description of the three islands

The island of Skarø covers 2 km², and has a population of 28. The village, where most houses are located, is at an elevation of 2.5–3.5 m AMSL. Several other houses and buildings are located at lower elevations. Some old, badly maintained dikes protect part of the islands' farmland, but not the houses. Several businesses are headquartered on Skarø. The largest produces high-quality ice cream that is sold globally. The island is a popular tourist destination, and tourism creates revenue for the islanders who own its two restaurants, the campground, the harbour, and several small shops that are only open in the holiday season. A 3-m rise in the surrounding water level would lead to extensive damage to houses, businesses, and tourism. It is also very likely to damage infrastructure such as power, water, and sewage systems. Skarø is connected to

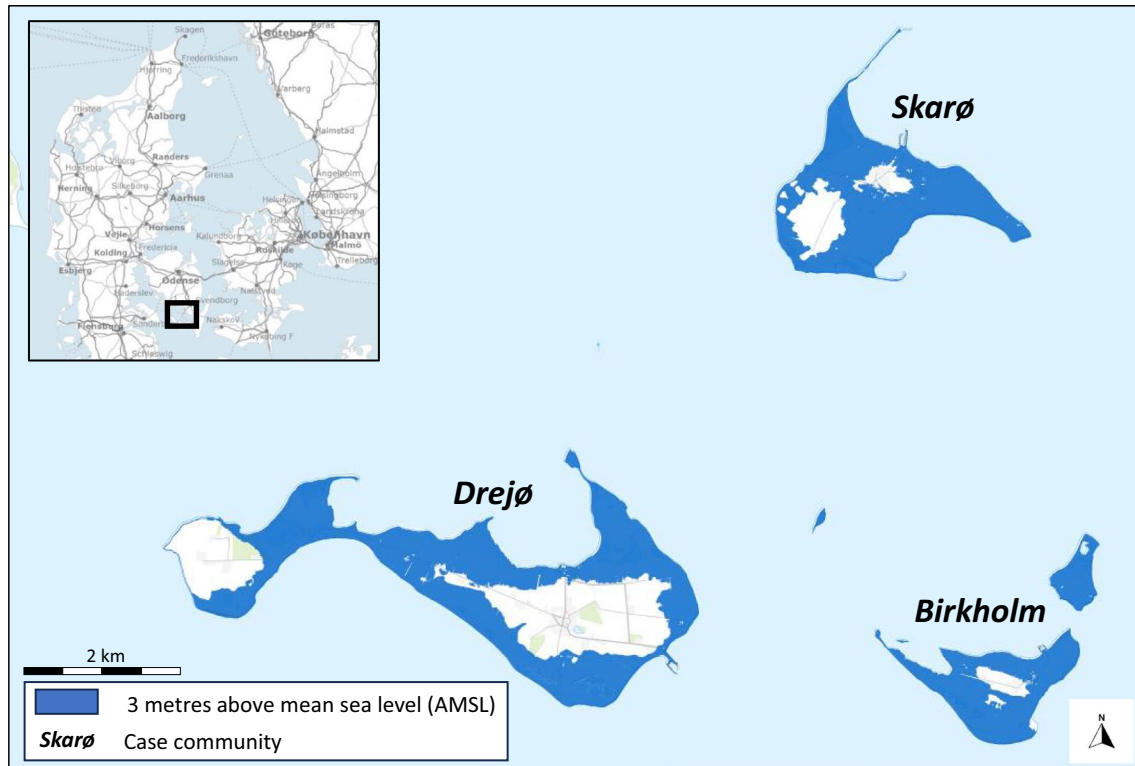


Fig. 1 The location of the three case study communities. The blue indicates areas of the islands that will be flooded at a storm surge of 3 m above mean sea level (AMSL) (The Ministry of Environment 2023)

the mainland by a ferry that runs 4–5 times a day, with the trip taking 45 min.

The island of Drejø covers 4.1 km². It is the largest of the three islands, and has a population of 69. Here, the village is located at a higher elevation than on the two other islands, at around 15 m AMSL. However, an area around the old harbour has several houses that are located less than 3 m AMSL, and the church, which dates back to 1535, is at an elevation of 3 m AMSL. Here again, old dikes protect some parts of the farmland, but not low-lying houses or the church. Drejø has a small supermarket and, in the tourist season, several restaurants, cafes, a campground, two harbours, and a number of bed-and-breakfasts. A water level of 3 m AMSL will not affect the houses' village, but harbours, the church, a number of other houses, elements of the tourism industry, and the island's supply and infrastructure systems will be under significant threat. Drejø is connected to the mainland by the same ferry as Skarø, with the journey taking 1 h and 20 min.

Finally, Birkholm is the smallest island, with an area of 0.9 km². There are eleven year-round residents, with a significant increase in summer months. Most of the islands' houses solely used as holiday homes. It is the lowest-lying island in this study. Its highest point is 2 m AMSL, and all of the houses lie at 1–2 m AMSL. They are protected by inner and outer dikes that were originally built to withstand a flood such as the 1872

event. However, these dikes are more than 100 years old, and have decayed in recent decades. According to the islanders, they would not be able to withstand a similar flood now. Provisions have to be brought from the mainland. The only shop is a small tourist shop selling ice cream and souvenirs in the island's village hall. It has power from the mainland, but there are no water or sewage systems. The islanders depend on local wells for drinking water, and these wells would be damaged in the event of a flood. Birkholm is connected to Ærø, another larger island in the area, by a small boat that departs once a day in winter, and twice a day in summer. The journey takes approximately 30 min. A flood of 3 m AMSL would be devastating, unless the dikes have been strengthened.

Methods

Although sense of place is subjective, several studies have found systematic variation, which is a strong argument for using it to investigate transformative potentials, reaching beyond the studied area (Masterson et al. 2017). Quantitative studies mainly focus on the strength of place attachment (Raymond et al. 2010), while qualitative studies are largely dominated by detailed examinations of place meanings (Amundsen 2015; Baron 2020). Both approaches provide

valuable insight into the relation between sense of place and adaptive actions, and thereby what can hinder or drive transformation. The study presented here is qualitative.

Empirical data were collected in three phases (Table 1). During the first, exploratory phase, researchers visited all three islands. The stay on Birkholm lasted 2 days, because it was not possible to go there and back in 1 day, while Skarø and Drejø were day visits. On all three islands, several appointments (e.g. participating in an exercise with the local fire brigade on Skarø, and driving around the island on Drejø) had been made beforehand. Observations from these meetings were combined with data from informal conversations and more structured, exploratory interviews. The aim of this phase was to gain a preliminary understanding of the islanders' place meanings, along with challenges and possibilities in relation to flood risk, from their perspective.

In the second phase, researchers facilitated a workshop that was held on Drejø. All islanders on the three islands were invited. Islanders who we contacted during the exploratory phase received personal invitations, and the others were invited through the islands' e-mail lists and Facebook groups. Of the 17 who signed up, 14 participated. During the workshop, islanders sat in two groups, with residents from all three islands represented in each group. There were three rounds of discussions. The aim of the first two rounds was to get an insight into participants' sense of place—first through a focus on how they gave meaning to living on an island, and then their sense-making in relation to flood risk. The aim of the third round was more transformative; here, the goal was to use the knowledge gained during the first part of the workshop to discuss possible adaptation measures, and barriers to climate adaptation. All participants took part in all three rounds of discussions.

In the final phase, researchers held in-depth semi-structured interviews with 11 islanders. These islanders were chosen because they represented perspectives that were not discussed during the workshop. Specifically, we contacted people who owned houses in the lowest-lying areas, along with others who made an income on the islands (either from farming or tourism), and who had not been able to participate in the workshop. We choose to also include two people who did already participate in the workshop, as they at the workshop had shared knowledge about the history and ongoing debate in relation to flood protection on one of the islands, but these topics were not fully explored due to time constraints. Interviews followed the same structure as the workshop, and the same guide was used with all interviewees. Initial questions focused on the interviewees' sense of place—how long they had lived on the island, and why they had moved there (if they were not born there). The questions that followed related to perceptions of past flood events, and future flood risks. The final set of questions related to how they gave meaning to their own, and their communities' ability to respond to increasing flood risk. Overall, interviewees gave answers that were comparable to the points raised by workshop participants. No completely new perspectives were mentioned. This observation suggests that there is a level of trust among the islanders with respect to the topic, as they shared the same thoughts when together and when being interviewed individually. It should be noted that other topics might be shared between the islanders, but not with us as researchers. However, our fieldwork suggested that the islanders did trust us, to the point of sharing detailed information that should not come to the attention of, for example, government officials.

Table 1 Overview of data collection

Time	Activity	Participants	Data handling
Jul–Oct 2021	<u>Exploratory phase</u> Exploratory interviews and informal conversations with islanders, observations on the islands. All three islands were visited once during this phase	10 islanders (4 from Skarø, 4 from Drejø, and 2 from Birkholm) 5 permanent residents, 5 holiday home owners. Both categories were represented from all 3 islands	Observations, informal conversations, and exploratory interviews were documented in fieldnotes written continuously during the visits
Mar 2022	<u>Main fieldwork: Workshop</u> One 3.5-h workshop with participants from all three islands. The workshop took place on Drejø	14 islanders (5 from Skarø, 4 from Drejø, and 5 from Birkholm) 8 permanent residents. 6 holiday home owners. Both categories were represented from all 3 islands	Group discussions and the final discussion were recorded and later transcribed
May–Aug 2022	<u>Main fieldwork: Individual interviews</u> 11 semi-structured interviews with islanders. All three islands were visited once during this phase	11 islanders (4 from Skarø, 4 from Drejø, and 3 from Birkholm) 8 permanent residents. 3 holiday home owners. Both categories were represented from Skarø and Drejø. Only holiday home owners from Birkholm	All interviews with the islanders were recorded and later transcribed

All participants in the workshop and interviewees have been anonymised, as far as possible. However, the small population makes full anonymisation difficult to achieve. Although we do not provide detailed demographic information about age, gender, and occupation, we were able to obtain a representative sample on all three islands. A specific goal was to obtain the widest possible range of voices throughout the project; nevertheless, we may have overlooked some perspectives.

Transcriptions of the workshop discussions and individual interviews are the main corpus of data used in this article. The transcribed discussions and interviews were coded with NVivo software. Coding was based on sense of place theory (e.g. what characterises the island, social networks, the local nature, and livelihoods), perceptions of flood risk and climate change (e.g. perceptions of the person's flood risk, references to climate change), and perspectives on challenges and solutions (e.g. understanding of the person's own responsibility, expectations of authorities, legislation, and regulations). Field notes from the exploratory phase were used as background knowledge, but were not included in the coding process, as that part of the field work did not had some focus on sense of places, as the later parts. Data analysis focused on respondents' sense-making in relation to flood risk, climate change, and their sense of place.

Some limitations should be noted. The study of motivation to take climate adaptation actions in areas where awareness of the potential risk is low raises several methodological and ethical dilemmas. As researchers, we initiated conversations about flood risk. This made it difficult to get an insight into how much thought respondents had given to the issue before being asked to participate in the study. From a methodological standpoint, we tried to address the issue in the design of both the workshop and the interviews. Specifically, we began the discussion with open questions about living on an island; here, the aim was to see if flood risk or climate change was brought up by respondents themselves. However, we were unable to avoid bringing attention to an issue that most respondents may have given limited attention to. This observation should be taken into account when considering our conclusions. Furthermore, this type of study raises an ethical dilemma, namely to avoid creating unnecessary fear. As researchers, we drew attention to the risk of flooding, which could create worry or fear among the islanders. Therefore, drawing on risk communication research, on the one hand, we balanced sharing knowledge about the risk, with, on the other hand, drawing attention to actions islanders could take to reduce the risk. This approach has been shown to be able to reduce anxiety, and motivate precautionary actions (Witte 1992; Grothmann and Reusswig 2006). Nevertheless, our study drew islanders' attention to the increased flood risk, and its potential consequences for their everyday life.

Analysis

The analysis draws upon the theoretical framework of sense of place to understand how respondents give meaning to their life on the islands, and to the increasing flood risk. The aim is to get a deeper insight into what drives and what creates barriers to transformation towards more flood-resilient communities on small Danish islands.

Variation in concern about flooding

In relation to flood risk, we find respondents there are highly concerned, and others there are relatively unconcerned, with most having limited concern. During group discussions at the workshop, participants were asked if flood risk was something they talked about. The quotes below illustrate one of the discussions that followed this question. The first three comments are from people from Drejø, and the last is from Skarø.

D3¹: Only when it's extreme.

D4: It's not something we talk about over afternoon coffee.

D3: I don't think that's what our conversation is about. It's rare that we're so serious (laughing).

S13: Well, as I say, if we know there's going to be a high tide, we'll go around and kind of keep an eye on it (...) So you could say, we look at it and talk about it, but I don't think it's part of our everyday life. It's mostly something when you're in it.

As this discussion shows, flooding was not an everyday concern for participants from Skarø and Drejø. This was supported by the interviewees from those two islands who were interviewed individually. However, on Birkholm, the lowest-lying island, the situation was radically different. The following quote is also from the workshop, and shows the response from people living there to the same question.

B4: It's every time you sit and have a cup of coffee, or a glass of wine, or you sit with some cake down by the pond, then it's always there. It always ends up being about that at some point. The question is if it's after half an hour, or four hours, but it will always come up.

B7: But it's also because it's so essential.

B4: It's a concern that's there at the back of my mind.

This conversation shows how flood risk is a large part of everyday life for respondents from Birkholm. Individual

¹ The letter-number combination at the beginning of each quote indicates which island the person is from (S=Skarø, D=Drejø, B=Birkholm), and the anonymisation code for each individual in the form of a number. I= interviewer.

interviews with the island's residents demonstrate that flood risk is not only something they talk about, but also something they regularly act on. Flood risk and the condition of the dikes are a regular item on the agenda of the island's committee meetings, and dike maintenance is an ongoing activity that everyone who owns a house on Birkholm is involved in. Here, flood is a very real concern, unlike Skarø and Drejø.

This initial illustration of concerns related to flood risk could lead to the conclusion that the islanders' responses are a direct result of objective differences in the risk of living on the islands. The logical conclusion is that transformation towards improved flood resilience is easier to achieve on Birkholm, compared to the two other islands, as the population has more motivation to take action. However, our study shows that this is not the case. Disagreement exists on all three islands about how to respond to increasing flood risk, both as individuals and as communities. Very little is being done on any of the islands, in terms of reducing or responding to flood risk. In the following section, we turn to the concept of sense of place as a tool to understand why this is the case.

Place meaning: a natural or cultural landscape

Place meanings can be identified through descriptive statements of a place (Masterson et al. 2017). In this analysis, we discern respondents' place meaning from how they describe their island, and what they value about it, specifically, which words they use, and what they decide to focus on in their descriptions. A special focus is how this varies among respondents.

Without exception, both workshop participants and interviewees noted that closeness to nature was what set their life on the island apart from lives in other places. Peace and quiet were frequently mentioned when asked to describe their life. However, when these statements were investigated in more depth, it became clear they were referring to different things when talking about 'nature'. Overall, two meanings were identified. The first is connected to the islands as they look today—namely, a cultural landscape that is formed by human activities such as farming and husbandry. In earlier times, islanders utilised the land as much as possible. The need for land for farming and grazing meant that fields reached the coastline in most places, and little space was left for forest or other types of uncultivated natural landscape (Friis 1926; Jensen 1982). Many respondents described this type of landscape in positive terms, as the quote below illustrates.

S5: When you, as I am, are born here and are used to the open views and high sky and water all around

you, nature is so close, you nearly have it in your living room. I think it's amazing. I think it's great to walk by the beach and walk out along the fields. Keep up with the seasons. Now we're farming. We see how things change, and what happens. And walking in the meadows, and seeing the birds coming and going.

This quote describes, among other things, farmed and open land. It is a very poetic, but also precise description of the islands as they appear today, where farmland and pastures still take up most of the space.

However, 'nature' also has a second meaning. Some respondents describe the islands as places that are characterised by large biodiversity, with limited human impact. The following quote illustrates this.

B7: One of the reasons that my partner and I fell very much in love with the island is that the wildlife and insect life are very rich. In summer, everything buzzes. Because there aren't many people, the space is filled with butterflies and bees, and flowers and birds. There is plenty of life, but it's different.

These two quotes show how place meanings differ among the islanders. These differences can lead to differences in people's responses to change, and thereby their reactions to climate adaptation measures (Stedman 2016). This was the case in our study. A detailed understanding of respondents' place meanings related to 'nature' helps in understanding the disagreements that exist on all three islands around flood protection measures. Respondents who see high value in the present landscape want to protect it from flooding. The following quote represents this line of thought, which was shared by several contributors.

S7: It's a cultural landscape, because it was humans who built the dikes. But if you ask The Danish Society for Nature Conservation, then they want us to pull the dikes and everything else down, so it gets flooded, so it becomes salt marsh (...) There are places out on the small islets, where you could say it's fine if they get flooded. And then there are other places where, if we want to protect rare plants and amphibians and so on, then we also need to protect the cultural landscapes as they are today.

The islander quoted here describes the value of protecting the present landscape, along with its flora and fauna. To achieve this, seawater must be prevented from reaching some of the lower areas. Many of the dikes along the coastline are in a poor state of repair, and respondents are aware that future storm surges are likely to flood large, low-lying areas if they are not repaired and improved. For the

person quoted above, and respondents with similar place meanings, the aim is therefore to find ways and means to strengthen the coastal dikes. This group also argues that the islands are already small, and giving part of them to the sea would result in a relatively large loss of land, compared to the overall area. They note that the present size and shape of the islands is how they should look. Any changes are seen as a degradation of what they value about the islands. However, the above quote also shows that people are aware that their views may go against other, more official understandings of nature protection, expressed by several respondents.

Biodiversity and wildlife were central elements in the descriptions of the islands for many respondents, and several people also highlighted the lack of areas not subject to human interference in Denmark. This was used as an argument for creating more of these types of areas. Allowing some areas to be regularly flooded is described in positive terms by those people, as illustrated in the following quote.

S6: Whether it gets flooded is not important to me. I don't really care. I just think it's great with all the birds out there. (...) The value of the [farm]land on the small islands is too low to protect it, compared to creating some good nature areas.

This quote illustrates the perspective of islanders who do not believe that it is possible, or sensible, to protect the islands' existing farmland. They argue that transforming some of the existing farmland into salt marshes (or other types of uncultivated area) will bring new value for the islands, as it will improve their biodiversity. Overall, this group considers that it would be more sensible to focus on protecting houses and other buildings, rather than the whole island, against flooding. As the person quoted above (S6) goes on to explain; "So if you have to put protection in place, then I'm more in favour of doing it individually, in relation to buildings, and not around the whole island, it doesn't make sense". As noted earlier, Birkholm is already home to an outer and an inner dike. The inner dike protects the houses, and the outer dike the farmland. Hence, this discussion directly translates into a disagreement about which dike is most important to maintain, and possibly make higher. Two projects have been proposed in the past 5 years: one is to strengthen the outer dike; and the other recommends using soil from the outer dike to raise the inner dike. Neither has gained support from a majority of the islanders, and there is still no agreement or decision regarding which solution will be adopted. Similar disagreements are found on Skarø and Drejø; here, the argument is whether the focus should be on rebuilding or maintaining the old dikes along the coast or on building a new dike closer to the houses.

This example illustrates two types of island-related place meanings, and how both are represented on all three islands. Among all respondents, place meaning is closely related to their perspectives regarding what is needed in terms of flood protection measures. Variation in place meanings has greater explanatory power (in terms of understanding the background for support and opposition to climate adaptation-related transitions) than objective flood risk alone.

Place attachment: the role of dependency and identity

Masterson et al. (2017) argue that place attachment consists of two elements: place dependency and place identity. In this study, we operationalised this as how respondents describe how their livelihood depends on living on the islands, and how they draw a connection between their description of themselves as a person and their description of activities that are unique to the islands (Masterson et al. 2017).

Islanders below retirement age make a living in various ways on the three case islands: farming, tourism, working from home, commuting, local business development, and providing local services (running the harbour, mail delivery, refuse collection, etc.). However, the options are limited, and if one source of income disappears, there are few alternatives.

Many respondents describe how traditional farming is less profitable today than it used to be. Nevertheless, many still rely on agriculture or grazing as their main source of income—in the case of grazing, mainly because it attracts EU funding.² Once again, this is directly connected to the debate about what to prioritise in relation to flood protection, as the quote below shows.

B4: His suggestion (a dike consultant) was to surrender the outer dikes in order to get material for the inner dikes. In other words, you just dig away the outer dikes and put them on the inner dikes instead. The problem was that us, the people who live on the island, did not agree. The problem is that you sacrifice everything outside the inner dike, because if the outer dikes aren't there, we don't need to get a storm surge before it overflows. All we need is an ordinary high tide, then the water will come all the way to the inner dikes. That's

² As a result of The European Agricultural Fund for Rural Development (EAFRD), it is possible to get financial support for grazing areas (Ministry of Food Agriculture and Fisheries of Denmark 2023).

how flat the island is. So if you do that, then there'll be no pastures for our cows anymore.

As the above quote shows, losing land for grazing is a central argument against giving up the coastal dikes, which were originally built to gain more farmland. However, the motivation for protecting the islands against flooding is clearly not only economic. The following respondent describes how they depend on their island life for several other reasons.

S8: I cannot do without Skarø. (...) I'll stay here until the day I have to be carried off. (...) I'm a nature person, an outdoor person, an organic farmer, and so on. Fishing and hunting in the winter, of course, then I like to walk around and prune the hedges, and so I have a wood stove, and that takes up a good part of the winter season. Well, I just like the outdoors.

This quote highlights the respondent's close connection to the place he lives, and how he describes his life illustrates a strong place identity. Many describe the islands as a place to get away from their busy everyday lives, and do things they would not be able to do in any other place.

B10: Well my parents have a holiday home here. (...) They took it over in 1990 from my granddad. And my grandmother and grandfather had a house down here (pointing at a map). And my parents actually met over here. So I've been coming to the island all my life. (...) I try to come every weekend in the summer if I can. I have a lot of hobbies that I can do over there. Sailing, driving my ATV.

These two quotes illustrate how having a house on the islands, and the activities that become possible, is very important for respondents, both permanent residents, as in the first quote, or part-time residents, as in the second quote. However, coastal flood risk protection is less important for activities that are unrelated to farming. Instead, protecting houses is more important, in order to continue enjoying aspects of their island life that people connect to their identity. Hence, flood protection dilemmas connected to place attachment overlap with those connected to differences in place meaning; however, it also contributes with another layer of understanding. While place meaning draws attention to the (in most cases) unconscious level of meaning-making among islanders, place attachment moves the focus to aspects easier to see and understand, e.g. economic arguments. Understanding which elements are central to the islanders' place attachment can, therefore, be a way to open up transformative discussions.

Discussion: how a focus on sense of place can contribute to climate adaptation actions on small Danish islands

Masterson et al. (2019a) argues that insight into dominant place meanings can be a way to break out of the socio-ecological traps that communities or individuals find themselves in, and thereby contribute to successful transformation towards more climate-resilient societies. The above analysis has highlighted some of the meanings behind the key disagreements on the three small Danish islands investigated in this empirical study. On all three islands, disagreement about what to protect, how to protect it, and why is preventing flood protection actions. The question is, to what extent can insight into place-related meanings drive transformation on these three islands and small Danish islands in general?

First, this study supports the well-documented conclusion that there is not necessarily a connection between calculated risk and the motivation to reduce this risk among the people living in this area (Witte 1992; Morgan et al. 2002; Grothmann and Reusswig 2006; Heath and O'Hair 2010), especially if risk calculations include anticipated climate change (Ingold and Kurttila 2000; Amundsen 2012; Baron and Petersen 2015). In this study, we saw that the variations in the respondents' understanding of flood risk and their perspectives on how to reduce this risk were better explained by the differences in their sense of place, than by the differences in the elevation of their house or property above sea level. This observation can have a transformative potential in itself, as it highlights the need to present local communities with arguments that go beyond a risk assessment, if the aim is to motivate them to take action.

In recent years, one response to the limitations of technical risk assessments in motivating action has been a growing focus on including indigenous and local knowledge when searching for the best way to transform and adapt to climate change (Lam et al. 2020; Brondízio et al. 2021). Empirical case studies like ours can be a relevant way to collect and include this kind of local knowledge in climate change adaptation research and planning. However, the focus on sense of place, used in the present study, also shows the limitations of this approach. Sense of place can be built up over many years, or over a short period, but it will always be grounded in past experience (Quinn et al. 2018). When it comes to preparing for a future that is likely to differ from the past (in relation to flooding), this creates challenges. Many of our respondents grew up on the islands, during a time when it was possible to earn a living from farming. Their sense of place builds strongly on an identity that is connected to

farming, as it is their place meaning. They do not want anything to change. This is an example of what Stedman (2016) calls a socio-ecological trap, namely, a situation in which the social situation and meaning-making prevent the transformation that is needed to adapt to an unavoidable change in the physical environment. In our study, some islanders are holding on to a place meaning that views the islands as farming communities; they can be seen as being trapped in a situation that prevents transformation. Here, the local knowledge and experience is therefore something that prevents a needed transformation.

Many ongoing debates on the islands centre around technical and physical solutions such as dikes, and how and where to build them. An insight into the different sense of place can contribute to broadening this discussion. Starting with the idea of socio-ecological traps, there is a need to not only discuss physical changes, but also meanings connected to the islands. Our study shows that one barrier to many of the proposed flood protection measures not only disagreements, but also lack of resources—physical or economic. The last is a barrier that is difficult to overcome, even if agreements could be reached, as the lack of inhabitants on most small islands necessarily creates economic constraints. Therefore, it could be particularly useful to move the discussion from the physical things, or areas, different islanders would like to protect, and instead focus on the values they connect to the islands, and which they would therefore like to preserve for the future. In many cases, there will be an overlap between the physical and what is valued. Nevertheless, it could be a useful tool in advancing the discussion. Stedman (2016) argues that a study of sense of place can be a way to discuss what is seen as the ‘desirable’ future state, as it helps to illustrate existing place meanings. For transformation to take place, we need to be able to understand what we would like to change physically and socially, but also in our sense-making. Hereunder, a discussion of if change is desirable at all. The use of the concept of ‘socio-ecological trap’ lays inherently a normative assessment of the need to break out of this trap. However, as this study has shown, what outsiders can look like a socio-ecological trap might for some of the islanders be their ‘desirable’ future state. Their ‘desirable’ future state is avoidance of change. An important contribution of this study is, therefore, that it gives the islanders words to describe what underlies their disagreements, and thereby creates a potential for them to better discuss their wishes and needs for transformation towards better flood resilience.

Finally, we can ask if the empirical insights into the sense of place in our study are transferable to all islanders on the three islands, or, even further, to islanders on other small islands in Denmark and beyond? We demonstrate

that the same types of meanings exist across all three islands. On Birkholm, islanders have higher risk awareness than on Drejø and Skarø. Nevertheless, the reason why only a few flood protection actions have been taken has its roots in the same disagreements connected to farmland vs. uncultivated nature. This shows a systematic variation in sense of place across all three islands (Masterson et al. 2017). As the three islands are representative of most small Danish islands, we argue that our findings are very likely to be transferable to other similar communities. They are less likely to be transferable to small island communities outside Denmark, as the identified sense of place is closely connected to the nature and history of Danish islands.

In summary, this study on the one hand demonstrates that external experts’ flood risk assessments exert limited influence on the islanders’ motivation to take preventive measures. On the other hand, relying solely on the islanders’ local knowledge and experiences neither effectively motivates actions. To enhance flood resilience on the small Danish islands, it is crucial to address the islanders’ current meaning-making processes. However, achieving this necessitates an in-depth understanding of the different existing sense of places. This might constitute the most significant contribution of this study to the field of climate change research.

On a final note, we held another workshop on one of the islands with participants from all three islands, after data collection for this article ended. We presented the results of our analysis, with a focus on the different place meanings that were identified. Later, the results were presented at an assembly of representatives from all small Danish islands. In both cases, participants expressed that the presentations had given them a better understanding of the reasons for their current disagreements, and how they could potentially be overcome. Whether this turns into flood protection actions remains to be seen; however, it supports our belief that empirical studies of sense of place might have transformative potential.

Conclusion

This article presents the results of a qualitative case study of three small Danish islands. On the background of our empirical data, we aim to understand how a focus on the islanders’ sense of place can contribute to understand what drives or hinders transforming toward more flood-resilient small islands in Denmark. Empirically, we focus not only on islanders’ perceptions of, and responses to, flood risk, but also on how they give meaning to the place where they live or have property. With this focus on meanings, we gain a deeper understanding of what

drives protection actions, what the barriers to action are, and what underlies disagreements. The key differences can be connected to the different meanings given to the concept of ‘nature’. For some, nature means birds, insects, and uncultivated land; for others, it is the present, cultural landscape. Another difference concerns whether the islands are described as a place to make a living or as a place to get away from everyday life. For some, farming and grazing are central to how they make a living; for others, this is seen as something from the past. These differences in place meaning and place attachment contribute to understanding different perspectives regarding what is worth protecting, and what it is possible to protect from flooding, as well as why it is difficult for islanders to reach agreement. Transformative potential rests in this understanding, as it can give both the islanders themselves, along with others with responsibility for planning or facilitating flood protection projects, valuable insight into the reasons for disagreements and a lack of action. Here in lays the articles most important contributing to climate change adaptation research.

We conclude with a recommendation for islanders and authorities. Debates about future flood protection initiatives, together with other relevant issues, should take differences in the sense of place as their starting point. So long as the focus remains on calculated risk and risk perceptions, it will be difficult to reach a decision, and understanding of the different opinions will be limited.

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Declarations

Conflict of interest The authors declare no competing interests.

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