Master's thesis

‘Heavy is the Mountain’

The tension between place attachment and the perception of hazards, climate change and place disruption, revealed through virtual walking tours in Patreksfjörður, Iceland

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Declaration

I hereby confirm that I am the sole author of this thesis and it is a product of my own academic research.

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Abstract

Natural hazards exacerbated by climate change and the adaptation measures designed to mitigate them are causing significant disruption to coastal communities and their surrounding landscapes. The interplay between place attachment, risk perception, place protective behaviour, and acceptance of landscape modifications gives important insights into community resilience, and understanding a community's place attachment can help land-use planners make decisions that better support local needs and priorities. In this study virtual walking tours are used to investigate how place attachment relates to perceptions of the landscape, and the method was found to be suitable for conducting cost-effective but deep-reaching community consultation. Testing this method in Patreksfjörður, a small fishing community in the Westfjords, where avalanche barriers are being constructed, showed that values associated with the surrounding landscape overwhelmed any sense of natural hazards (avalanches, slushflows and landslides) as a source of threat. Perceived vulnerabilities were consistent with the dominant social and demographic threats to small Icelandic coastal communities. Further, the community did not perceive a link between climate change, increased risk of natural hazards and potential harm to the local economy. Consequently, there were mixed reactions to the avalanche barriers, including with regards to the limited protection they provide the harbour, one of the community's primary economic resources. Although responses showed limited acceptance of the new infrastructure, they also revealed the strengths of the planning process, namely trust in the local authorities and engineers, and the walking routes built into the barrier designs.

Útdráttur

Náttúruvá af völdum loftslagsbreytinga, og ráðstafanir til að draga úr áhrifum náttúruváar, valda umtalsverðri röskun í sjávarbyggðum og á landslaginu í kringum byggðirnar. Samspilið á milli staðartengsla, áhættuvitundar, verndarhyggju gagnvart stöðum, og sáttar við breytingar á landslagi gefa mikilvæga innsýn í samfélagslega seiglu. Skilningur á samfélagslegum staðartengslum getur komið að gagni fyrir skipulagsyfirvöld til að taka ákvarðanir sem styðja við þarfir og forgangsröðun heimamanna. Í þessari rannsókn er notast við sýndar-gönguleiðir (e. virtual walking tours) til að kanna sambandið á milli staðartengsla og landslagsskynjunar. Aðferðin reyndist gagnleg til að framkvæma hagkvæmt en um leið djúpstætt samráð við samfélagið. Aðferðin var prufukeyrð á Patreksfirði, sem er lítil sjávarbyggð á Vestfjörðum þar sem verið er að byggja ofanflóðavarnir. Rannsóknin sýndi að gildi sem tengjast landslaginu í kringum bæinn standa fólki nær en tilfinning fyrir náttúruvá (snjóflóðum, krapaflóðum og aurskriðum) sem ógn. Veikleikar sem þátttakendur upplifðu voru í samræmi við félagslegar og lýðfræðilegar ógnir sem eru algengar í íslenskum sjávarbyggðum. Einnig kom fram að í samfélaginu skynjaði fólk ekki tengsl á milli loftslagsbreytinga og aukinnar hættu á náttúruhamförum sem mögulegs atriðis sem gæti skaðað efnahagslíf staðarins. Þar af leiðandi voru blendin viðhorf gagnvart ofanflóðavörnum, þar með talið vörnum sem er ætlað að verja höfnina sem er lífæð efnahagslífs samfélagsins. Þótt svörin hafi sýnt takmarkaða sátt við þessa nýju innviði, sýndu þau líka styrkleika skipulagsferilsins, þ.e.a.s. trausts til staðaryfirvalda og verkfræðinga, en einnig ánægju með göngustíga sem eru lagðir í tengslum við varnargarðana.

Dedicated to the human and animal communities, the rocks and the clear fjord waters which make the Westfjords an irresistibly attachable place.

Table of Contents

List of Figures

List of Tables

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1 Introduction

In a climate-changed world, landscapes are changing rapidly as physical processes occur at ever-increasing rates in some areas and adaptations which modify the landscape are made to protect others (Clarke et al., 2018). The impacts of climate change include increasing risks to coastal communities from a number of possible hazards (IPCC, 2021), but the perception of these risks and responses to them by community members is not always straightforward. Likewise, communication of climate change impacts remains a difficult topic, despite the global scientific consensus on likely scenarios. As research has repeatedly shown, risk perception, attitudes to climate change and place-protective behaviours can all be connected to and complicated by place-related aspects of identity, including place attachment (Bird et al., 2011; Devine-Wright & Quinn, 2021).

Place attachment is the emotional bond between a person and a place. It is affected by the social and physical elements of the environment, and it has been shown that there are factors, such as length of residence, cultural values and work and leisure opportunities, which can all have an effect on place attachment (Scannell & Gifford, 2014). Research into place attachment usually explores these elements as well as related behaviours, attitudes and perceptions, and can be understood on different scales and in different domains (Manzo & Perkins, 2006). It has been found that there are complicated patterns relating place attachment to responses to hazards (De Dominicis et al., 2015; Pagneaux, 2011; Davenport & Anderson, 2005), making it a concept of key importance to disaster and emergency planning.

Place attachment is also of importance to the concept of place disruption, caused by physical changes to the landscape by both human and non-human actors, for example damage or evacuation due to natural hazards, or interventions to the environment such as avalanche defences (Mihaylov et al., 2021; Devine-Wright & Howes, 2010). Perception of place disruption is interlinked with and can affect place attachment (Cheng & Chou, 2015), and potentially alter the pro-social and -environmental behaviours that are associated with strong place attachment (Chapin & Knapp, 2015) and sense of place (Masterson et al., 2017). In Iceland, it is expected that climate change will lead to an increased likelihood of

heat extremes and heavy precipitation (IPCC, 2021), leading to increasing hazards from landslides, avalanches or slushflows (IMO et al., 2021). Since the ongoing climate crisis will lead to the construction of more adaptation infrastructure such as avalanche barriers, it is essential that planning processes and community consultations take place attachment into account in order to minimise place disruption. The adoption of community-led approaches is suggested as part of the path towards climate change adaptation (Carter & Wood, 2016) and research on place attachment continues to support the idea that "place-related identities and meanings should be incorporated into policy and planning processes" (Clarke et al., 2018).

This thesis seeks to address the question of how place attachment relates to perceptions of climate change related landscape changes and risks in Patreksfjörður, a small coastal community in the Westfjords. It investigates the balance between how residents of Patreksfjörður perceive their environment and how they understand the hazards and uncertainties that are present in their landscape, especially when it comes to disruption to their environment. It seeks to inform planning and development issues related to community resilience to climate change hazards in the Westfjords in response to a research gap on the subject (Bjarnason & Edvardsson, 2017; Júlíusdóttir et al., 2013). The thesis will form a pilot study to provide evidence for Climate Change Resilience of Small Communities in the Nordic Countries (CliCNord), a project investigating climate change resilience of communities in the Nordic countries which "…will examine how the small rural communities in the selected areas understand their own situation, how they handle adverse events and build capacity, and under what circumstances they need help from the established system and civil society organisations" (CliCNord, 2021).

The thesis tests a novel qualitative method, designed to cope with the impact of Covid-19 on social science research and participatory planning and consultation: Virtual walking tours. The virtual walking tours attempt to draw out participants' perception of their environment and using place attachment frameworks (Scannell & Gifford, 2014; Manzo & Perkins, 2006), identify perceived values and vulnerabilities and understand the nature of the community's attachment to place. The analysis of results assesses whether and how place attachment and perceptions are related, and whether place attachment has any impact on these perceptions, or vice versa.

The method is tested and evaluated for the purpose of assessing whether it could be applied in similar research contexts or in practice such as disaster planning and preparedness, or land-use decision making. The aim behind this is to create alternative ways of carrying out participatory processes that amplify local voices so as to better support the needs and priorities of communities.

1.1 Research Aims and Objectives

How does place attachment relate to perceptions of place, including impacts from climate change and related hazards in Patreksfjörður, and how effective are virtual walking tours for investigating these topics?

The aims of this research are twofold:

1. To investigate the relationship between place attachment and perception of the environment, especially climate change hazards, in Patreksfjörður.

2. To test a novel method in response to the challenges of conducting research in small, remote communities during the Covid-19 pandemic.

The research objectives are as follows:

- Qualitative methods (virtual walking tours) are used to draw out an understanding of the personal experiences and perceptions of individuals who live or have lived in the community.
- Narratives are analysed using qualitative methods and the theoretical framework of place attachment.
- The results of the analysis are discussed in order to understand the interplay between place attachment and perceptions of the environment.
- The data informs a discussion of how these results are applicable in participatory community development and planning.
- Participants are surveyed to gain feedback about their experience of the methodology, in order to learn lessons and assess the method's utility in future research.

1.2 Content and organisation of the paper

Chapter 2 provides a conceptual and theoretical introduction of the main topics and the study area, summarising the existing research into place attachment, and describing climate change impacts and natural hazards in the study area. Chapter 3 introduces the methods that were used, and describes the design and process of testing virtual walking tours, an online adaptation of transect walks, developed for this research designed to cope with conducting participatory community research during the Covid-19 pandemic. Chapter 4 presents the results of the qualitative interviews and also shows the results of the assessment of the method, which came partly from data gathered during the interviews and partly from a post-interview survey. Chapter 5 discusses the results, and first investigates how the community perceives the local environment. In so doing, it attempts to understand the interplay between the nature of the community's place attachment and perception of the environment, including disruption from hazards, climate change and the infrastructure that has been built to protect the community from those hazards. Secondly, it assesses the success of the virtual walking tour method and makes recommendations for improving the method and its application in future research or planning. Chapter 6 summarises the findings and discussion, and explores routes for future research.

2 Background

Climate change is expected to cause increased precipitation and greater risks of mudslides and avalanches in Iceland, with an identified high risk in the research location of Patreksfjörður (IMO et al., 2021). In the context of the increasing uncertainty and risks driven by climate change and weather variability, a small population in a remote area can be more vulnerable to shocks due to being further from assistance, in difficult terrain, with limited resources (OECD, 2020). The additional social and economic vulnerabilities in the region make it essential to protect the community's resources and existing capital (for example, machinery, transportation and buildings), and continue to improve resilience (Amundsen, 2012). Local voices and local knowledge have a vital role to place in preparation for, and responses to, natural disasters of the kind described above (Bird et al., 2011). Place attachment is a key theoretical tool for investigating and understanding a community's assessment of risks, and can help identify vulnerabilities and strengths within a community. This chapter outlines existing research to situate the research question in context.

2.1 Climate change, natural hazards and social impacts

Climate change is already affecting communities worldwide, with human influences contributing to weather and climate extremes (IPCC, 2021). Changing temperatures and weather patterns, melting glaciers and permafrost, ocean acidification and rising sea levels cause a higher frequency of natural disasters such as prolonged drought, wildfires, landslides, flooding, and coastal erosion (WMO, 2021). These can all lead to displacement and severe disruption to communities (Murray et al., 2021) and have a range of impacts on the economic, physical, mental and ontological security of the people who live there (Resnick & Shipherd, 2016).

In the Arctic, reductions in sea ice, snow cover and permafrost are some of the changes that become greater in direct relation to increasing global warming, and according to the IPCC (2021) it is virtually certain that the Arctic will continue to warm more than global surface temperature" (IPCC, 2021: 15), making the expected rate of change higher in the

Arctic latitudes. For the sub-Arctic coastal communities in Iceland, there are a number of observed and expected impacts from climate change, including those that can lead to disastrous events. There has been an observed increase in heat extremes and heavy precipitation since the 1950's (Olafsson et al., 2007). All of Iceland's glaciers are already receding, with one of the glaciers, Ok, having disappeared completely illustrating this trend (Aðalgeirsdóttir et al., 2020). Glacial retreat has resulted in altered glacial river flow, and is likely to lead to an increased risk of glacial floods (Aðalgeirsdóttir et al., 2020). It is expected that sea levels will rise, though less than the global average due to the effect of the loss of the Greenland ice sheet on the local gravitational field, and it is known that ocean acidification in the region (at 68°N) is occurring more rapidly than at lower latitudes (Ministry for the Environment and Natural Resources, 2018). Ocean acidification and warming temperatures affect fish stocks, which are fundamentally important to one of the country's main industries. Increased heavy precipitation and a warmer climate are likely to contribute to an increased risk of avalanches, slushflows and landslides (Bartsch, 2020; Decaulne, 2007; Morino, 2018), which can all occur in populated regions, and are therefore of concern due to their potential to have sudden disastrous impacts on communities.

2.2 Place attachment and perception of risk

There are increasing calls to study the perception of risk and hazards due to the increasing number of people that are being affected by environmental disasters (Bonaiuto et al., 2016). Place attachment is a theoretical framework that can shed light on these perceptions (Hovelsrud et al., 2018) and this thesis investigates the ways in which place attachment is related to perceptions of place, including environmental hazards. Taking into account emotional connections to place sheds light on community resilience to shocks and can give an insight into the needs and concerns of locals that should be taken into account when planning interventions to protect communities (Manzo & Perkins, 2006).

Places are spaces that have meaning (Tuan, 1977), and meanings are created through human interaction with space; social constructs (Mihaylov et al., 2021) that reflect the experiences of the people who perceive them and exist within them. Significant time, experiences and interactions can all imbue certain places with meaning (Manzo & Perkins, 2006), which create roots and bonds between people and places (Mihaylov et al, 2021).

The exploration of places that are new to us tends to be filled with anticipation. The loss of places can provoke intense emotions of yearning. Place attachment theory attempts to describe and theorise the emotions that places evoke and a fundamental human need: to feel at home in a place.

Place attachment can be defined as the emotional bond between people and places (Altman and Low, 1992). This emotional bond between people and places has been compared with those we have with other human beings (Scannell & Gifford, 2014) and the way we interact with them, and it is broadly accepted that place attachment involves human cognitions, attitudes, behaviours and identities (Stedman, 2002), perhaps in similar way to how we relate to and interact with people.

While the definition above encapsulates the essence of place attachment, it is multi-layered and related to or includes other nuanced and narrower concepts, such as sense of place, place identity, and place dependence (Scannell & Gifford, 2014). For the purpose of this thesis, place attachment is used broadly to include all aspects of the emotional bond between people and place. Other concepts such as place identity and dependence are relevant to this study, as they are also related to how people, in relation to place, "maintain or improve them, respond to changes within them, or simply to stay in that place" (Manzo & Perkins, 2006: 337). Place dependence relates to practical reasons such as leisure interests or employment derived from the resources in the environment, whereas place identity relates to the sense of self derived from a place, which can be affected simply by spending significant periods of time there, as well as other cultural factors. A full exploration of the definitions, the nuances of place attachment and related concepts that have been proposed by other researchers can be found in Scannell & Gifford (2014).

Scannell & Gifford's "Person, Process, Place" framework of place attachment is used to help structure the methods and analysis of the results of this study (Scannell & Gifford, 2014). This framework highlights some of the factors that affect how people interact with places and the nature of their resulting attachment to them. The three elements in this framework are described in the following section:

Person: Person concerns whose attachment is being described, at what societal scale or level. It is possible to connect to place on an individual or collective level. Individuals gain knowledge of a place through personal experiences, which creates significant one-off

experiences, or through time, repeated experiences or rituals, or multiple different experiences. Memories are formed and meaning derived from them: from the familiarity of experiences lived in a place over a long period, to the fleeting – like a kiss or a blizzard. Collectively, communities can have attachments to particular places, sometimes for religious or cultural reasons (a holy site, or because of a sense of belonging to a hometown). A sense of collective place attachment is derived from the combination of individual narratives in this research, and the focus on collective place attachment is supported by Mihaylov et al (2021) and Manzo & Perkins (2006).

Process: Process refers to how people feel attached to a place, through affect, cognition, and behaviour. Cognition relates to knowledge of a place, its physical features and social history. Even during a brief visit to a place, beliefs and mental representations of the physical place, routes, features of different neighbourhoods, and significant landmarks can be formed. With time a deeper sense of place attachment can be created through the collection of memories. Behaviours include how we interact physically with a place, such as making regular trips to an important place, such as to visit extended family or summer houses, or pilgrimage to a site which has collective religious and cultural importance, or for regular day to day activities.

Place: Place is defined as space that has meaning, and the role of the characteristics of a place in place attachment helps explain why people are attached. People can be attached to places for social or physical reasons, or both. Social ties are the community, family or friends; physical features are aesthetics of the area or features of the landscape that give people a reason to live there, which can be related to place dependence, for example because of leisure of work provided by environmental characteristics of a place. Both social and physical aspects of a place can give people a "sense of place" to different degrees, from superficial (resting on aesthetic features of a place, experienced through short exposure, such as a tourist visit) to ancestral or cultural senses of place which involves historical connection of a community to a place. The ties to a place can also produce a sense of place identity, or the incorporation of a place into one's sense of self.

The person, process, place framework and the elements within them (individual/collective, affect/cognition/behaviour, and social/physical) are used to structure the approach to

analysis in the grounded theory coding, which is explained in Chapter 3. This guides the assessment of the nature of attachment to place in this study.

Manzo & Perkins' (2006) Ecological Framework for Community Planning and Development also provides a useful tool for analysis of the community's place attachment. This ecological framework guides the analysis of the results by examining how reported behaviour, cognitions and affect fall into different environmental domains (physical/social/political/economic), and the engagement of the community members in these domains at multiple levels of analysis (individual, group/organization, community/neighbourhood, and city/region/society) (Manzo & Perkins, 2006). For the analysis of the results of this study, the focus is on the individual and group levels of analysis, and these two levels are treated as being synergistic so there is less of a distinct division between them, in line with the collective approach taken throughout this research.

Understanding place attachment of a community can help to predict how people are likely to respond to problems if they arise in a community. Communities with stronger place attachment have been demonstrated to show greater stewardship of a community's resources including its environment (Brehm et al., 2013; Briggs et al., 2019), especially in response to climate change (Chapin & Knapp, 2015) and its related hazards (Fornara et al., 2010; Hovelsrud et al., 2018; Devine-Wright & Quinn, 2021; Bird et al., 2011). Place attachment's interaction with pro-social and -environmental behaviours is related to concepts such as social capital (Hovelsrud et al., 2018), which describes the resources and capacities within a community that can increase resilience and allow a community to withstand shocks. In relation to climate change impacts, this can include better land stewardship (Stedman, 2002). Place attachment is sometimes described as part *of* social capital. It is therefore important to understand place attachment of a community, in order to promote it and understand how to avoid disrupting it.

It has been found that place identity and belonging can be threatened when changes to the local environment are perceived as place disturbance (Mihaylov et al., 2021). The interaction between place attachment and place disruption is illustrated by Devine-Wright & Howes' (2010) study of opposition to wind farms, which suggested that where there is strong attachment to place, interventions involving a change to the physical environment can result in negative attitudes from the affected community. Similarly, perception of

weakness in governance processes has been associated with stronger place attachment, such as in Clarke et al.'s (2018) quantitative study of perceptions of flood risk transformations. This study also suggested that place attachment had a stronger effect on perception of the disruption caused by change, and this was unaffected by an individual's experience or exposure to risk of flooding. Since stronger bonds or senses of place attachment are associated with social capital and pro-social and -environmental behaviour, it is therefore in the interests of community developers and planners to work with communities to minimise disruption caused when making changes to the built environment that are intended to protect and enhance the community. Trust between the community and planners is also essential; in the same study, it was found that trust in key actors in the process can mitigate the community's response (Devine-Wright & Howes, 2010).

In addition to its association with positive behaviours, place attachment is also important due to its associations with attitudes to environmental risks, which are of interest to this research. The relationship between place attachment and perceptions and understanding of environmental risks or disruptions (such as from avalanches and debris flows) is not well understood, with contrary findings in different locations, and appears to be influenced by culture (Adger et al., 2013). For example, some research finds that strong attachment to place coincides with increased resilience to hazards (Bird et al., 2011), whereas others (for example, De Dominicis et al., 2015) find that strong attachment to place will reduce the likelihood of a community to seek safety in the event of a hazard. Another study notes that people ignore risk due to other factors such as the importance of resources in an area that provide employment, demonstrating the powerful role of place dependence (Pagneux, 2011). Quinn et al. (2019) found that where there is a strong sense of meaning derived from a place, there can be a reduced perception of risk, and therefore protective measures can be met with opposition, illustrating the interplay between place attachment, risk, disruption caused by infrastructural changes to the physical environment, and community attitudes and behaviour. To help with the design of adaptation measures that are fully supported by local communities, it is recommended that a better understanding of community priorities is gained before changes are made (Quinn et al., 2019). Other research supports this by recommending that an understanding of the local perceptions of and attitudes to landscape change should be applied to issues related to contentious management decisions (Davenport & Anderson, 2005). In addition, this can help to

maintain strong place attachment and feed back into the pro-environmental/place protective behaviour loop (Stedman, 2002). The importance of these issues to land management is especially relevant to this research.

Of specific interest to this study is how people perceive and respond to place disruption, including "natural" disruptions from climate change, natural hazards or weather events, and "human" disruptions such as changes to the built environment, and the interplay of these perceptions with place attachment. Place attachment is related to finding meaning in the environment and the landscape, and this interplay is important as there may be a complex interaction between the values derived from the environment, the perceptions of risk and the likely behaviours that people will engage in if the landscape is disrupted by natural hazards, or by physical changes to the environment carried out by humans to protect the community from hazards.

Place attachment can help us to understand what is important to people about a place. Taking place attachment into involving participatory processes where non-hegemonic voices can be heard and taken into account can benefit the community and stakeholders at other levels. It has been recommended that place attachment be applied in the context of place disruption in order to understand local needs, concerns and priorities (Pearce et al., 2021), in places where change is required to protect a community, to create plans for communities that meet their needs and concerns, and which involve the least possible disruption, maintaining what people love about a place (Clarke et al., 2018). In communities which have already seen a decline in population and other challenges to their resilience in recent years, prioritising this understanding could be of benefit to regional development as a whole.

2.3 Climate change and hazards in the Westfjords

The sparsely populated landscape of the Westfjords is characterised by deep fjords surrounded by glacially sculpted valleys and steep mountainsides (Figure 2.1) leading to plateaux up to around 900 metres in altitude (Jóhannesson & Arnalds, 2000). The climate of Iceland in the coastal areas is mild on average, with cool summers and relatively mild winters for its latitude, but this is combined with high precipitation and strong winds. The mountains contribute to extremes in weather conditions, creating the sudden day-to-day changes in the weather that are also typical. These extreme temperatures, wind speeds and

precipitation are caused by damming of cold air, warm downslope descent, local acceleration of the airflow or by forced ascending motion in the mountainous areas (Ólafsson et al., 2007).

The region has also been undergoing many social changes in a relatively short time span, including changing lifestyles, patterns of economic activity and new industry (Granholm, 2011; Kokorsch & Benediktsson, 2018). The challenges faced by many rural communities in Iceland over the past 20 years include a lack of diversity in the local economy; changes in access to fisheries; a decline in farming; seasonal tourism; a negative spiral in services due to a decreasing population, technological changes and political change; and a lag in infrastructure development in many areas (Harðardóttir & Halldorsson, 2021; Baldursdóttir & Halldorsson, 2018). Community resilience therefore remains a key issue for regional development in rural parts of the country, including the Westfjords.

Figure 2.1: Photograph showing the geology of the Westfjords. A typical example of a glacial valley leading to the fjord Dýrafjörður (photograph by author)

Natural hazards and climate change compound the issue of resilience due to the added uncertainty they both present. Many small communities in the Westfjords are vulnerable to the elements that also sculpt the landscape: *Ofanflóð* (literally, "flood from above") which includes snow avalanches (*snjóflóð),* mudslides (*aurflóð*) and slushflows (*krapaflóð)*. It is

estimated that 65% of inhabitants of the Westfjords live in or near avalanche zones (Decaulne, 2007). During storms, accumulation of snow drift occurs as a result of the topography of the plateaux and gullies in combination with the extreme and changeable weather conditions. This causes snow to collect at avalanche starting points in the gullies, creating the conditions for avalanches. Heavy precipitation combined with variations in temperature are the conditions responsible for high avalanche danger in the region (Björnsson, 1980) and the conditions which create the more dangerous avalanche cycles follow bands of low pressure causing north or north-easterly winds combined with heavy snow fall. The snow that collects on the steep slopes following such storms is at its least stable in the immediate aftermath of these storms (IMO, personal communication, 28/10/2021). Slushflow hazards also require thick layers of snow that gather in a similar way to avalanche starting zones, but differ in that they occur in areas with a large water supply such as streams, or following rapid rainfall and increased temperatures, which usually occurs with southerly winds, or following a rapid or unusually early spring thaw (Bartsch, 2020). These factors all make slushflows a topic of increasing concern in relation to the growing threat of climate change in Iceland, and in the Westfjords in particular. The absence of forests on the steep mountain slopes that is typical in the region means that there is a lack of natural protection in these areas (Jóhannesson & Arnalds, 2000).

Gravitational flows such as avalanches are responsible for the highest number of deaths due to natural hazards, other than deaths at sea (Björnsson, 1980; Harjanne et al., 2016; Jóhannesson & Arnalds, 2000). It is well-known in Iceland that avalanches are a particular, though not unique, hazard in the Westfjords, and they have been subject to a significant amount of research (Bartsch, 2020; Decaulne, 2007; Harjanne et al., 2016; Valdimarsdóttir, 2000). Avalanche paths are well-documented and mapped (Figure 2.2) by the Icelandic Meteorological Office (IMO) Avalanche Centre, based in Ísafjörður in the northern Westfjords. These records are publicly available and can be accessed online. Of the twelve communities that have been assessed to be most at risk of avalanches in Iceland, six are in the Westfjords, and these are Bolungarvík, Ísafjörður, Suðavík, Flateyri, Bíldudalur and Patreksfjörður (Jóhannesson & Arnalds, 2000).

The year 1995 was a turning point in Iceland's collective consciousness with regards to avalanches; in that year 34 people were killed by avalanches in the Westfjords, 14 in Suðavík in January, and 20 in Flateyri in October of the same year (Decaulne, 2007;

Pálsson, 2019). These were huge losses to the families and communities of those who died, and to wider Icelandic society. The 1995 avalanches brought about a change in policy regarding risk assessment and hazard zoning, aimed towards removing reliance on evacuations as the main course of action in the event of an avalanche, and subsequently there was a move to construct avalanche defences in areas assessed to be subject to an unacceptable level of risk (Decaulne, 2007; Jóhannesson & Arnalds, 2000; Pálsson, 2019).

Figure 2.2: Map of avalanche paths in Patreksfjörður. The recorded avalanche paths are marked by the red lines. (Modified from IMO, 2021a)

Unacceptable risk is defined as a probability of death that is higher than the approximate risk of being involved in a fatal traffic accident, leading to a definition of acceptable risk level due to avalanches of 0.2 to 0.5 fatal accidents per year per 10 000 persons (Jóhannesson & Arnalds, 2000; Arnalds et al., 2004). Safety requirements state that avalanche defences should be designed to increase safety so that after their construction, the local risk of people below them never exceeds 3.0 out of 10,000 per year (according to Article 22. of Regulation no. 505/2000 on flood risk assessment, classification and utilization of hazardous areas and preparation of a preliminary risk assessment and its amendment in Article 11. of Regulation no. 495/2007) (VSÓ Ráðgjöf, 2018). Hazard zones are categorised as Zones A: probability of 0.3 per 10,000, Zone B: 1 per 10,000, Zone C: 3 per 10,000 per year (Ágústsson et al., 2003; Arnalds et al., 2004).

The estimated direct economic cost of damage due to avalanches between 1974 and 2000 was around 3.3 billion ISK (41 million USD). The death of a person in an avalanche or landslide accident has been valued, using the utilitarian methods of cost-benefit analysis, at

100 million ISK (1.2 million USD) per person. These estimations have been combined with the estimated cost of defences to suggest that the cost of avalanches to Iceland during that period was 13 billion ISK (162 million USD). It is intended that the building of defences will reduce human and economic losses in the long run (Jóhannesson & Arnalds, 2000; Pálsson, 2019). There are now numerous avalanche defences around the towns of Flateyri and Suðavík, as well as in neighbouring communities of Ísafjörður, Bolungarvík, in the southern Westfjords and elsewhere in the country. These take the form of large walls, fences and breakers that will slow or stop the flow of an avalanche and protect infrastructure below (Figure 2.3). In addition to physical barriers, evacuation plans remain in place for hazard zones, determined by statistical risk and dynamic modelling (Decaulne, 2007). Overall, there has been dramatic improvement in protection of the public, infrastructure and personal property from avalanche danger since 1995.

Figure 2.3: Photograph of avalanche barriers protecting infrastructure. In the centre of the image (below the large bowl-shaped depression and main gully) are two rows of vegetation-covered mounds designed to break up the avalanche flow. They are built to protect the road to Flateyri below. Avalanche and debris run-off mounds can be discerned below almost all of the smaller gullies (photograph by author).

Iceland has a long history of recording avalanches and other gravitational flows, with the first recorded avalanche dating from the year 1118 (Björnsson, 1980). The importance of local residents' knowledge to the records and planning around avalanches should not be ignored. Local knowledge is recognized as being of importance to emergency response plans (Bird et al., 2011); historical records and local observations have been combined with surveys of areas with physical evidence of older events and modelling in areas with no records of avalanches to create the detailed data that resulted in the hazard zoning which exists today (Decaulne, 2007). There is also deep local involvement in Icelandic Search and Rescue teams (ICE-SAR) throughout the region, and local contributions to disaster response form part of the social capital of communities in the region. The participation of local people in rescue efforts, whether at sea or on land, is an ingrained part of the system of response and recovery after a disaster, and this participation is interlinked with the theoretical framework we use, as community attachment has been found to motivate people to engage in protective behaviour in the face of a threat (Mihaylov et al., 2021). In this case, place attachment and the drive to protect the community may feed into each other, as it has been found that networks drive mobilization of social capital, and this mobilization can reinforce existing networks (Mihaylov et al., 2021).

In 2020 Flateyri was hit by another large avalanche (Hafstað, 2020). This was deflected by the A-shaped deflection barrier (Figure 2.4) built to protect the town, preventing any deaths or damage to property. The barrier protected the residential area, but the deflected avalanche arrived in the harbour and caused significant damage to the town's boats, including fishing boats, a major economic resource. It appeared that this was a surprise to the community, despite the high level of knowledge and awareness of hazards in the town. Although people in the community "had burned their minds with the memory of the avalanches of 1995" (Icelandic Road Administration (Vegagerðin) representative, personal communication, September 2020), at the same time, a false sense of security existed, and people trusted that the avalanche barriers would protect the town completely. Combined with some movement of population in and out of the community, some knowledge or awareness had been lost and the community didn't realise the risk to the harbour. "People come and go… some kind of inner truth exists in the town that the harbour was protected" (IMO Avalanche Centre representative, personal communication, September 2020). The

importance of local knowledge for reducing vulnerability is highlighted by Bird et al. (2011) among others, who also notes that local knowledge of hazards can be lower among those who live alone or who are new to a community.

Although there is a common understanding that avalanches are a part of life in the Westfjords, the impacts of climate change compound the issue and add another level of uncertainty about the vulnerability of communities to the hazards that have been historically present in the landscape. This climate change element is not currently widely discussed in mainstream society in Iceland (Canosa et al., 2020; Ingólfsdóttir, 2016). However, this is a conversation that may develop in the coming years as Iceland increasingly experiences the predicted impacts of climate change. In December 2020, after 5 days of precipitation which destabilised the mountainside, the largest landslide to hit an urban settlement in Iceland occurred in Seyðisfjörður, in the Eastfjords, causing damage to property and economic losses but no loss of life (IMO, 2021b) (Figure 2.5).

Figure 2.4: Photograph of the avalanche barrier in Flateyri. The barrier protects the residential area that was hit in 1995 causing 20 deaths (photograph by author)

Shortly after large amounts of precipitation followed by landslides and rock falls in the area around Siglufjörður in October 2021, the IMO, the Icelandic Institute for Natural History and the University of Iceland published a joint assessment stating that analysis of

the risk of mudslides was needed in eleven communities in Iceland, including Patreksfjörður (IMO et al., 2021). During the same period, more cracks were observed in the mountains of the Seyðisfjörður mudslide area. The experience of the previous year meant that the authorities ordered evacuation of houses and increased monitoring. Experience and increased reporting of climate change impacts might suggest increasing public awareness of these hazards.

Figure 2.5: Photograph of the remains of the mudslide in Seyðisfjörður, Eastfjords (photograph by author).

As climate change impacts in Iceland will lead to the need for more adaptation measures – such as avalanche barriers – to protect people's lives and the places where they live, there is an increasing need to understand rural and remote communities in a holistic and integrated way in order to make planning decisions that meet and address their needs and protect the resilience of the community in the long term. Planners need to understand the values of communities in order to understand how to reduce risks, predict behaviour and encourage positive decision-making around emergency and land-use planning.

The current strategic regional plan for 2018-2024 (Icelandic Regional Development Institute, 2018) includes few sections on climate change, adaptation or mitigation. This

research project aims to fill in this gap and addresses one of the major challenges that Iceland as a whole, and remote rural communities in particular, are facing. Asking whether there is climate change awareness and to what extent this translates into risk perception and place protective behaviour is one of the main questions this research aims to answer. Avalanches and other gravitational flows are not only a risk to the local population but also to infrastructure inside the community, such as harbours, and outside of it, in particular energy supply and road accessibility. The devastating event in Flateyri in 2020 has shown that the mainstay industry of a community can be destroyed within seconds. In the regional development plan, it is stated that "Policymaking for or within regions shall include discussion of climate change, its possible impacts, adaptation and countermeasures, e.g. in regional planning […] or through measures aimed at raising awareness among residents and visitors." (Icelandic Regional Development Institute, 2018: 4) This research project discusses climate change (awareness) but also some of the measures taken (avalanche protection). In one of the more specific aims the same document states that the design of infrastructure should blend in with the landscape and contribute to the positive experience of visitors (Icelandic Regional Development Institute, 2018: 22). This is an ambitious aim, and this research project goes beyond assessment of the experience of visitors, taking the question of infrastructure design and perception to the local level, aiming for local voices that are confronted with changes to the built environment on a daily basis.

2.4 Study area: Patreksfjörður

In this study, the focus is on the voices of one community in the Westfjords, Patreksfjörður, which has been chosen as a study location because of a unique set of circumstances relating to natural hazards in the environment and the construction of new infrastructure.

Patreksfjörður is the largest town in the southern Westfjords. It has a population of approximately 687 according to the 2017 census, a decrease of around 30% since the Individual Transferrable Quota (ITQ) system was introduced to Iceland's fisheries in the 1980s (Ágústsson et al., 2003). It is located on the northern side of the fjord of the same name, and like many towns in the Westfjords the town has a thriving fishing industry, which despite the changes already outlined above, continues to constitute a major part of the local economy, alongside growing aquaculture and tourism. It benefits from its

proximity to the Látrabjarg cliffs, which are a sanctuary for cliff nesting birds during the summer, and other parts of the peninsula which attract tourists to the region (Visit Westfjords, 2022).

Its geography is characteristic of Westfjords towns, being sandwiched between the fjord and mountains. Part of the town is located on an *eyri* (enlarged sandspit) called Vatneyri, which is linked to the former separate settlement of Geirseyri by a narrow strip of land below the area Klif up to the area bounded by the stream Litlidalsa below the gully Geirseyrargil. There is another residential and commercial area on the other side of Litlidalsa bounded by the stream Miklidalsa and the main roads that lead out of the town towards Bildudalur to the north (Route 63) and Barðastrand to the south (Route 62) (Figure 2.6).

Figure 2.6: Map of Patreksfjörður. Key locations are labelled (Modified from Google Earth, 2021).

These roads cross mountain passes and are largely unpaved but are being developed (Figure 2.7). The roads are periodically closed during the winter when the weather is poor meaning the communities in the region can be cut off from each other, the wider Westfjords region and the rest of the country for several days at a time.

Avalanches have caused evacuations and damage to property in Patreksfjörður, and slushflows have caused deaths and severe damage in the past (Ágústsson et al., 2003). Five people are known to have been killed by slushflows in Patreksfjörður in the last 200 years, one in the 19th century (which may have been a flashflood or slushflow), and four in 1983 when a slushflow came from the gullies of Geirseyrargil and Litlidalsa, also destroying 20 houses (Bartsch, 2020), and injuring six others (Ágústsson et al., 2003). There is a memorial to mark the location of the slushflow below Geirseyrargil (Figure 2.8). While

this event was of significance in the local and wider community in a similar way to the avalanches of 1995, it did not result in policy change in the same way. In the following years, it was noted that there was thin snow-cover during winter, and the community did not experience problems from *ofanflóð* (Valdimarsdóttir, 2000).

Figure 2.7: Photograph of the road to Patreksfjörður under repair during winter. The mountain roads are key to connectivity in the southern Westfjords (Photograph by author).

Other recorded incidents include large avalanches in 1906/7, 1921, 1943, 1958, 1981, and 1995 in the Urðir area; slushflows in 1948 and 1966 that came from Geirseyrargil, reaching the sea or shoreline. Two other slushflows are known to have occurred in the nineteenth century. In March 1989 there were two avalanches above the street Mýrar above Vatneyri, and in January 1995 there were three small avalanches above the street Sigtún in the Geirseyri area, another in January 2000, and one near the school in the Klif area also in 1995. There have also been debris flows in the Klif and Urðir areas, which are considered a smaller but significant threat to the settlement, and are within the risk zones designated by slushflow or avalanche hazard (Ágústsson et al., 2003). These records were all taken into account when hazard zoning and decision making around avalanche protection infrastructure were carried out (Figure 2.9).

Figure 2.8: Photograph of the memorial to the victims of the 1983 slushflow. The memorial is located below Geirseyrargil, the gully visible in the image (photograph by author).

While it did not have the same nationwide impact as the 1995 Flateyri and Suðavík avalanches, the process for hazard assessment in Patreksfjörður began after the 1983 slushflow, when investigations were made and potential starting areas for avalanches were identified. There was a further assessment in 1992. In 1997 evacuation zones were drawn up for several communities including Patreksfjörður, and around the same period research and planning for defence structures began (Ágústsson et al., 2003). The full details of the subsequent hazard zoning can be found in Ágústsson et al. (2003). Verkís is the consultant regarding avalanche barrier in Patreksfjörður, with assistance from specialists from Switzerland (Vesturbyggð, personal communication, 4/1/2021).

To summarise, avalanches and slushflows are documented and zones of unacceptable risk were assessed around Urðir above Vatneyri, Geirseyrargil above Geirseyri, along Litlidalsa and below the slope Klif in the central part of the town, resulting in 60 domestic houses falling within category C hazard zone. The town is also designated as at risk of coastal flooding and rockfall hazards, which fall within the zones for avalanche and slushflow danger (Figure 2.10).

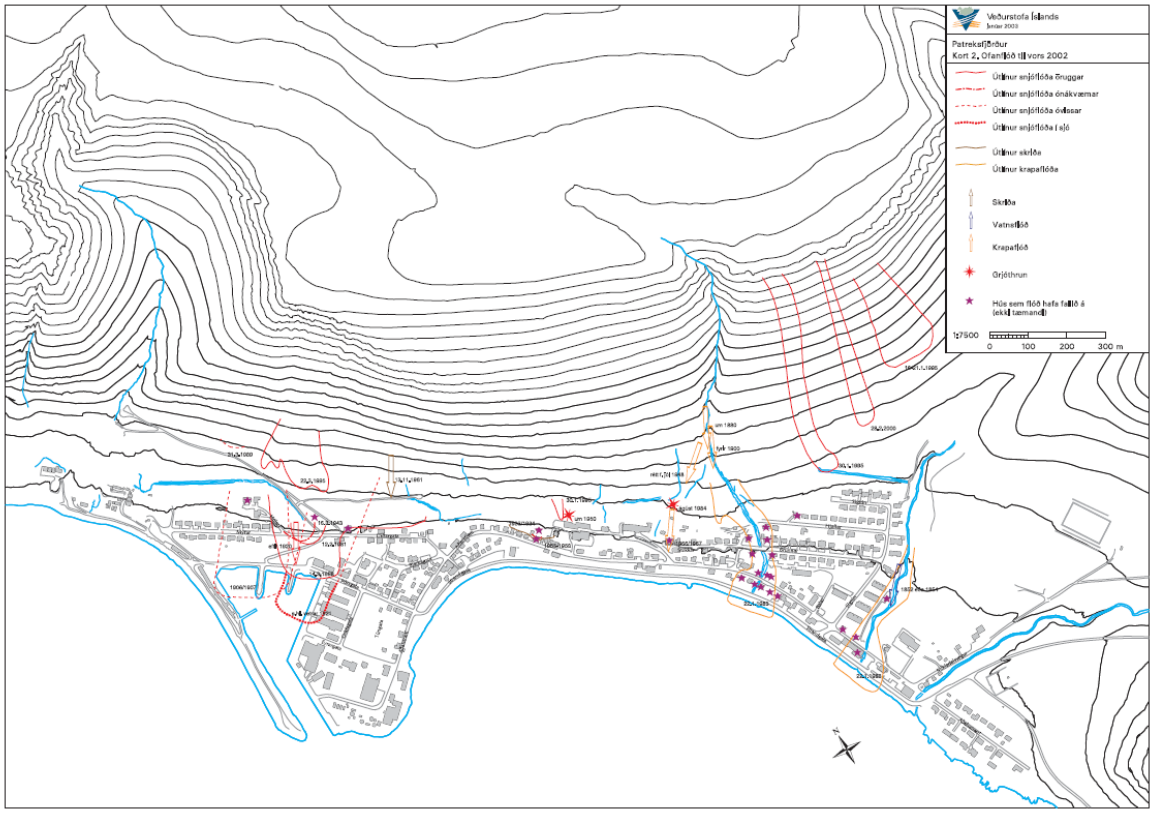

Figure 2.9. Documented avalanche, slushflow and rockfalls in Patreksfjörður. Red lines indicate avalanche paths, orange lines and arrows indicate slushflow, red stars mark rock fall, and purple stars mark houses damaged or destroyed by slushflow. The data is used for designation of hazard zoning. (IMO, 2003)

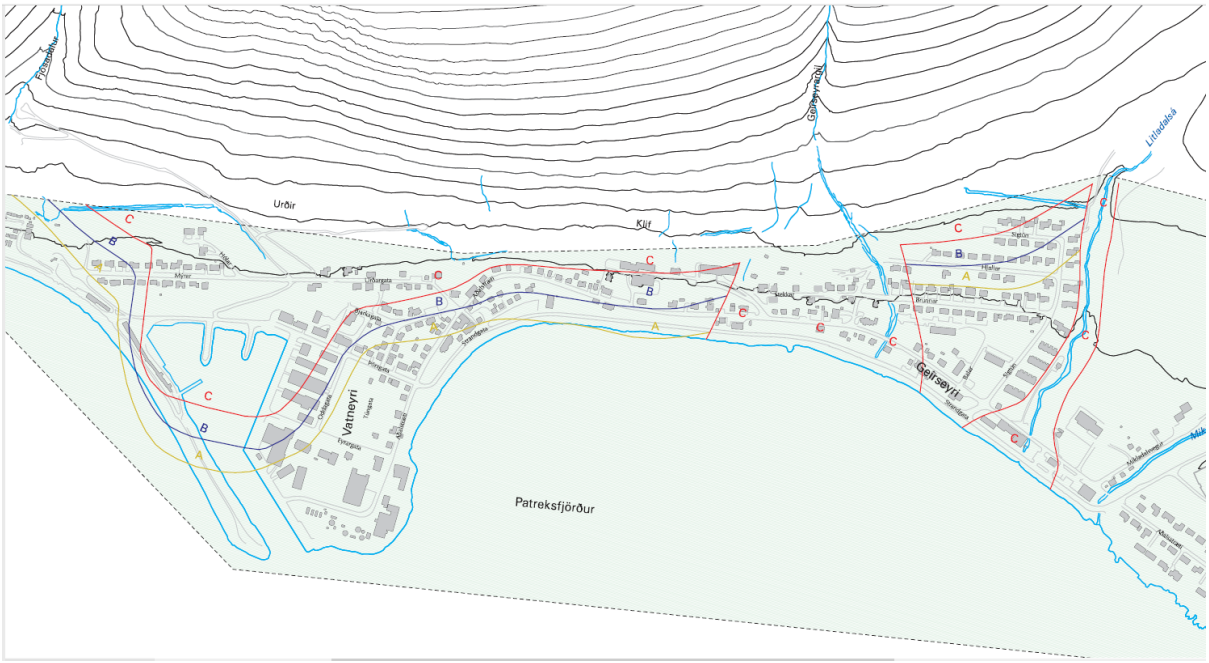

Figure 2.10: A map of Patreksfjörður, showing hazard zones A, B and C. This was carried out before construction of the avalanche barriers (IMO, 2003)

More recently, Patreksfjörður has been subject to evacuations due to slushflow and avalanche risks, for example in 2020 and 2015 (Bartsch, 2020). Three avalanche defences were planned and are under construction by the construction company Verkís at the time of writing. When completed the barriers will reduce hazard zone C so that no residential buildings remain within it (Figure 2.11). One V-shaped defence is being built above the streets Mýrar and Holar, a large wall protects the homes in the area Urðir (Figure 2.12), and a long wall stretches along the edge of the town (following the area described as Klif).

Part of the harbour remains in hazard zone C, and currently there is no official harbour evacuation plan. According to the local municipality Vesturbyggð, when the avalanche barrier is finished the IMO will update the risk assessment and evacuation plan, because in addition to the remaining risk in that area, the effect of the new avalanche barrier upon the flow of a large avalanche into the harbour could create a tidal wave (Vesturbyggð, personal communication, 4/1/2021).

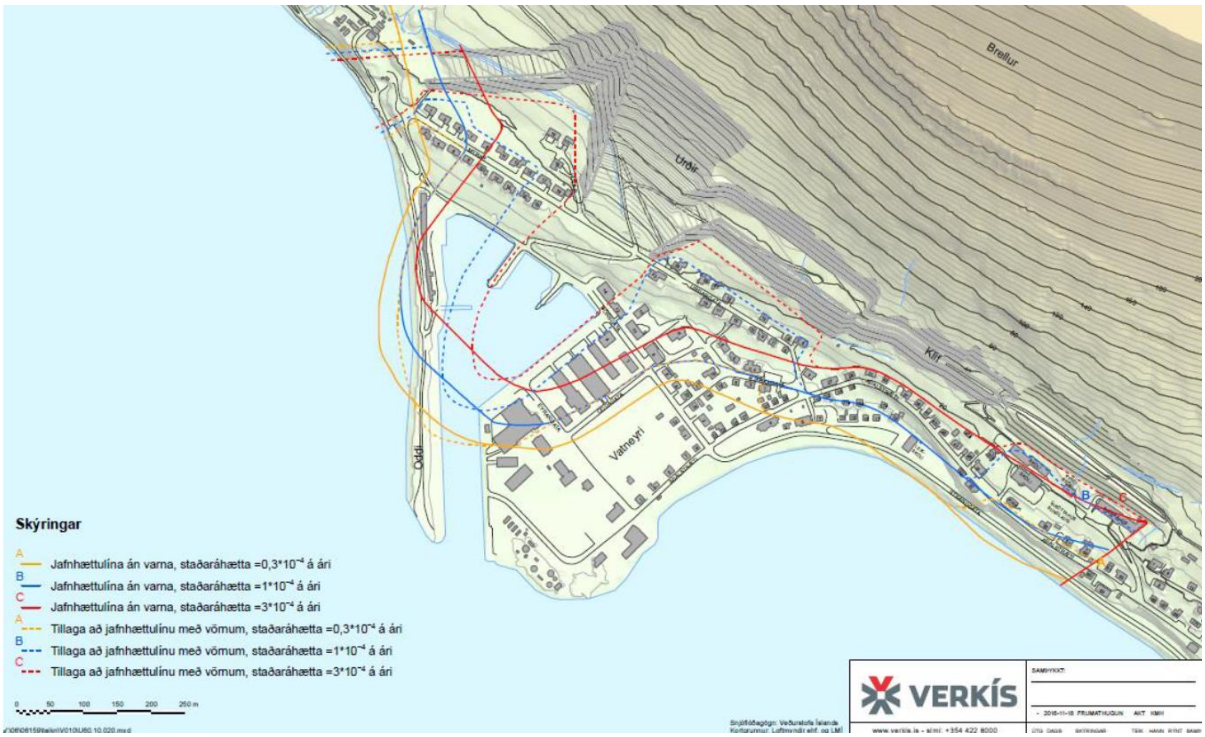

Figure 2.11: Avalanche barrier designs in Patreksfjörður. Excerpt from Verkís' preliminary study showing a proposal for a revised hazard assessment and the location of danger areas (fault lines) after the construction of avalanche defences. Hazard zones A, B and C in the Urðir and Klif areas before construction of the barriers are shown with solid lines, and after construction with dotted lines (Verkís, 2016).

While they will protect the areas below by removing homes from zone C, the defences impact upon the physical appearance of the community, its social history, the atmosphere of the town and the local ecosystem. There was community consultation by VSÓ Ráðgjöf to discuss the project and residents were given the opportunity to attend meetings about the construction before it began (Vesturbyggð, p.c. 4/1/2021). VSÓ Ráðgjöf also presented results from Environmental Impact Assessments (EIAs), and work in coordination with the IMO who carried out the hazard zoning and risk assessments before and after the avalanche barrier construction. The EIAs concluded that the construction would have a significant negative impact on the landscape and appearance, and a considerable negative impact on geological monuments, archaeological remains and acoustics. The fortifications were assessed as likely to have a significant positive effect on outdoor life due to the incorporation of walking routes into the design of the barriers. They were also assessed as having an insignificant positive effect on hydrology. Other environmental factors were considered to be negligible (VSÓ Ráðgjöf, 2018).

Figure 2.12: The avalanche barrier at Urðargata. Photograph of one of the avalanche barriers under construction in Patreksfjörður, with the mountainside behind it (photograph by author)

The process of constructing the barriers is not complete. Currently, some the areas around the construction sites are only accessible to the constructors as they are using heavy machinery. When finished, the barriers will be planted with vegetation for aesthetic improvements, and more walking routes and viewpoints which are currently off-limits will be open for public use.

A tension exists between the functionality of the physical defences on the one hand, and the range of negatives they bring on the other. The barriers being constructed in Patreksfjörður mitigate the most serious risks that would likely be experienced by the community, including those due to climate change, preventing disruptions to place. At the same time, these alterations disrupt the physical, social and environmental character of the settlement. This thesis explores how residents of Patreksfjörður perceive these disruptions, one currently intangible and potential, the other real and ongoing. It investigates how they view their current local environment, and the values and vulnerabilities within it. It assesses the nature of the community's place attachment and uses a framework based on existing literature to decipher the different levels at which the community demonstrates its resilience and vulnerability. This research attempts to address the tension around place disruption in Patreksfjörður in order to get a deeper understanding of the community and address the question of how responses to climate change related risks should be best planned and delivered. The theoretical and methodological approach used is described in the next chapter.

3 Methodology

The research methods in this study attempt to take a qualitative, space-based approach to understand the collective place attachment of the community. The primary method used is a "virtual walking tour", to carry out a combination of walking transects and mental mapping, following the format of a semi-structured interview, but in an online setting.

The research uses a multi-disciplinary approach inspired by methods from geography, sociology, anthropology and ecology to approach the topic. The study is exploratory and qualitative, involving non-probability sampling, due to the fact that the data being collected is cultural and location-specific (Marshall et al., 2006; Bernard, 2011). A qualitative approach is called for in order to understand place attachment and risk perception to give an insight into the lived experiences of those who live in a place that is subject to natural hazards, who may not normally hold positions of power or have their voices heard (Manzo & Carvahlo, 2021; Denzin, 2017).

Research has shown that place attachment can be understood via meanings interpreted from the landscape and environment (Brown & Raymond, 2007), typically be expressed as cognitive, behavioural or affective engagement with social and physical aspects of place (Scannell & Gifford, 2014; 2017; Stedman, 2002). The perceived importance of wilderness or spiritual values and identification of special places due to their aesthetic, recreational, spiritual, economic or therapeutic value have been shown to be predictors of place attachment (Brown & Raymond, 2007), and it can therefore be understood through elicitation of such environmental values (O'Neill et al., 2008) and identification of special places by community members. The spatial method of survey mapping of these values and places can provide "richer place-based information for land-use planning" (Brown & Raymond, 2007) and therefore a spatial approach to these topics is appropriate.

3.1 Interviews

Qualitative interviews are used to collect data about attitudes, beliefs and experiences in research that does not claim to be representative or generalisable, but exploratory, reflecting the subjective, lived experiences of participants (Nathan et al., 2019). Semi-

structured interviews are the preferred method for qualitative research which aims to understand people's lived experiences and their ontological understanding of the world (Longhurst, 2016). Rather than being based around a fixed set of interview questions that would be used in a structured interview, a semi-structured interview employs a more open format, albeit with a guiding structure. It allows a degree of interpretation from the participant and flexibility in following lines of thought that might deviate from the written questions, allowing the participant to express themselves fully on a subject and providing angles and perceptions that might not be expected or predictable.

3.2 Walking transects and walking interviews

Walking transects and walking interviews are well-established methods for engagement in research into outdoor urban environments (Emmel & Clark, 2009). A transect walk is a form of interview, which takes place in the study location, and involves walking along routes in and discussing related topics with participants. It is recognised as a method for identifying problems or opportunities within a community, including climate change hazards (Flora and Fauna International, 2013), and to detect change (Liu et al., 2018). It can also be used to try to gain insights into how space and place are perceived by those who inhabit them (Emmel & Clark, 2009). It is a versatile method that can show the "location, topography, distribution of resources, features, landscape […] and to understand inter-relationships between human activities and settlement patterns and their natural surroundings" (Liu et al., 2018). As such, this method is well-suited to the research topic of this thesis.

3.3 Mental mapping and spatial analysis

Representing thoughts and perceptions of space and place as a graphical or visual object such as a map can help articulate them. Mental maps, also referred to as cognitive maps, contrast with other types of maps, those used for navigation for example, in that their purpose is not utility for moving through space, but to represent the internal reality of a subject in relation to space (Lynch, 1960) and this can reveal social biases (Matei et al., 2001) as well as emotional bonds to places and the related concepts of identity and belonging (Den Besten, 2010). They can also reveal new information and provide contributions to scientific understanding of ecological features, due to the involvement of local people with specialist knowledge about an environment (McKenna et al., 2019).

Mental maps make the connection between the "theoretical construct not observable in its original repository – the human brain" (Götz, 2018), and a tangible reification of that construct, often a physical graphical object that resembles a map, but which could also be textual, oral or acted out through behaviours.

Mental mapping is an important tool for participatory processes. It allows perceptions and local knowledge to be placed geographically rather than stated generally, which can be applied directly in emergency planning and community development. Community mapping, for example, can be used in participatory processes of community development to allow the voices of different stakeholders to be heard. It has been used in research into risks and hazards, climate change resilience, and perceptions of resources and vulnerabilities of communities in many parts of the world (e.g., Liu et al., 2018; Pearce et al., 2021).

A new method which draws inspiration from the methods described above was developed for this research. The method of virtual walking tours brings walking transects online, and combine semi-structured interviews and mental mapping to allow a participatory, qualitative exploration of space and place in the research location over a relatively short space of time, using minimal resources. The following section describes the design, sample, tools used, and limitations of the methodology.

3.4 Virtual walking tours

The initial idea for this research was to conduct a series of transect walks of Patreksfjörður in person, based on research supporting this method as a way of investigating perceptions of space and place, described above. The methodology design moved online, partly motivated by the unsettled weather affecting North-West Iceland in September 2021 – which made repeated journeys over the mountain passes to the research location difficult to plan – but mainly due to the ongoing Covid-19 pandemic. Small, tight-knit communities are particularly vulnerable to Covid-19 due to limited healthcare facilities the older average age of inhabitants, among other social factors (OECD, 2020). At many points during the pandemic, digital technology has become a dominant form of social interaction for many people (Köpsel et al., 2021), and the use of virtual tours allowed community participation in the research despite the restrictions put in place to reduce social contact and the spread of disease. The recommendations in the small amount of literature advising how to carry

out online research during the pandemic were applied, for example by making at least one in-person visit to the study location, remaining flexible, using a simple approach, and learning lessons from the experience for engagement with communities as the pandemic progresses and evolves (Köpsel et al., 2021).

The flexibility inherent in online methods for scientific research have already been reported as resulting in increased participation and being more inclusive (Köpsel et al., 2021). A number of additional benefits relating to this particular online method were also considered. The online method uses virtual interactive panoramas (hereafter referred to by the commonly used term "street view"), which do not change from one day to the next. This meant that the weather conditions were controlled, so participants' responses would not be affected by these conditions on the day of the walk. Since the focus of the research – perceptions of the environment – could be affected by changing weather, one advantage of the virtual method was that all participants would see the same conditions during their interview. This would not be easy to organize for real walking transect interviews. Using street view also means a number of other variables could be controlled without inconveniencing people, such as the starting point of the interview. The route taken is also easily replicated and therefore offers another element of control, but allows people to deviate from the set path to an extent, as participants can ask to go along different streets if they want to point out some salient features or a special place that is not on the designed route. Other benefits included the possibility of interviewing former residents of Patreksfjörður or those who are temporarily living elsewhere without asking them to travel, interviewing participants with limited mobility, and interviewing people with young children. The online method allows the interview to continue for as long as it takes to cover the route without anyone getting cold, needing access to facilities, or struggling with the physical challenge of walking or standing for long periods.

During data collection a number of events could have hampered the research. There was a national increase and highest peak in Covid-19 cases since the beginning of the pandemic through November-December 2021, and the re-introduction of Covid-19 restrictions including mask wearing and limits on gatherings (The Directorate of Health and The Department of Civil Protection and Emergency Management, 2021). There was also an outbreak of Covid-19 in Patreksfjörður, resulting in businesses and schools closing for five

days at the time the research was conducted (Vesturbyggð, p.c. 24th November 2021). Nonetheless, the research was not interrupted.

Overall, the virtual option was considered to be a more controlled methodology than the in-person method, more convenient for participants and researchers and very easily replicated, and most importantly, resilient to the impacts of the pandemic.

3.4.1 Tools

The virtual tour uses three main online tools: Street view via the online map Já.is (www.já.is), Zoom for video calls (www.zoom.us), and automatic transcription (inbuilt software in Zoom).

A street view of Patreksfjörður is accessible through the Icelandic mapping website www.ja.is. This site was chosen as it has more street view coverage than other online maps, which were found not to cover the southern Westfjords in detail. In Iceland, since there is high-quality street view data on this site for our case study location and almost universal internet usage, this methodology can be applied easily.

For application of this method in other contexts, street view coverage outside population centres and in other parts of the world can be inconsistent. There are, however, a number of different mapping sites that could be used for applying this method in other research locations, including Google Maps (https://www.google.com/maps), Mapillary (https://www.mapillary.com/) and Kartaview (https://kartaview.org/landing). Both Mapillary and Kartaview are open-source, allowing users to contribute imagery, creating a democratic and diverse street view map. In theory any space could be mapped as a "street" view, even routes on water, as the images can be geo-tagged with any coordinates. Therefore, if the researcher is able to visit the study location at least once, it would be possible to upload their own images onto one of the open-source platforms and create their own route and virtual tour, making open-source map sites a useful tool in those contexts.

The involvement of public contributions in this research process, like the user contributions in these mapping sites, make decolonisation of space possible, this being a key challenge for critical cartographers working on digital maps (Pavlovskaya M., 2016). It is suggested that application of this method could make valuable contributions to

democratising the representation of space in its research locations due to its participatory nature (Harley, 1988; Wilson, 2016), especially if working on participatory processes with communities whose voices are not usually heard.

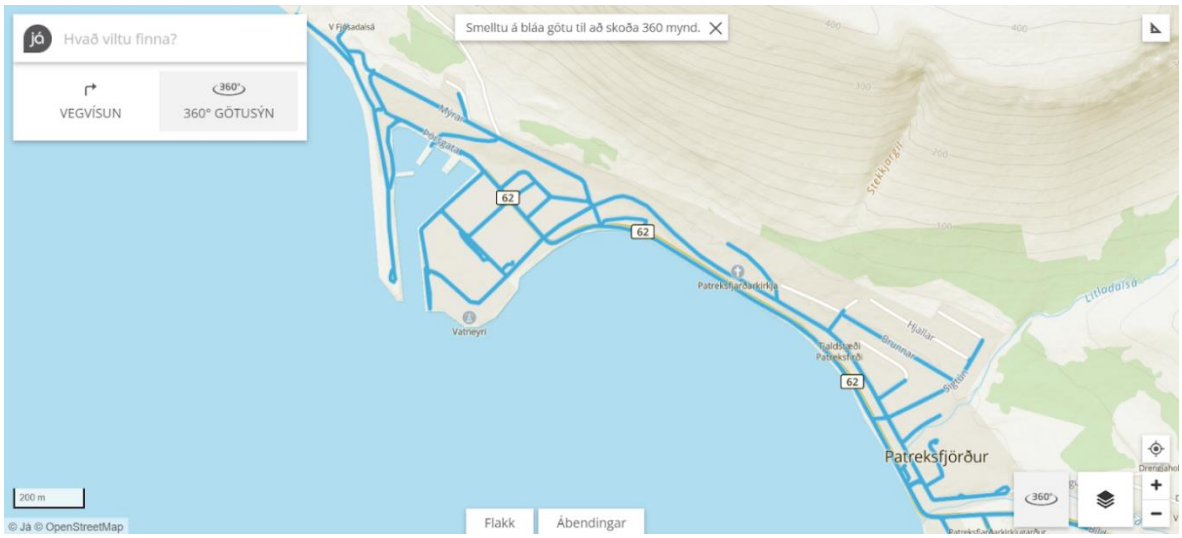

Figure 3.1: Extent of street view coverage in Patreksfjörður. The blue lines show which streets can be entered with 360° street view (Source: www.ja.is).

Figure 3.2: Street view on Mýrar in Patreksfjörður. An example screenshot of a street view, with an inset map showing its location (Source: www.ja.is)

3.4.2 Interview set-up

An invitation and pre-interview information (Appendix B) were sent through email to ensure that it was easy to locate the paper trail for each participant, and Zoom calls were

scheduled at the convenience of participants. Interviews took place between 27/10/2021 and 12/11/2021, and all interviews took place between 10:00 and 14:00. Automatic transcription was set up in the Zoom account settings.

At the start of each call, verbal consent was obtained from participants for recording and transcription, prior to beginning the walking tour. Screensharing the street view in full screen gave a bigger image on the participant's computer, and the closed captions were not visible to participants during the interview so as not to distract participants from the more important visual input of the street view images. At the end of an interview, the recording and a text file of the transcription were automatically downloaded by Zoom into dated text file. Some corrections to errors in the transcription were necessary, especially for Icelandic words and placenames, but automatic transcription was overall helpful and saved time. The technical side of the virtual tour was tested with a non-resident volunteer who was able to give feedback about the use of street view and Zoom, and to test the automatic transcription.

3.4.3 Route and narrative

The route taken in the virtual walking tours was based on a preliminary walk around Patreksfjörður. The route begins on the outskirts of the town, and follows Aðalstræti through the town past the memorial for the 1983 slushflow victims, the swimming pool, church and to the crossroads to turn right along Urðargata and then Mýrar (Figure 3.3). At the end of Mýrar overlooking the harbour, participants were asked if they wanted to go to any other locations, and were encouraged again, as at the beginning of the walk, to choose significant places that were not covered by the route.

A narrative (Appendix C) accompanied the online walk, and formed the semi-structured interview. The narrative provides a structure that can be replicated in every interview, while allowing participants to elaborate when they have something to say. The aim was to elicit participants' perceptions of the place where they live so questions at each point on the tour were open questions that allowed participants to make personal reflections on their experience of the places we visited. Participants were also encouraged to interrupt, ask to rotate the view or to ask to go to places of personal significance if they wanted. It was designed to create an immersive experience for the participant, beginning by asking them to imagine arriving on the edge of town after a long journey away from

Patreksfjörður. The intention was to bring the participant into the street view environment, spark their imagination, memories, or prompt them to talk about their attitudes and behaviours related to different parts of the town. To start with a neutral topic to ease into the interview, and to avoid biasing the data towards the topic of interest, the first question was "What three words come to mind when you arrive in Patreksfjörður?"

Figure 3.3: Map of the planned route for Patreksfjörður virtual walking tours. Route marked in red (Source: OpenStreetMap, author)

The topic of climate change and natural hazards were of particular interest in the interviews, and this guided the design of the route, but it was decided not to ask directly for their views on climate change in order to assess whether the topic is perceived as salient in their community, or whether other issues were perceived as more important. Therefore, the words avalanche, slushflow, mudslide, flood, or climate change were not mentioned until the respondent brought them up spontaneously.

To assess the place attachment of participants, knowledge, memories, attitudes and reported behaviours or activities were of interest, as discussed in Chapter 2. In addition, if they had not mentioned this topic spontaneously, at the end of the walking tour participants

were asked directly whether anything would cause them to leave the community. For those who had moved away, they were asked why they left, and whether they would go back.

3.4.4 Sample selection

Initially, local personal contacts were asked to take part or suggest other contacts. Out of eight people approached in this way, four people agreed to take part. Two other people were approached through University Centre of the Westfjords contacts and they agreed to take part. Three people with businesses in Patreksfjörður were approached by email and one agreed to take part. Snowball sampling was then attempted to try to reach further into the community and to find people of different ages/backgrounds.

A public call for participants was made using the Facebook social media platform (facebook.com). While this might seem informal and potentially exclusive of non-users, it is a culturally appropriate method of contact in Iceland since it is currently widely used there for individual and community level communication and to run businesses. In December 2021, an estimated 330,000 people or 94% of the population of Iceland have an account on the platform (NapoleonCat Stats, 2021), making it an inclusive way of reaching the population, regardless of age, social status or other factors. Releasing a poster on Facebook resulted in finding four additional participants (Figure 3.4). It was shared 15 times and received a number of comments on multiple shares. It was shared to two groups: "*Patró*", which has a town history focus and 2857 members, and "*Íbúavefur Patreksfjarðar*", which is for residents or homeowners in Patreksfjörður, and has 580 members. This resulted in two more participants. Snowball sampling from these resulted in one interview with two participants who were not Facebook members. In total, eleven participants took part in the virtual walking tours. A total of nine interviews took place; seven interviews with individuals and two interviews with couples. Interviews lasted between 40 and 94 minutes, with an average interview length of 52 minutes.

The age range was roughly 20-70 years, and there was a ratio of eight women to three men, seven residents and four ex-residents, eight Icelandic and three non-Icelandic. As expected, those who took part were highly motivated individuals with a lot of knowledge, memories and thoughts to share about Patreksfjörður, its local and wider environment. The individuals had a range of different occupations and interests, which are kept confidential to maintain anonymity, given the size of the community, and they gave an anecdotally rich impression of the town's culture and environment.

Figure 3.4: Poster appealing for participants released on facebook.com (Graphic: author)

3.4.5 Ethics

Ethics approval was obtained for the study in August 2021, and the research follows the ethical guidelines of the University Centre of the Westfjords. All participants were over the age of 18 and were asked for consent to participate in the study. Verbal consent was obtained for the recording of the interviews, which they were informed would be deleted after analysis was complete. Participants were assured that it would not be possible to identify them from the information presented in the thesis or any later presentation or publication, and informed of their right to withdraw from the study at any time. Participants were informed of the basic aims and objectives of the study prior to taking part, but were not informed of the specific interest in climate change perceptions in order to avoid influencing their responses. Participants were given more information about this at the end of the interview, but assured that all their contributions had been valid and helpful to the research even if they had not commented on climate change.

3.4.6 Limitations

In any qualitative research, the expectation is not to be truly objective or to gain a fully representative understanding of a community (Longhurst, 2016), but to provide a deep insight into the real lived experience of the participants and a richer understanding of the research topic than can be gained through broad quantitative methods, and this is acknowledged as an inherent quality of this kind of study. There were, however, a number

of limitations that were recognised as specific to the method used, including accessibility, language of communication, age of participants, and the age of the street view data. The opportunity to test a new method was viewed as having greater potential to make a contribution to future research than relying on methods that are known to be effective, and so these limitations were considered to be outweighed by the advantages of the online method, but are elaborated below.

Accessibility: The walking tour was designed using a number of online tools. The question of whether the method is accessible due to the need for digital literacy or internet access is an important criticism of all online research designs (Köpsel et al., 2021). Overall, there is good internet connectivity in Iceland, and although digital literacy should be considered seriously in any online research design, in this research context it was considered not to be a barrier to participation. In terms of physical accessibility, this method allows participants with limited mobility to take part, to go further or on more challenging terrain, or in bad weather.

Language: The interviews are conducted in English rather than Icelandic. It might have been preferable to conduct the interviews in the mother tongue of participants, and we can only acknowledge that this limits our findings in ways that are beyond the scope of this project to remedy. One way to improve on this research therefore would be to work with a translator or to collaborate on the research with Icelandic researchers. The survey sent to participants after the interviews were completed was translated into Icelandic, to try to mitigate this and prompt further comments in the participants' preferred language, including their reflections on whether they would have preferred to communicate in Icelandic. This is discussed in chapter 4.

Age of participants: Ethical standards meant that it was not appropriate to approach anyone under the age of 18 to take part in this research. It would be interesting for a researcher to conduct this methodology with children in a safe and sensitive way (for example, accompanied by an adult, or using other Virtual Reality software that could be supervised by parents or guardians) to gain an insight from young people in the community and understand whether there are generational differences in place attachment and perceptions of the local environment, how social challenges affect young people, and how they view climate change.

Age of street view data: Photographs in the available street view date from 2013 and 2017, before the avalanche barrier construction started. This might be seen as a drawback to this method, but since the research topic involved the participants' responses to the changes made to the built and natural environment it adds an extra cognitive layer to the research. The participants are likely to have a mental image of the present-day reality in Patreksfjörður which they can compare with the past presented to them in the street view image, potentially providing a prompt for any latent or salient opinions or other perceptions. Walking and recording the route was considered in order to present to participants with a view of the streets and surroundings as they look in the present day. This would not have allowed deviation from the route, however, which is possible when using street view. This was considered an important aspect of the method, as it allows some flexibility and better reflects a real, in-person transect walk.

Figure 3.5: Contrast between street view and present-day view of the same street (Sources: www.já.is (left), photograph by author (right))

3.4.7 Researcher bias and reflexive practice

"Even as elegies are written for a disappearing landscape, people still travel to the Arctic under the banner of expedition. Adventure-seeking tourists marvel at calving glaciers. Adventure-seeking scientists document faltering ecosystems and fracturing ice sheets. Awe and melancholy weave together in unsettling ways. But in the process of accounting for our agency in the Arctic landscape, we release the idea that it was ever otherworldly to begin with…" Stephen Lezak (2021)

The researcher's perspective as an outsider is likely to have some influence on the data collected, and to some, "awe and melancholy weave together in unsettling ways" in the landscapes of the Arctic, while to others it is simply home. It is important to acknowledge that it is impossible to remain unbiased and not to bring some personal opinions into place-

based research. It should also be acknowledged that the interpretation of the data here captures a different understanding than would be interpreted by a local, but as the Icelandic proverb says *"Glöggt er gests augað"* ("Clear is the guest's eye"), and it is possible that the outsider status of a researcher may shed light on details that would not be perceived by a community insider. I attempted to keep my outsider gaze looking through a window rather than into a mirror by controlling the route and interview questions of the methodology. Following the reflexive approach recommended by other research into place attachment (Manzo & Carvalho, 2021) a summary of findings was sent to participants January 2022 and they were asked whether they were satisfied with my interpretation of the data overall. They were given the opportunity to provide additional feedback, especially on the topic of climate change, consultation about the avalanche defences and their views on protection of the harbour and boats from avalanches, and their responses are taken into account in the presentation of findings.

3.5 Methods for data analysis: grounded theory, geospatial data representation

This thesis is in response to the issues of climate change in Iceland and rural community resilience, and investigates the interplay between place attachment and risk perception. The methods developed in this research combine traditional qualitative semi-structured interviews with transect walks by inviting participants on virtual walking tours. The results of this method are analysed using grounded theory, aided by qualitative discourse analysis software MAXQDA. Grounded theory is a well-established method of analysis of exploratory qualitative interviews, well-suited to topics or contexts which lack prior understanding or research (Cope & Kurtz, 2016). It involves the inductive development of a coding system by a researcher, highlighting topics that are noticed repeatedly during examination of interview recordings or transcripts. Identification of salient topics through an iterative process categorises and organises the interview narrative data, until a systematic understanding is reached of these topics and how they might be understood on a conceptual level. This results in construction of a theoretical understanding of the research topic that is grounded in the data that has been collected (Charmaz, 2014). Themes are identified and coded in this study according to the place attachment frameworks described in Chapter 2 (Manzo & Perkins, 2006; Scannell & Gifford, 2014) to assess place attachment and identify the important places, resources and vulnerabilities of the

community, and how participants interact with them at different levels and environmental domains.

The results are analysed for spatial information to help illustrate the results of the interviews in the form of maps. Each coded segment is coded again for its location, then using these location codes, it is possible to identify how topics relate to locations using MAXQDA code relations browser. The located topic data can then be visualized using open-source geographical information system software, QGIS (Liu et al., 2018), which is presented in the maps illustrating the data in chapters 4 and 5. These visual representations of participants' responses were created to help illustrate their perceptions of the local environment, to show the link between the interview narrative and the geospatial nature of the virtual walking tour, to quantify the data in a meaningful way, and to create a visual way of communicating the results - which could be useful to an audience familiar with the study location - and finally, to show the potential of the methodology to future researchers. Maps are presented showing themes related to values and vulnerabilities that emerged from the interview narratives. The method was also analysed for its effectiveness through coding sections that appeared to show immersion in the experience of the virtual walk, and these results are shown in a map of where memories and other immersive indicators occurred.

3.6 Follow-up survey

During the interviews, any comments or reactions which indicated that participants were immersed in the experience, such as observations they made of the images, were coded, and participants were also asked directly about the experience at the end of the interview. In order to add to the analysis of the method, a post-interview survey was sent to all participants (Appendix D). This was used to verify whether the data about the method taken from the interviews was interpreted correctly, to check assumptions (such as the ease of use of technology and preferred language), gain better insights into the experience of the participant, understand how it could have been improved. The survey was anonymous and it was translated into Icelandic in order to allow participants to say anything they might not have been able to express during the interviews and to obtain honest feedback. It was sent to all eleven participants on 26/11/2021, one month after the interviews were completed, and received ten responses. Best practice for future use of virtual walking tours in other research or community consultation work were drawn out of the responses, presented in Chapter 4.

4 Results

Place attachment literature has in the past focussed largely on place attachment expressed by individuals, and those involved in planning have tended to overlook the emotional connections to place, even where participatory processes have been used. Therefore it is recommended that to bridge the gap between the disciplines of environmental geography and planning, we should aim for an understanding of collective place attachment, as opposed to understanding only the place attachment of individuals (Manzo & Perkins, 2006). Following this recommendation, the analysis of place attachment in Patrekfjörður in this study is interpreted from individual accounts, but generalised to the collective level.

4.1 Discerning the nature of place attachment and perceptions of place

The iterative process of coding and review was carried out to ensure that the coding system used was applied consistently across all interview transcripts and to ensure validity of the findings. A reflexive approach was applied by returning to consult with participants to check whether they agreed with the findings, which is suggested as an ethical approach to place attachment research by the literature (Manzo & Carvalho, 2021). The results were treated collectively to give an overall impression of the most important features identified by participants as a group, both in describing the defining features of the place and assessing place attachment. This was partly motivated by the need for participant anonymity due to the small sample size within a small community. The collective focus on place attachment is also supported by Mihaylov et al. (2021) as discussed above and in Chapter 2.

Segments were coded with an overarching framework of themes relating to the conceptual framework of place attachment (Cope & Kurtz, 2016). The simple framework of cognition (which included knowledge, opinions/beliefs and memories), affect (emotions and preferences including values and threats) and behaviour (how people engage with place) was used to categorise the coded segments at the top level. Each of these themes was subdivided into environmental and social categories, with a number of specific codes within each category, developed through the iterative grounded theory method. This

process resulted in developing new codes through the course of the analysis, with each transcript and video being reviewed three times or more. Some of the emergent codes overlapped and it was possible to merge these together in MAXQDA to simplify the code system and avoid duplication.

4.1.1 Salient themes

After review and analysis of the codes, the most salient themes were identified. The following themes were identified, and these are elaborated individually in this section:

1. Sense of safety and shelter provided by surrounding mountains
2. Awareness of avalanche danger
3. Proximity to nature
4. Local environmental knowledge
5. Non-monetary value of the environment
6. Geographical remoteness
7. Community connectedness
8. Socio-economic vulnerabilities

1. Sense of safety and shelter provided by surrounding mountains

The safety of the mountains and the shelter they provide relates to broad topics relating to the environment. This theme was mentioned in reference to the mountains on all sides of the town and fjord, such as around Litlidalur (Figure 4.1) and at the other end of the town below Brellur, and was coded 30 times. It was referred to repeatedly either spontaneously when asked about the meaning associated with the mountains, or in response to questions about the avalanche risks after the subject came up later in the interview.

The following quotes are from different participants and sum up the consensus on the feelings about this part of the landscape. One participant said: “The mountains around Patró, they feel very friendly, you don't get threatened because they are very gentle... they're not steep.” These words were echoed and qualified in terms of the physical protection they provide: “The mountains are so friendly”, “They protect you from the worst storms”. Others tried to describe the sense of emotional security they provide: “It's

like... stability, they are just always there, the same, you know… They are just like a stone that you can handle, and you know that this is your place."

Figure 4.1: Litlidalsa, Patreksfjörður. Participants reported that the mountains provide shelter from the north winds, and provide a sense of safety (photograph by author).

2. Awareness of avalanche danger

This is another environmental topic, relating specifically to the local climate, weather conditions and hazard awareness, and is linked to topic 1. Positive association with the mountains, as well as a sense of safety in relation to the risk of avalanches were highlighted by participants. A number of participants expressed a sense of security from the dangers of avalanches, and the following comment was not unusual: "Well, from what I've heard there has never been any accumulation of snow, like above there. That's just what I've heard from people in town that it was more of, you know, regulation thing…". There were, however, many coded segments related to local knowledge of avalanche danger, and awareness of where the most hazardous areas were (both before and after the construction of the barriers), such as in comments which noted dangerous locations: "There are no houses there between Urðargata and Mýrar, because this is the kind of dangerous bit."

3. Proximity to nature

This topic concerns the natural environment, pride in the view, and in relation to this theme many comments were about the ocean and the mountains. Proximity to nature was discussed by participants as being one of the main benefits of living in the town, and this was often qualified in statements such as providing a sense of the time and of daily or seasonal structure: “I think, somehow, the mountains and the ocean, it gives a lot here, and you know it's the sense of weather, the sense of the day.” The presence and visibility of both the mountains and the sea was identified as a unique local characteristic, during interviews there were 30 coded segments about the physical proximity of the mountains and/or the ocean and wider environment. Some participants even gave statements of place identity such as: “I really like having the mountains close and the sea close. I'm such a fjord person.” A sense of pride in the community was derived particularly from the view, which was visible in almost all the street view locations: “And the view, I mean it's perfect”.

4. Local environmental knowledge

Participants shared local knowledge of the environment, including plants, berries and leaves for foraging (Figure 4.2), place names, and salient weather conditions (Figure 4.3), across genders and age groups. There were 28 coded segments relating to local environmental knowledge and 16 related to salient weather conditions. Participants knew where water exists in the landscape: “You can see it's the light green in the area where there is, that is very wet, that area.” They also knew where to forage and the uses of different plants: “I pick Icelandic Moss; leaves of the berries, also the berry later; Angelica; *Blaberg*, that is the Icelandic thyme I think; *Holtasoley*, the national flower of Iceland, you can eat them if you have a stomach ache. And every child that I know and my children they use Holtasoley when it is [at the stage in the cycle without flowers, when it is] called *Rjupalauf* [...] it’s very good for the stomach…”

The prevailing wind was mentioned several times, sometimes in great detail: “Yeah, they call it *innlögn*, and maybe around 10, 11 o’clock on a hot summer’s day it starts going up. And it goes down maybe around six in the evening, so you get a really calm and nice weather in the morning and in the evening, but you usually have wind in the middle of the day”. Most participants seemed to be aware of this, including newcomers and those who

lived there for a short amount of time: *"*When it was sunny in the morning, then you always knew that the wind was coming in, 'innlögn'. Someone told me, because I said the wind is always coming insane directly down the fjord! It's called innlögn." Participants described how walking in the landscape gave them a deeper relationship with it, and the importance of the cultural history of the land: "There are layers of place names… you go deeper and deeper into the landscape, you know, bodily, and then with your mind you find another kind of knowledge, place names and maps and things like that."

Figure 4.2: Crowberries in Litlidalur. Local knowledge of the environment is connected with the theme of non-monetary value in the environment (photograph by author).

Figure 4.3: 'Innlögn'. The flags show the direction of the prevailing wind in the fjord. (Source: www.ja.is)

5. Non-monetary value of the environment

This topic was related to social activities as well as environmental topics. Non-monetary value associated with the environment was another salient theme expressed by participants, relating to the interactions people reported as taking place in the town, its immediate surroundings and further afield. Abstract, artistic or spiritual benefit gained from the environment, sometimes expressed in metaphorical terms, were expressed by many. One participant consistently used metaphorical language to describe the environment, for example saying “the sea is, I think, it's mystic” among other similar statements. The 51 coded segments included references recreational use of the environment, especially walking and hiking, foraging and fishing: “I got my small boat from Denmark. Since that I have been sailing a little bit. And I hope I will be sailing in it a lot in the next years.” Sitting on the shore looking out to the mouth of the fjord was cited as having mental health benefits: “It's like, you know what is white noise? It's exactly like that. You can just listen to it, and shut your mind off or think about whatever you need to think. And I have a spot here close to my house whenever I like just to walk there. Look at the sea, and think, if I need to think about something you know it's just good. The sea is not judging you for whatever you would say to it.” (Figure 4.4).

Figure 4.4: Looking towards the mouth of the fjord from the edge of the town. Participants referred indirectly to mental health benefits of the local landscape (photograph by author).

6. Geographical remoteness and isolation

This topic was identified as a theme on its own, but one that links and running as a current through many of the other themes, connecting the natural environment with social issues. Participants acknowledged Patreksfjörður's remoteness, with isolation identified as both a positive quality for those who it suits, and a drawback, in 18 coded segments. Many participants stated how much they enjoyed the stormy days, when: "the mountain passes would be cut off for four or five days and so on. I kind of liked that because of being so remote, you know, so isolated. That was kind of cool." Others also consciously referred to the sense of isolation as a positive aspect: "Yeah like if you go for solitude, it could not be better", but others said: "The negative thing would be maybe that you're kind of isolated."

Patreksfjörður *is* the big city to those who grew up in even more remote locations or on farms rather than in the town: "When I was a kid, it was always very exciting to go to Patreksfjörður and visit the stores and everything so I sometimes get that feeling when I'm coming to the big town. And I still get it when I come home from a trip to Reykjavik. Wow, I'm going to Patró!" Although it can be recognised that the town is located in a sparsely populated area with limited connectivity, these statements emphasise the fact that remoteness is a relative concept, and Patreksfjörður can only be said to be remote in relation to other places. This is explored in the next chapter.

7. Community connectedness

This theme is mainly related to social topics. Participants frequently referred to community cohesiveness, with 34 segments coded for this theme. Many referred to the sense that people look out for each other and that there is a sense of mutual support in the community. Comments such as the following came from residents who were not originally from the town: "I do actually feel like I'm home. And I know those people here. We are a small community here, so we know each other."

Within this theme, community membership was a common topic, including both community inclusion and limitations. Themes relating to the strengths of the community, especially its size and its safety making it an ideal place to bring up children were mentioned, as was perceived openness and acceptance of outsiders: "The connection starts with your kids." And "I think it's one of the best places where I could raise my kids." The

potential limitations of community membership due to the community's size and its nature as a small fishing village were also stated, however, and these topics were raised mainly by ex-residents, who said for example: "When we moved. It was because I thought, I have done everything here I can ever do… It's not because of how far away it is, it is also in your mind, you know, and also the countryside and the town…"

8. Socio-economic vulnerabilities

This is also a topic relating to social issues, such as connectivity, economic activity and services. It was mentioned that there are many reasons for young people to move away, such as for specialised training and education, which was often stated in simple terms such as by a participant who said: "If you want something more for your children, you have to go away." Other participants referred to the need to seek out a different mindset, especially for young people. One participant referred to their daughter who had said: "It's the masculinity. The masculinity, it stinks here."

Participants mentioned threats to the community originating from socio-economic factors 36 times. Participants repeatedly identified the potential for economic collapse, greater employment opportunities outside the community, or the limitations relating to services, especially education. It was stated that these threats were more likely to cause damage to the community than any kind of environmental hazard such as an avalanche. Participants specifically talked about the fisheries, with a high level of awareness of dependence on this industry in the region. The understanding of the potential impact of the fisheries collapsing or restrictions on aquaculture was reflected in all opinions of the fisheries, whether fisheries (especially aquaculture) were perceived as generally positive ("it just shows that something is happening and something is being created") or negative ("I'm afraid it might be like one of those times where we just take everything from nature, and then everything collapses"). The sentiment is summed up by the statement that: "I think it's not possible here to get an avalanche make bigger problems than problems in the salmon industry would do."

These salient themes are used to explain the nature of the community's place attachment, in combination with the results described in the following sections. The following sections concern perceived values and vulnerabilities, and place disruption in relation to avalanche/slushflow hazards, avalanche barriers, and climate change.

4.1.2 Spatial information: Community vulnerabilities and values

At the end of every interview, if they had not brought up the answer spontaneously participants were asked whether they could think of any reason why they would move away. The reasons identified were related to the social and economic factors described above, such as their children moving away for school, if they required specialist medical treatment, or for employment. Those who no longer live in Patreksfjörður described similar reasons including a sense of the town being either too small, or not quite the right 'crowd' to meet their needs. Some mentioned work or other commitments elsewhere. Even those who had no immediate intention to move admitted a list of potential reasons they might have to leave: "I think that will be the only force, a sickness in the family, or all the kids moved away. That will be the only force that will make us move, or maybe a job, if you would get a job offer that you couldn't deny…" No one suggested that a disastrous event would be likely to cause them to move, with some pointing out that it would be far more disastrous for the community if the main source of employment were to disappear, as mentioned above in relation to the fisheries. A summary of the frequency of coded segments for top-level codes (Figure 4.5) shows a comparison between threats and values, which are divided into social and environmental categories. The frequency of segments coded as social or environmental cognition and behaviours (i.e. the other top level codes) are also presented. Environmental values, environmental knowledge and social values are the three most commonly coded themes. A strong contrast is shown between perceived threats, which are the second most common theme coded in the social category, and the least common in the environmental category.

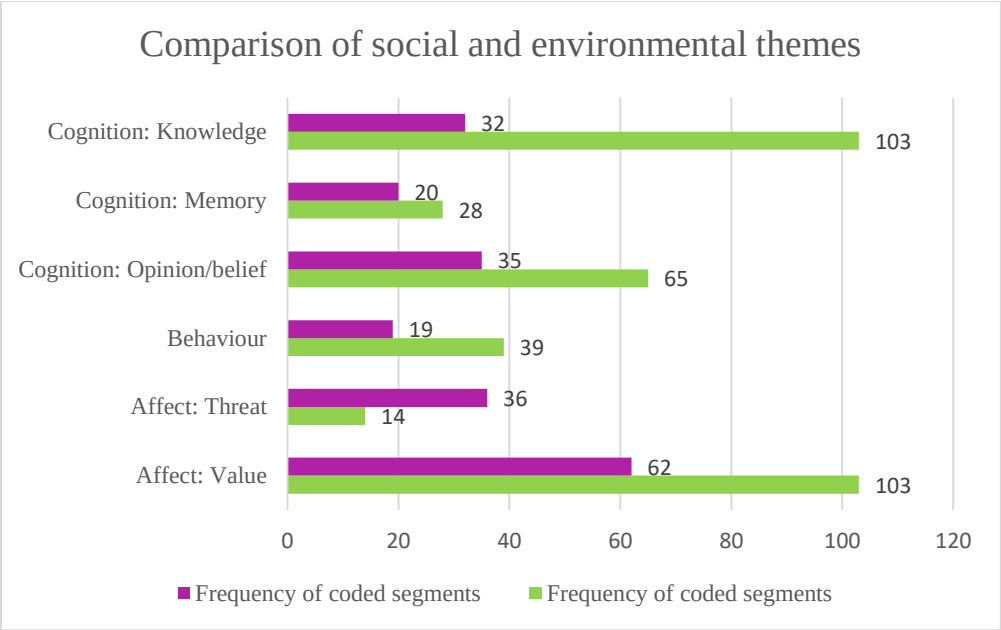

Figure 4.5: Comparison of social and environmental themes. Summary of code frequencies showing that environmental knowledge and values are the most common environmental themes, values are the most common social theme. There is a contrast between the perceived threats as social threats are more commonly identified than environmental threats.

All coded segments were also identified with specific locations to give spatial information about the data, which adds to this finding by showing stronger identification of values outside the built environment (Figure 4.6), and a stronger concentration of identified threats within it (Figure 4.7).

Examples of values came from any segment which was coded as representing a positive aspect or strength for the community, a reason to live there ("The ocean, it means everything to him") or a source of resilience (such as mentioning roles in the community, for example in the rescue team). Threats and vulnerabilities include any segment which suggested a reason to leave the community, a possible way that the community could be harmed ("the mountains for me, I'm always thinking of the story of the avalanches"), or specific negative aspects such as industrial or domestic pollution in the environment ("for me, the fjord water, [I associate it with] fish farming and also the fact that we have sewage just coming out being untreated").

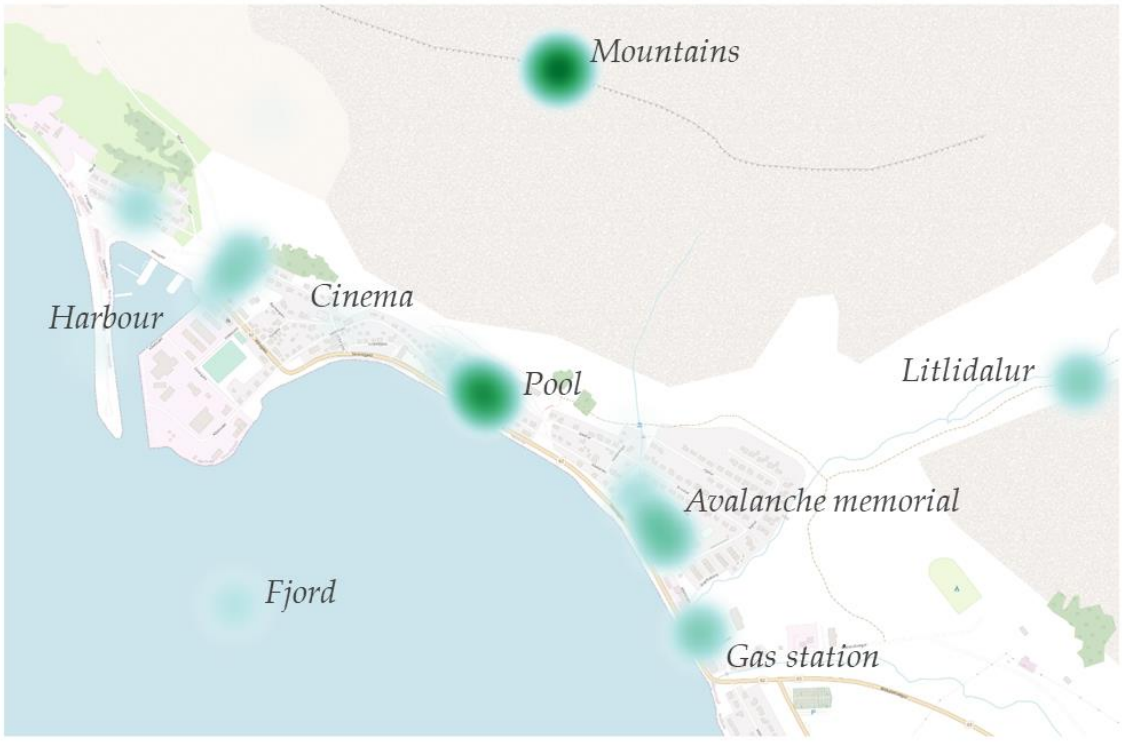

Figure 4.6: Heatmap of locations where participants perceived values. Values tended to be associated with a sense of safety and benefits derive from the natural environment, and are also derived from positive aspects related to the social life of the community.

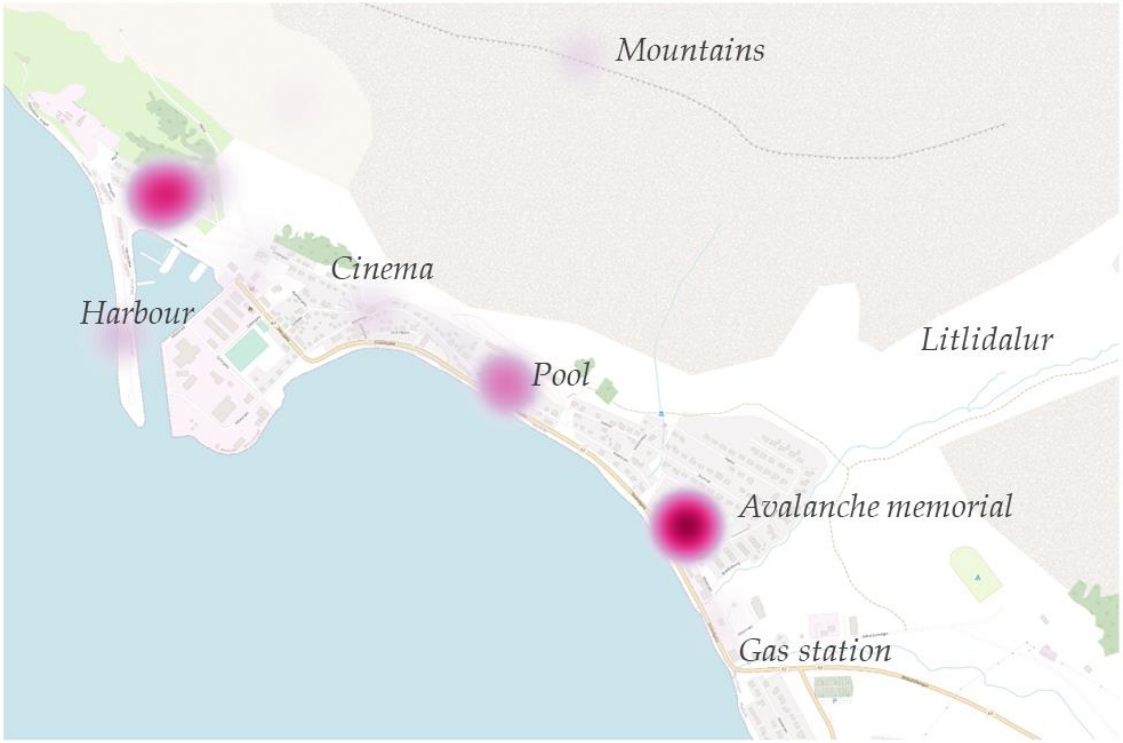

Figure 4.7: Heatmap of locations where participants perceived community vulnerabilities or threats. Threats were more often associated with socio-economic vulnerabilities and tended not to be associated with environmental hazards.

4.1.3 Place disruption: Avalanche/slushflow hazard awareness

As stated above, participants identified a risk of avalanches in certain areas of the town, showing local knowledge of hazard areas, but there were differences of opinion over the risk in other areas that the avalanche barriers are designed to protect, such as above the street Mýrar. The most hazardous areas were identified as Urðargata where there was a recent avalanche in 2015 and 2020, and the slushflow memorial below Geirseyrargil: "You know, you can see there are no houses in the front. Because of avalanches, people decided that this area is too dangerous". Participants also recalled memories of being evacuated from their homes or other direct impacts, but these also implied there were areas that are less hazardous than others: "Before we had to often had to leave our house because of avalanche danger. But then we moved to the other end of the town where we knew we wouldn't have to go out."

Perceptions of risk to the harbour from avalanches were discussed in some interviews and were mixed. Some people recognised the hazard zone remained in that area, but there was a lack of clarity about whether there was a need for a plan to move boats in the event of an avalanche large enough to arrive there. Combined with a lack of knowledge about planning "I'm not aware of any plan in the evacuation plan for avalanche in Patreksfjörður on moving the boats from the harbour", some participants denied that there would be a need for boats to be moved in the event of a large avalanche: "If the owners of the boats would have thought there was need to move the boats away, they would have done it." In the following exchange, the fact that there is now some protection for the town is cited as being preferable to having none, even if the harbour is not fully protected:

> Participant: "The barriers should protect the town. And the avalanche should go to the sea where no houses are, if it comes. If it's big."
>
> Researcher: "Is that going to be near the harbour or is that going to be away from the harbour?"
>
> P: "Near the harbour, yes."
>
> R: "Can you see any problems with that or do you think it's okay?"
>
> P: "It's better than not. Well, [because] it saves lives"

It was, however, also stated that there might be a need for a plan to evacuate the harbour: “We know that the avalanches have been in the harbour, and possibly quite often, every 100 years or so. That's something we must just think about if we think a big avalanche is going to come, we must move our boats.”

Some participants recognised a change in their perception of danger regarding avalanches and other hazards, and gave some indication of insight into changes to their sense of security. One participant described their experience of the 1995 avalanches, illustrating the conflict between the perception of the landscape as protection and a source of threat, as well as the cultural history of avalanche danger in the region: “When the avalanches were in Sudavik and Flateyri, suddenly there was a threat to our homes. In the first avalanche in Sudavik, our home was a safe place, and people came and stayed overnight because they had to evacuate from their houses. But when the next avalanche threat came, then they [assessed] that our house was also at risk. So we had to go somewhere. And when that happened, it kind of settled in you some kind of threat. But before when there was this crazy storm outside and you couldn't see out of your window, it was just very nice. And I always saw the mountain above my house, it's called Brellur, it was kind of like a shelter from the harsh north wind.”

In addition to personal memories and direct impacts from avalanches such as evacuations from their homes, a number of participants pointed out the uncertainty around environmental hazards. Some participants mentioned landslides and coastal flooding as potential threats, although with little certainty over their probability or where they would be likely to occur. In total there were 14 coded segments related to potential environmental threats. This participant referred to mudslides and gave insight into the conflict between the town’s resources being linked to the landscape, with its inherent source of vulnerability: *“*Those mud avalanches, I have seen it in books and records, there have been so many avalanches in the Westfjords in the old times that lots of places just were completely destroyed - the fields and houses and whatever - and nobody lives there now […] And it was really good to live in the Westfjords, but the avalanches, mud avalanches or landslides did destroy many places.”

4.1.4 Place disruption: Climate change

Climate change was mentioned in five coded segments from segments resulting from participants bringing up the topic spontaneously, and these concerned reduced snow cover, which one participant related directly to climate change: "... and talking about climate change, you know, that's one of the consequences, there used to be plenty of snow in there." Some participants mentioned the perceived threat of rising sea levels: "If the sea level rises up maybe one meter, then we have no flat area left in Patreksfjörður. So, we'll have to go up the mountains, there's the mountains and that's it."

Participants also expressed the view that avalanche barriers were needed elsewhere to deal with climate change hazards, and that they were unnecessary in Patreksfjörður: "At the same time I remember when it was like this all this stuff happening in Seyðisfjörður like with the mudslides, and then in Patreksfjörður they're building those massive walls and everything and throwing all the money in the places that like aren't even that threatened you know, it's kind of like, injustice, like the people that really need it don't get anything"

Some participants did not bring up the topic of climate change at all, and when asked directly at the end of the interview they responded that this was not a topic at the forefront of their minds: "I'm not really sure about this. I don't really know how to answer that, maybe because I am not really thinking a lot about it."

Participants were asked in a follow-up question via email about their climate change perceptions, because of the low number of comments. This resulted in four responses. Some participants responded that they perceive there to be less snow cover than in the past, and mild winter conditions in recent years: "We feel that the weather has changed in some way. There is less difference between winter and summer; less snow in the winter and a bit colder in the summertime". One participant got closer to the possibility that heavy precipitation and sea level rise as climate change impacts could cause damage to infrastructure, such as in the following response: "We have more rain, heavy rain, that has a direct effect on our houses in the mountain's slopes. We have more problems with the damage that water causes during the wintertime than we had before, due to the higher temperature and the fluctuations in the temperature. We are also aware of the sea level rise, and that is something that we must take into consideration when we are building near the sea or planning a new building area in Patreksfjörður."

Others stated that they do not perceive the issue to be relevant in their community, saying: “Whereas climate change occurs all over the world, I think it is not relevant.”

4.1.5 Place disruption: Avalanche barriers

The subject of place disruption due to the construction of avalanche barriers was understood through 44 coded segments relating to opinions about the avalanche barriers. These opinions were mixed. Some had negative opinions, and mentioned the alteration made to the landscape, including people’s gardens and favourite places: “the mountains feel gentle, but the avalanche barriers don't feel very gentle, they feel a bit looming and threatening, actually. And I think they'll be protective but they’re so steep”. Some of these relate to the fact that the construction is not yet complete: “…there are a lot of huge machines that they are using for building the wall […] Because they are building it still it's difficult to say how it will exactly look. It's gonna protect the houses, but it looks much better in this photo than in reality now”.

Some believe that certain parts of the barriers are not necessary, according to their understanding of avalanche hazards in those areas, illustrated by statements such as the following, which also shows how participants sometimes voiced theories about why those parts of the barriers might have been built: “In some places I think it's very good, and it makes people make more secure. But I think, well, behind the street here, I don't think there will ever come an avalanche, or have ever been. The mountains behind here are not so steep but maybe for the whole site they decided to have it just through the town to the end.” As mentioned above, other areas were unanimously recognized as being areas where avalanches or slushflows occur.

There is another side to the discourse about the avalanche barriers which gives a sense of passive resignation, such as relating to a lack of knowledge, not wanting to say for sure whether there was a hazard or not, and this included placing trust in avalanche specialists and engineers: “I think that we just put our trust on those guys doing their best.”.

Finally, many coded segments on the topic of the barriers relate to initially being opposed to the barriers but getting used to or finally accepting them, despite initially or still holding some negative opinions about them*: “*We get used to it you know we don't see it anymore […] it's like it has always been there in a few years.” Some participants also referred to the

walking routes that have been included in the avalanche designs, saying for example: “I think when they have finished it will be a good area for walking and just enjoying the view over the fjords. Maybe something that you would not essentially do if you didn't have the barrier and the walking path.” However, two participants did not express acceptance of the barriers. Both of these participants took part in paired interviews, and their views on this topic were opposed to their partners. For example, in this exchange, the lack of acceptance is clear from participant 2:

> Participant 1: “I'm not a big fan of humans modifying their surroundings a lot but like they are you know for people's safety so I'm kind of all right with it.”
>
> Participant 2: “I’m not.”

The interpretation of the community’s place attachment and the relationship between place attachment and perceptions of place disruption (relating to physical change to the built environment, climate change and related hazards) derived from these results are discussed in chapter 5.

4.2 Assessment of Virtual Walking Tour method

The virtual walking tour method is evaluated in two ways. First, segments were coded as showing immersion in the virtual walk. Indicators of immersion included when participants recalled memories triggered by visual cues, when participants commented on the environmental conditions during the walk, or when they disagreed or redirected the route of the walk to go and visit something that they considered important. Segments that indicated immersion were coded using MAXQDA, in the same way as other topics and themes. Participants were also asked directly about the experience at the end of the interview. The results from these data are in section 4.2.1. Secondly, the responses to the post-interview survey on the success of the method from the participants’ point of view are found in section 4.2.2.

4.2.1 Interview data: indicators showing immersion in the virtual walk

A total of 71 segments were coded as showing immersion in the street view experience. These were analysed as falling into three categories: triggered memories, noticing environmental conditions, and giving directions.

Participants recalled personal memories about different locations. These sometimes related to avalanches, but were often about social occasions they remembered that were associated with particular buildings or streets, for example. In total 48 segments were coded as memories. Participants referred to many small but significant events and light-hearted memories that evoked a sense of nostalgia, such as: “Albina, the shop over there. I mean, that is the first place that I actually tasted machine ice cream for the first time. So I have a lot of good memories there.”

Participants noticed the weather or other environmental conditions in the imagery on street view, such as: “It's really low tide as well, we can see on the boat.” At times they made comments which related to the subject they were already talking about or helped to explain the content or location of what they were saying (“Behind where they are drying their laundry up there”) but often comments were made as asides, such as for example: “Oh, that’s my car”. This reflected how the flow of conversation on a real walk can change direction caused by distractions in the environment.

Participants were encouraged to divert the route when they wanted, and some gave more directions than others. Participants gave directions, since they did not have control of moving through the street view, so this was captured in the transcription, as in the following instructions: “Also the harbour is always full of life – oh here we can turn right […] Yes, and then before the red house we can turn left.” Variation in the route was documented (Figure 4.8), with some diversions exploring Vatneyri, Geirseyri beach, or the mountain pass. Other diversions went further afield, around the other side of the fjord to areas such as Scápadalur or Bardastrand, which showed the importance of the wider environment. Feedback on this aspect also came from the post-interview survey.

The coding system made it possible to show a thematic map of the locations where any coded segments occurred. It was found that the majority of coded segments relating to triggered memories or indicators of immersion in the virtual tour were concentrated along the walking tour route (Figure 4.9).

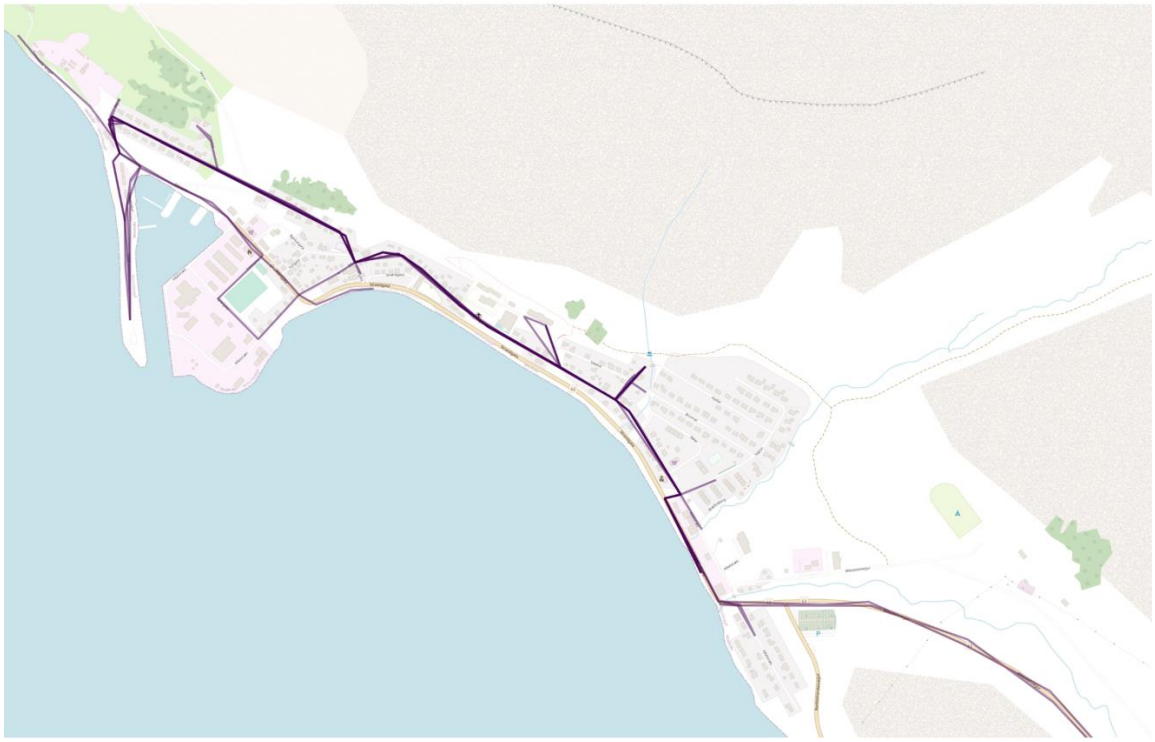

Figure 4.8: Routes and diversions taken in the virtual walking tours. Diversions during the tours can be compared with the planned route (Figure 3.3, also shown below in Fig. 4.9).

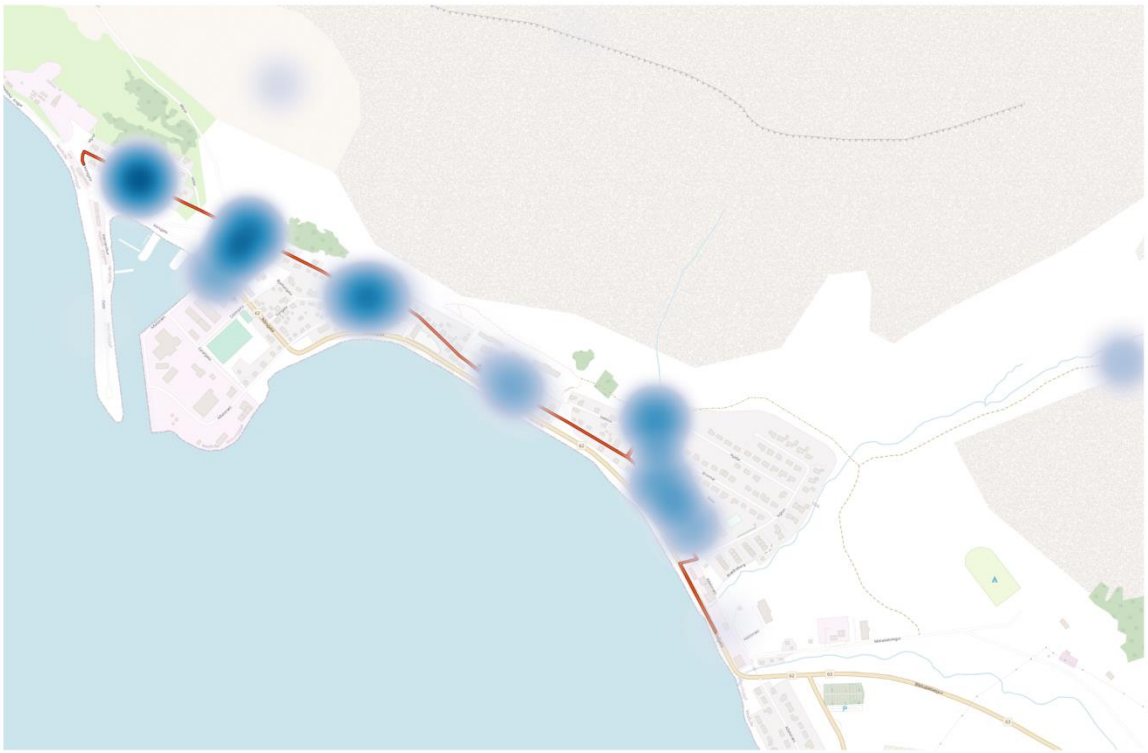

Figure 4.9: Memories triggered and indicators of immersion in the virtual walking tour. These indicators are marked on the heatmap in blue according to reference points, and most of these are located along the walking route (shown by the red line) rather than further afield, possibly showing that visual cues triggered the participant's immersion in the interview.

Finally, participants were all asked for their reflections on the experience at the end of the interview. This resulted in responses from all participants and 21 coded segments, but it was felt that in order to allow people to express themselves more freely, the interview should be followed up with the option to give anonymous feedback. This was elicited using the post-interview survey.

4.2.2 Post-interview survey

Ten out of eleven participants completed the post-interview survey, of whom 6 were residents and 4 were non-residents. Seven completed the survey in Icelandic and three in English. One participant reported their age as under 30, four were aged 30-49, five aged 50-70.

On a five-point Likert scale, nine out of ten participants rated the ease of use of technology during the interviews as 5 (very easy) and one rated it as 4, to give a mean rating of 4.9.

Of the responses to the question "What was the most enjoyable thing about the walk?" many of the participants referred to the novelty of the experience, stated that it had brought back memories, or provoked new perspectives or thoughts about the area. The following sums up the overall response*:* "New experience seeing very familiar surrounding from different perspective. Definitely different memories come back when doing virtual tour rather than the real walk."

When asked about how they rated the length of time taken to do the interview, there was some variation. Half of the respondents rated it as the right length, four would have liked a little more time, one would have preferred a lot more time. Participants were asked to rate the level of engagement in the interview through the question: "Did you feel inspired to talk about the town and its surroundings, and to share your memories during the walk?" The mean response on a five-point scale was 4.4 (with a rating of 5 corresponding to "very inspired").

Participants were then asked whether they would have preferred a real or virtual walk, and the results were split 50-50. When divided by place of residence, since this is a practical consideration for non-residents, the results showed that one non-resident would have preferred a real walk, with the other 3 non-residents preferring the virtual walk. Of the residents, four would have preferred a real walk, and two residents stated that they

preferred taking part in the virtual walk rather than going on a real walk. When asked to explain their answers, there was a mix of practical considerations and enjoyment of the novelty of doing it online: “It is different to see the town in pictures and it gives possibilities and space to interpret feelings and opinions "without influence" from the town.”. Responses to this question also drew out comments that showed participants could see the utility of the method for a research project, and that they understood the purpose of the method:"I like walking and walking around the town a lot, but this technique is very nice and is very suitable for projects like this."

Preference for a real walk came from wanting the physicality and immersion in nature that would only be possible with a real walk, such as being able to look closely at the environment, stop, drink coffee, for example one participant said: “I would like to go on a real walk with you and take time to chat and also stop for a coffee, on a real walk we could stop at small details and zoom into them, have a closer look.” Others pointed out that they favour the physical nature of walking for exercise and fresh air: “It is healthier to go on a real walk, and because people are spending so much time home now, I think we should use every opportunity to get out of the house.” Other participants felt that they would be able to relate their views and experiences better by being in the physical environment: “The story becomes clearer when I'm there.”

Participants were asked: Did you get the feeling of a real walk around the town during the virtual walk? Responses could range from 1-5, with 1 being “not at all”, 5 being “it felt very real”. The mean response was the lower than other ratings, at 3.9. This question was followed up with a multiple-choice question: “Would any of the following options have made the walk seem more "real"?” Participants were able to choose any number of options. The option with the highest response was hearing sounds of the town (four votes), followed by walking along a different route (three votes). Other options relating to taking part as a group, talking about other topics and speaking Icelandic during the walk received two votes, and walking in silence received one vote. Nobody voted for starting the route elsewhere. Participants also made their own suggestions for improving the walk, including using Virtual Reality technology, being able to smell different scents in the environment, and moving more slowly through the environment (Table 4.1).

When asked for elaboration, other comments were related to the route and interview topics, suggesting that the route was too limited for what they wanted to explore. For example, one participant responded: "I would have chosen a bit other path than we followed. I could feel how I was directed to places the guide wanted me to tell something about. I had been looking forward to go to other places. And when we were in the neighbourhood, I could feel it was not enough time left to go there."

Participants were asked if there were any other locations they would have liked to visit during the virtual tour. Response to this question was not compulsory. Three responded "No", and two did not respond. The other five responses suggested a range of locations, some of which would not be possible in street view such as: "Maybe up on the mountain because I never did that when I was there". Others suggested locations within the town such as Central Square (Friðþjófstorg), Hafnarsvæðið, the old houses on Vatneyrinn and the monuments, the harbour, Björgin.

Table 4.1: Preferences and suggestions for improving the sensory experience of the virtual walk

Option	**Number of votes**
Hearing sounds that you would hear around the town	4
Taking part as a group with friends/family	2
Speaking Icelandic during the walk	2
Starting from a different place	0
Walking along a different route	3
More time just "walking", in silence or with no questions	1
Talking about other topics	2
Other suggestions: VR technology; moving more slowly; being able to smell different scents	

The results of the coding analysis and the assessment of the method are discussed in Chapter 5.

5 Discussion: The Village – a remote, safe harbour

The discussion of the results is divided into two sub-chapters. In the first part the interpretation of place attachment and perceptions of place are discussed. The second part discusses the success of the methodology.

First, the sense of place derived from the salient themes is outlined. A sense of place gives an insight into the lived experiences of the community, which is essential in order to understand their priorities. The salient themes identified in chapter 4 gave an insight into the character of the study location, its strengths and vulnerabilities, as described by the group of participants who took part in this study. This then guides an understanding of the community's place attachment and the interplay with perceptions of place, especially relating to place disruption. The eight salient themes were interpreted as being interconnected, and driven by two overarching qualities or drivers: *Safe harbour* and *Remote*. The sense of place was found to be well-illustrated by words from *Þorpið*, "The Village", a poem based on life in Patreksfjörður written by the local poet Jón úr Vör in 1946, which was mentioned by one participant during their interview:

Þungt gnæfir fjallið yfir okkur bert og grátt,
til fangbragða ögra risaarmar hafsins,
hvert má þá halda?

Heavy is the mountain above us, barren and grey,
the arms of the sea challenge you to wrestle,
where can you go?

This poem, translated into English by Guðrún Úlfarsdóttir and the author for the purpose of this research due to a lack of available official translation, and it was read in more detail after the analysis was complete. Although many aspects of life have changed since it was written, almost all the themes that were drawn out of the modern narratives coming from the virtual walking tours were reflected in lines of the poem, and these are used to help understand that place attachment is embedded in personal and collective cultural history, augmenting what was found through applying the structured coding system. Lines of

poetry are used to mirror and bring together the salient themes (described in the results) in the section that follows.

The overall sense of a safe harbour was identified as crossing through multiple categories and codes. The sense of safety and shelter provided by the mountains was interpreted as being important to the participants' relationship with the environment, and suggested that the community has a meaningful connection with the natural surroundings of the town. The mountains were overwhelmingly described as safe, providing shelter or protection from the worst winter storms, as opposed to being perceived as a source of danger or a threat. In contrast, there was also a high level of awareness of the history of avalanches and slushflows and the damage they have caused, including some personal memories of the fatal 1983 slushflow, with some participants having been evacuated from their homes on occasion. This contradiction between a sense of safety and experience of hazards presents a cognitive dissonance, but could be explained by individual attachment to place, as suggested by the reviewed literature (Bonaiuto et al., 2016; De Dominicis et al., 2015; Pagneux et al., 2011).

Kirkja er okkur ströndin og hafið og fjallið

Our church is the coast and the sea and the mountain

Local environmental knowledge as a salient theme also appears to indicate a close relationship with nature and the high value attached to the natural environment, and is linked to engagement with the surrounding valleys and mountains. This theme also overlaps with the theme of non-monetary value derived from the environment. Non-monetary values were reflected in behaviour such as foraging and leisure pursuits in the local environment, and abstract enjoyment or meaning derived from the environment (expressed as visual enjoyment, thoughts expressed through metaphor, etc.). Mental health benefits of these activities and the natural environment were implied in some segments coded for these behaviours, especially when talking about the tranquillity of certain areas such as Litlidalur, or the lack of human presence in areas where it is possible to sit or walk in coastal areas around the fjord. Elements suggesting place dependence due to the geography and character of the place came through clearly from many of the participants' explanations of what they value in the community.

bíður ung kona við þaragróna vík
og hlustar eftir blaki af árum

A young woman waits in a kelp-grown cove
and listens for the fluttering of oars

Remoteness also cuts across multiple salient themes. While the word remote can be loaded with negative connotations, it can also be a positive characteristic, and describing Patreksfjörður as remote is meant to objectively reflect the geographical position of the community in an area which takes some effort to access. It is also important to recognise that remoteness is a relational concept, connected to the concepts of place, region and scale (Paasi, 2004), and for people living in Patreksfjörður or any small coastal community, using this term to describe their town situates them at the edge, and other regions (such as the capital) as the centre. Doing so creates an impression that remoteness equates with insignificance or unimportance, which is problematic in the context of uneven rural development in marginal areas (Bock, 2016). Like all small coastal communities in the Westfjords, Patreksfjörður's geographical location, a coastal area with access to rich waters and protection from the elements, provides a safe harbour and this is the reason the area was settled.

Guðspjall dagsins vanmáttur mannsins
Í lífi og dauða

Gospel of the day is man's helplessness
In life and death

The remoteness of the region is interpreted as the dominant geographical characteristic of the town, and is an overall driver for other themes that emerged relating to the community, contributing to both its strengths and vulnerabilities. Community cohesiveness is one salient theme that is assumed to be related to the size of the community and a need for neighbourly behaviour due to the challenges of living in a remote area with limited services and resources. It appears that Patreksfjörður is a tight-knit community, benefitting from strong networks and mutual support, participation in community roles such as the Icelandic Search and Rescue team (ICE-SAR), and some participants stated that it is welcoming to outsiders or newcomers.

konur, sem lauma í rökkrinu nýskotnum fugli eða fiskspyrðu inn um eldhúsgætt
grannkvenna sinna, ef farið hefur verið á fjörð

women, who in the twilight slip a newly shot bird or a couple of fish in through their neighbouring women's kitchen doors, if they have gone on the fjord

Cohesiveness is connected to community membership, which was described in both positive and negative terms, on the one hand being open to outsiders, while on the other hand having only so much to offer certain people, particularly the young. There is a sense of paradox in the defining geographical characteristics of the community. Remoteness positively impacts community membership and cohesion, and is described as ideal for some people, but is also the source of key vulnerabilities, such as distance from services, lack of connectivity (e.g. limited road infrastructure), and higher costs of groceries or other essential goods. The geographical location of Patreksfjörður limits access to services, specialist healthcare, employment and specialist training opportunities. One of its resources, the rich waters of the fjord, which is derived from its location, is also a source of vulnerability: the dominance of the fisheries creates a strong local economy, but over-dependence on one industry creates a potential vulnerability, which was identified by many participants. In contrast with the past, the fishing industry is no longer a physically dangerous occupation, but a different source of precarity for the community whose storms may be even more difficult to predict or manage.

Og næsta morgun var blár steinbítur
á héluðum hlaðvarpasteini,
og sól sindraði í silfri ýsuhreisturs, --
og hamingja í húsi fátræks manns.

And the next morning was a blue wolffish
on a hearthstone covered with rime frost
and the sun sparkled on the silvery haddock scales
and happiness in the house of a poor man

The safe harbour of Patreksfjörður provides shelter and beautiful natural surroundings. It is also at the core of the economic life of the town, but dependence on this industry presents a sense of vulnerability: Participants perceive that economic collapse is more likely to bring about decline in the community than any natural hazard. The town's remote location is understood to be integral to some of the community's strengths but also its vulnerabilities. The remoteness (and size) of the town drives the need for mutual support and social connections, but it also hinders access to services and connectivity with other parts of the region. These aspects of the town's character are understood as being at the heart of the nature of their attachment to place, which is explored in the next sections.

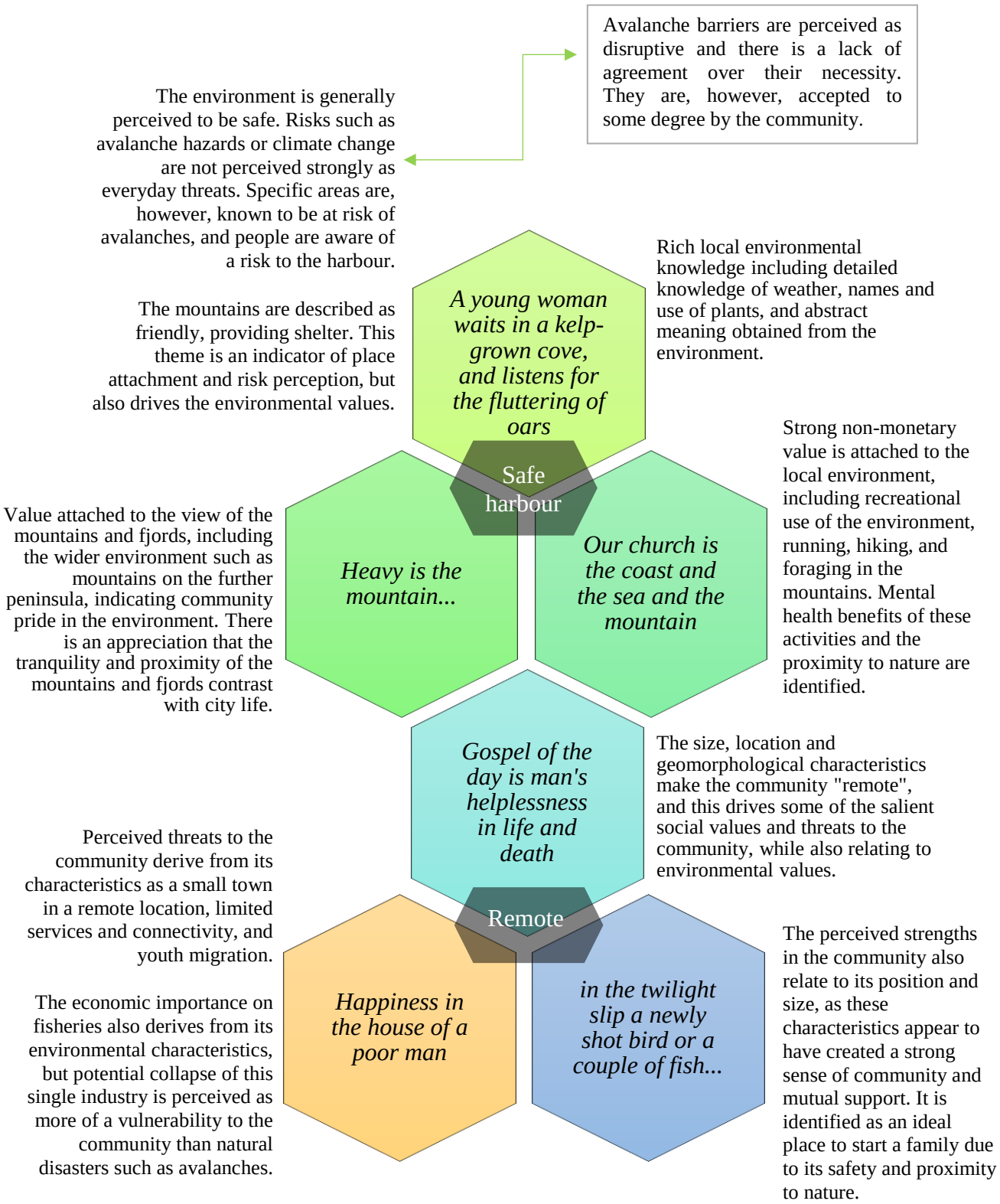

Figure 5.1: Salient themes. Themes elicited from interviews and illustrated by lines from the poem Þorpið *help to understand the nature of the community's place attachment. Themes are interconnected and highlight key values and vulnerabilities, as well as shedding light on perception of place disruption.*

While the focus was maintained by the semi-structured interview narrative and basic route plan, each virtual tour resulted in a unique impression of that person's experience of the place. During analysis the codes were allocated colours for broad topics in order to help guide the coding in a visual way. The structure and colour codes applied to the coding system can be found in Appendix E.

Using the colour codes of the topics, anonymised portraits of each interview were created using MAXQDA (Figure 5.2). These portraits allow a comparison of the concerns of the individuals involved in the study, showing for example that some participants focussed more on social topics (purple) and others on environmental topics (green), or avalanche knowledge and experience (turquoise). The portraits also highlight where different topics arose at different points in the interviews, which is reflected in the contrasts in the sequencing of colours in the portraits. This visual representation highlights that although the analysis of the narratives is based on an impression of the participants as a collective, within this group there were unique voices with different concerns.

The summary of salient themes combined with the interview portraits should demonstrate that the character of the community is complex, with many positive features but also a number of vulnerabilities and contradictions. While many residents benefit from its qualities, it can be a hard place to live for some people, far from a simple rural idyll, or simply a repository of idealised values (Shucksmith, 2018). Attachments to domestic space are not necessarily straightforward (Manzo & Carvalho, 2021), and some participants expressed mixed feelings as well as negative experiences, which was to be expected, but the overall impression given was positive. When searching for participants, one person who was approached declined to take part because they didn't want to dredge up memories of the time they lived there. Those who did volunteer might have given more positive accounts because they genuinely have a positive experience of life in the community, but they may also have deliberately avoided speaking about subjects they perceived as negative. This was mitigated to a certain extent by finding ex-residents of Patreksfjörður, some of whom spoke about bad memories and negative experiences connected to certain places. The interpretations made here can only be taken to represent those who took part in this study, but they do offer an insight into the essence of the community's place attachment and how the community relates to and perceives the landscape of the town.

Figure 5.2: Interview portraits. Each interview discourse followed a unique thematic path, reflected in the variations in colour patterns in each portrait, despite following the same route and using the same semi-structured interview narrative in every virtual tour.

5.1 Place attachment, perceptions of place & place disruption

The salient themes and sense of place described above were interpreted to discern the nature of collective place attachment. Within the group of participants, it was interpreted from the data that the nature of place attachment in Patreksfjörður involves:

- A sense of comfort and safety derived from the environment;
- Engagement with the environment through behaviour and cognition;
- Local knowledge of the environment, including its nature and culture;
- Expression of appreciation and pride in the environment;
- Expression of opinions about place disruptive elements of the avalanche barriers;
- A sense of community connectedness and cohesion;
- Importance attached to place-protective roles and duties within the community;
- Place dependence based on the presence of mountains and water, for personal preference or leisure activities as well as economic reasons.

Using Manzo & Perkins (2006) Ecological Framework to analyse how place attachment is structurally embedded in the community, an understanding of engagement on the physical, social and economic levels was derived from the data. In the physical domain, there is a sense of shared place meaning and attachment, expressed through the sense of safety, resident pride and satisfaction in their environment, and place dependence related to leisure activities and enjoyment of the qualities inherent in the landscape. At the social level, there is a strong sense of community, neighbouring behaviour and mutual assistance, participation in community organisations, as well as strong networks and social cohesion. At the economic level, there are elements of place dependence due to the favourable location for the fisheries, as well as private investment, property and involvement in fundraising for community assets. At the political level, the situation is less clear and there is not enough data about this domain to make strong claims about community empowerment or citizen participation. There is a sense that there is potential for and space has been made for community involvement in local decision-making during consultations for the avalanche barriers, but there is also an impression of passivity in this area of community life unless an individual has an official role through employment or being an elected official. This could be an area to focus on in future research.

In terms of the perception of place and their environment, avalanches and slushflows are an obvious focus. Residents appeared to be dismissive of the threat of avalanches in some areas, such as above the street Mýrar, where modelling had designated the highest risk (Zone C), despite some people occasionally having experienced being evacuated from their homes. This part of the narrative was difficult to approach, as it represented a conflict between the rationale for the construction of the barriers (based on avalanche modelling) and the local knowledge and observations of people who have inherited wisdom from previous generations and who see and experience the landscape every day. Understanding where this conflict of opinion on the necessity of the barriers comes from could be relevant for decision-making processes in future development of similar infrastructure, and the communication involved in planning. Although participants' dominant perception of the surroundings was that it gives a sense of safety and shelter, their high awareness of and ability to identify hazardous areas of the town means that the threat to the community from natural hazards is not absent from people's minds. There was a great deal of local knowledge of historical slushflows, avalanche paths and the hazardous zones prior to the building of the barriers, and also knowledge of the risks remaining to the harbour area.

Participants' opinions of the avalanche barriers were mixed. Some view the barriers as unnecessary in certain areas, including areas which were assessed as Zone C (at the highest risk of avalanches), whereas others expressed that they did not know enough to have an opinion. Some described how they perceived very negative physical impacts on the local environment, including in areas that were important to them personally, but there were also positive perceptions of how they have added to leisure opportunities by creating new walking paths and views around the town.

The strength of opinion about the avalanche barriers gives significant insight into the degree of place disruption that they cause, and may give an additional insight into place attachment in this community. Place attachment includes an affective bond to both the natural and the built environment (Mihaylov et al., 2021). A strong sense of place, including place bonding or place attachment "usually causes opposition to, and rejection of, place disruption" (Mihaylov et al., 2021; supported by Quinn et al., 2019), and based on this assumption and the sense of place derived from the salient themes in our analysis, this reinforces the finding that people in Patreksfjörður have strong emotional bonds to the place in physical, social and economic domains, whether as their permanent home, as

summer or temporary residents, or people who no longer live there but still value it. Within the group surveyed, there was of course some variation, as already noted. Despite the overall sense of attachment to the place, all current residents acknowledged that they could imagine some reason to take them away from the place, even if they had a strong desire to stay. However, none of them identified place disruption from natural hazards as a reason to leave the community. Nor did they express that place disruption caused by the barriers would make them leave.

It was common for people to say that they had simply got used to the barriers, or that it was worth having them in order to protect lives, despite holding negative opinions about them. This suggests a degree of acceptance of the changes that are being made, which is a key stage following place disruption and an indication that perhaps efforts taken to address community concerns have achieved some success (Mihaylov & Perkins, 2014). An analysis was made of whether there were any variables which might indicate likely acceptance or not, based on comparing the characteristics of individual participants. This resulted in the finding that participants who were born in the town did not indicate any level of acceptance of the barriers, and since these individuals did not have any other variables in common (e.g. gender, age, permanence of residence, or length of time in the community), and all other participants indicated acceptance, it suggested that birthplace, combined with a continued stake in the community, may have a stronger bearing on acceptance of the avalanche barriers than other variables. This cannot be stated firmly due to the small sample size but may be worth exploring in future studies into related topics.

Finally, the perceptions of climate change were mixed. Many participants recognized a change in local weather conditions, or mentioned some specific details relating to climate change, but it was not interpreted as being a particularly salient topic on its own. Some participants stated that there is less snow cover in Patreksfjörður and the southern Westfjords, some mentioned mudslides in general, or the mudslides in Seyðisfjörður, and others talked about rising sea levels. When asked, some said that it was not a topic they knew much about or that they felt was not relevant to the community. The topic of climate change was not prevalent in the interviews, and this may give an insight into the question of whether climate change is a salient topic for participants. It was decided during the research design process to wait for participants to bring up the topic themselves, in order to see whether the topic was salient or not, and it appears that it is not salient. Other reasons

for the lack of salience could be that unlike the avalanche barriers or other features of the landscape, climate change cannot be seen in a street view image. As the virtual walking tour depends on visual stimuli, whereas climate change is a topic that could seem very abstract, this could be another reason for a lack of insights on climate change from participants. However, the importance of the issue globally and its connections with questions about the future, or about change in the landscape, make this latter reason rather weak.

The topic of climate change was followed up more directly with participants by email to get further insight. Responses added to the interview data, showing that overall participants did have a general awareness of climate change, with some specific observations of local weather conditions (such as less snow cover). Participants also mentioned sea-level rise and the impacts this might have on housing in terms of available land and damage to property from water. One participant did refer to increased precipitation, but likely future impacts on the local area relating to landslides were not elicited. Another response indicated a high level of sensitivity to the environmental indicators for landslides, commenting that the noises coming from the rocks in the mountainsides moving during or after heavy rainfall, which was a common phenomenon for example in Ísafjörður, where rock-fall is more frequent, is not something that is heard in Patreksfjörður. Comments like these illustrate the significant levels of local knowledge and heightened perception of the local environment among participants, but only serve to highlight the low salience of the topic, and even a low level of denial that there might be a severe local impact from climate change in future. Like the perception of avalanche and slushflow hazards, it appears there may be a disconnect between observation or knowledge of local conditions and the perception of risk. It appears that despite the recent decision to carry out landslide hazard assessments in this community, the link between climate change and avalanche, slushflow, rockfall or landslide hazard in Iceland has not yet become part of the public understanding or perception of the impacts of climate change on the local environment.

5.1.1 Understanding the link between concepts and reality: Place attachment, denial of risk and acceptance of change

Qualitative analysis of the data reveals the values, strengths and vulnerabilities perceived by the participants, which have been used to determine the nature of place attachment in this community. The interplay between place attachment and perceptions of place and

place disruption have been explored above. Overall, it has been assessed that place attachment among the participants in this study is related to the described sense of place, crosses multiple domains and manifests at different societal levels. It also appears that the changes made to the environment around the town in recent years are perceived as place disruption. Place attachment may drive the perception of disruption, and there are different responses to this place disruption. While some accept the barriers and can see new benefits beyond their primary function, such as providing walking routes, others object to their visual impact, appear to reflect a denial of hazards and there is variation in acceptance of the disruption. This may reflect some shortcomings of the consultation process, trust or a miscommunication of hazards; or it may simply reflect that the process of constructing the barriers is not complete, and the participants may well be satisfied with the end results when construction work has ended, the barriers are planted with vegetation for aesthetic improvements, and more walking routes and places to admire the view are made accessible. Some individuals may continue to reject the changes altogether, and birthplace has been highlighted as a possible variable having some influence on this outcome.

Vulnerability due to avalanche or slushflow hazard is perceived as less of a threat to the community than socio-economic vulnerabilities, and it did not appear that there was an understanding of the link between climate change the increasing risk of hazards. The one remaining area in hazard zone C after the completion of the barriers will be a section of the town's harbour, which is of key economic and cultural value to the community. At present it appears that there is a disconnect between the perception of place disruption from hazards, and the potential for climate change hazards to cause socio-economic damage. Climate change is perceived as having some local impacts, but also as a distant threat. The impacts it could have on the economic resources of the community include direct damage to the harbour from a large avalanche. Impacts of climate change on fisheries in general such as ocean acidification or warmer oceans were not mentioned at all, neither were the potential for landslides further afield to affect the community, for instance by blocking road infrastructure and connectivity, all of which are of importance to the local economy.

Local environmental change that is viewed as disturbance can affect people's sense of place identity and belonging, and since place attachment and related concepts such as positive social bonding can motivate a community to mobilise for the protection of place, these need to be understood in order to make interventions that positively impact

communities (Mihaylov et al., 2021). The avalanche barriers protect the community from disruption due to avalanche and slushflow hazards to a certain extent, but they also cause disruption to the local physical environment, including the area immediately outside people's homes. According to the results of this research which suggest that physical interventions in Patreksfjörður have caused a sense of place disruption, potential implications for planning and development include more effective messaging and more participatory policy-making which takes place attachment into account.

Planners and emergency management agencies should be considering "inherited knowledge, risk perception and nuanced attachment to place in conjunction with social issues" (Bird et al., 2011) in communities such as Patreksfjörður, in order to help with decision making as coastal Icelandic communities begin, or continue, to experience climate change impacts. However, it should also be repeated that steps were taken to consult with the community prior to construction, and this may have contributed to eventual acceptance of the barriers by most participants. Furthermore, Patreksfjörður may be unique in that its recent history means it has experienced relatively few impacts from natural hazards, but has had a large investment made in the avalanche defence infrastructure. In addition, the geography of the town and local topography leave little space between residences and the mountains, and participants were aware of this, citing the words of Jón úr Vör: "There is this one poem with the mountains, the high mountain, you know, and the sea, you know - crazy - and you are just in between but where can you go? You know, the mountains tower over us, he says, and the sea, it invites you to a wrestling match […] where can you go in these circumstances?"

5.2 Virtual walking tours: Lessons learned and future development

Data from the interviews that suggested a level of immersion in the experience were coded and are used to support the utility of the method. The recollection of personal memories supports the data from the post-interview survey that the method can bring out latent perspectives or opinions. These place-based memories triggered by the visual stimulus of the street view are important to the investigation of place attachment as they fall into the affective and cognitive parts of the place attachment framework, and can provide

particularly rich place-based data about special places and community values relating to specific locations.

Comments about the conditions in the street view suggested that there was a degree of suspension of disbelief about the experience, and that some participants became deeply immersed. The statements often were not qualified as being virtual by saying for example "in the picture", they were simple statements of fact (e.g. "It's low tide"; "Oh, that's my car"). This suggests that the data collected comes from a participant who is fully involved in the experience, is comfortable with the experience, and is hopefully speaking freely and as authentically as they would on a real walk.

Instructions given by participants to divert the route or change the view were coded as relevant to the level of immersion in the walking tour. There were mixed results between participants, which is explored in more detail in section 5.2.2. Some participants gave many directions and some gave none. The spatial information related to these results (Figure 4.9) support the idea that what the participants were seeing in the street view images were the dominant stimuli for the data that was gathered, as the memories and immersive indicators appear to closely follow the main route that was taken.

This shows the importance of the visual stimulus for eliciting insights into the life of a community, as the method provoked thoughts and memories that we assume are connected to what people were seeing. The density of immersive indicators within the town might also suggest that in the wider environment, people have less densely located "special places". For one person there is importance associated with the mountain Muli, for another Blakkur, whereas in the town many people are forming memories on a daily basis. It would be interesting to see the contrast with elicited memories from an in-person walk in this respect. Overall, the ability to present the data resulting from this research in thematic maps supports that the methods used (virtual walking tours with coding analysis and mapping) can draw out place-based information which could be useful in particular contexts, such as land-use planning (Brown & Raymond, 2007).

The general outcome of the post-interview survey was that it was a positive experience. It is unfortunate that one participant did not respond to the survey, as it is possible that non-response could indicate that this participant had a negative experience and their feedback could have been the most useful for making improvements. However, even assuming that

this person had a negative experience, a positive response from 10 out of 11 participants is encouraging in terms of the suitability of this method for future research.

The results of the questions relating to the technology used in the virtual walks was positive, with every participant responding that it was easy or very easy to take part. Responses from participants indicated that the most enjoyable aspects of the walk were that they were able to re-visit places, that memories were triggered, that it was a novel experience, or that the interview made them consider new or different perspectives, suggesting that this method could be used as a way of exploring subjects that people do not usually talk about in their day-to-day lives, or to trigger discussion of subjects that are otherwise latent.

Opinion was divided over the preference for a real or virtual walk. Feedback from participants indicates that they had a good insight into the motivation behind doing the virtual walk for research purposes, and they could see the value in using this method in order to save time, to avoid distractions or bias creeping into their responses from "influence from the town" itself. Some responses indicated that participants would have enjoyed both a virtual and a real walk, but the question had forced them to choose one option. Ultimately, personal preferences will always vary. In terms of lessons learned, it appears that it might be worth carrying out an in-person method such as transect walks in combination with the virtual walks if possible. This would potentially draw out different information and some individuals might be more comfortable with this method. In addition, it would break down the barriers inherent in the computer screen (such as more subtle tone, body language, etc.), which could help with forming a good rapport with participants.

There was some variation in the length of the interviews (40-94 minutes) and the surveys were anonymous, so the responses about the length of the interviews are interpreted based on the average length. There was some variation in the answers but nobody answered that it was too long and some participants stated that they would have preferred to talk for longer. It can therefore be assumed that participants who have volunteered their time to take part have done so because they are already interested in the experience and have set aside the time to do it, and so the interviewer should not worry about taking up too much of their time. There are obvious limitations in terms of data processing time, and it is

important that if extra time is allocated to an interview, it addresses the subject of interest. The average length of the interview was 52 minutes, which suggests that an hour is an acceptable amount of time to schedule. Finally, results relating to this question indicate that participants were comfortable with the experience and the questions. If participants had not been enjoying the experience, they may well have expressed that they felt the interview was too long in their response to this question.

The lower mean response of 3.9 out of 5 to the question relating to how "real" the walk felt indicates first of all that the virtual walk is not a replacement for in-person methods such as walking transects, and also that the experience could have been richer on a sensory level. Despite the advantages of the method, there are improvements that could be made to give a deeper sensory experience and try to get closer to an outdoor experience. The most popular suggestion for improving the sensory experience of the virtual walk was to be able to hear sounds that would be heard in the town and its environment. It might be worth trying to create a soundscape as a simple improvement to the virtual walking experience, by making field recordings in the research location or by using pre-existing recordings that could be played at key points.

Other considerations are related to providing the option to carry out the interview in the participant's mother tongue, and that some participants might enjoy taking part with friends or family. The option to carry out the interview in Icelandic was chosen by two participants, and it would be preferable to do this where possible in order to get closer to the lived experiences of those individuals who feel more comfortable using their first language. There were also participants who spoke other languages as their mother tongue and there are obvious constraints depending on the budget and resources of different researchers.

As mentioned, in two of the interviews the participants took part in pairs. From the researcher's point of view, it could be of benefit to find more participants who are willing to take part as a small group, because a pair or group who are comfortable in the interview may begin to discuss issues or memories amongst themselves, agreeing with or contradicting each other, which allows the researcher to step back from controlling the narrative and gain different insights. This occurred in the paired interviews and is an established benefit of focus group interviews (Longhurst, 2016).

Some comments suggested that participants felt rushed and didn't feel they could opt to go to other areas in the town. Although most participants stated that they had enough time, these comments came from three participants, so a lesson should be learned from this. One of the lessons learned is not to rush the route or the interview. As discussed above, if participants have volunteered or agreed to take part, it should be assumed that they have the time to take part, and that if they need to leave, they will say so.

Variation in regard to this aspect of the interviews as well as how involved participants were in the process could be an indicator of how comfortable different participants were in the interview setting. This could be due to individual differences, or it could be a reflection of how well the researcher was conducting the interviews. It could for example reflect the level of confidence or comfort on the part of the researcher, which improved with familiarity with the methodology and when prior, informal exchanges before the interviews had occurred.

It should be emphasised more strongly to participants that they are encouraged to divert the route to special places. At the beginning of the interview, participants could be asked where they would like to go. As shown from the survey results, participants could also be asked for their feedback on the route after the interview, and this information could inform the design of the next interviews. On the other hand, the controlled route was deliberately designed in to the research method to maintain the same conditions for all participants. In addition, the amount of data that could be analysed was limited by time constraints. Therefore, while it might be worth consulting with participants about the route taken, it is likely that due to issues of control, resource limitations and individual preferences, there will always be some kind of shortcoming to the either the replicability of the method or the satisfaction of the participants.

This method was well-suited to this research topic, and was especially useful during the Covid-19 pandemic where remote methods helped to carry out research with community participation. Lessons learned and recommendations from analysis of the data include:

- Virtual walking tours can provoke discussion of latent subjects, trigger memories, or provoke participants to consider new or different perspectives;
- Participants are able to understand the purpose of a virtual walk and see its benefits;

- The method may be improved by combining virtual tours with in-person research methods such as transect walks, if possible;
- Participants who volunteer to take part tend to enjoy taking part and are happy to offer their time, so the tour should be done at a relaxed pace and not be rushed;
- The decisions made about the route and places visited are important, and in order for the participants to feel satisfied with this side of the experience, they should be reminded and encouraged to choose locations to go to that are meaningful to them;
- The length of 1 hour is an acceptable time-frame for a virtual walking tour;
- The sensory experience of the virtual walk could be improved by adding a sound-scape or audio soundtrack;
- Other ways to improve the method might include using the first language of participants;
- Another option for improving the experience for participants and enhancing the data for researchers is to carry out the virtual walking tour with small groups.

This method has a number of advantages that make it well-suited to qualitative, place-based research, especially as a way of carrying out participatory qualitative research during a pandemic. It is suggested as an effective method for gaining a rich understanding of a community's place attachment and valued places, which could be used by planners to improve the design of adaptations aimed at protecting communities and the consultation process, and also reduce costs associated with the consultation process. As the method requires minimal resources, it is a cost-effective method for improving approaches to participatory emergency and land-use planning.

6 Conclusion: Heavy is the Mountain

This thesis investigated the nature of place attachment in one small community through qualitative interviews and spatial analysis carried out using the new method developed in this study, virtual walking tours. Participants were asked questions that aimed to draw out perceptions of the environment, and to ascertain to what extent climate change and related natural hazards are important to residents in this location. The findings indicate that place attachment matters for perceptions of place, especially concerning disruption caused by changes to the built environment. The study found that alterations to the landscape for the purpose of protecting at-risk groups has had an impact on the wider population and to some extent may impact upon how people relate to their local area, meaning that large infrastructure development such as avalanche barriers have the potential to disrupt the relationship between people and their environment.

These results suggest that the planning process in this location could have been improved, and with the benefit of hindsight and the results of this study there are suggestions that can be made. The most obvious suggestion is that consultation should give residents a sense of being listened to and having their needs taken into account. A participatory process rather than the simpler form of consultation that took place could have allowed planners to gain a deeper insight into the valued places in the community landscape, and also address concerns or doubts in a more personal way. For example, it still appears that local knowledge is at odds with the avalanche modelling, and this does not appear to have been approached well in the consultation process, at least with some residents.

However, some factors appear to have mitigated this disruption to a certain extent, leading to the majority of participants accepting the barriers as part of the landscape. This could reflect at least a degree of satisfaction in the consultation processes, that planners have positions of trust in the community, or that they have addressed some of the community's needs, for example through incorporating walking routes into the designs; all of these factors were mentioned by some participants. Additionally, one key area of dissatisfaction with the barriers appears to be their proximity to people's houses, and as noted in relation to practical considerations as well as by the local poet Jón úr Vör, the geography and

topography of the town means there is a lack of space to in which to build new infrastructure or housing, so there are simply very few ways to deal with this problem. Again, the only way to mitigate people's sense of place disruption in a context where there are no other options in terms of the physical changes that must be made is through better communication and building trust with residents.

The study also found that in this community, hazards and place-disruption relating to climate change are not seen as being linked to socio-economic factors. This phenomenon may play a part in the difficulties faced by those trying to convince the public that climate change is of genuine concern to their day-to-day existence, but it also reflects a failure to communicate that message. There are, however, links between identity and climate change views and perceptions (Devine-Wright & Levinson, 2015), which make this a difficult task. More effective delivery of climate change information as part of participatory management or adaption plans that does not damage the ontological security of those who do not yet perceive this threat is a huge challenge.

Prior research suggests how place attachment and these perceptions are relevant to emergency and land-use planners and developers, and the importance of consultation, resident participation, and trust in those involved in the planning process. While there are individual differences between and within communities, this study may give an indication of how people in other communities are likely to perceive climate change, hazards and other threats or vulnerabilities.

The results of this study provide suggestions for tools and methods that can be used to get a richer understanding of these perceptions, as well as the values and importance attached to local landscapes. Virtual walking tours were found to be an effective method for understanding these meanings and attachments, and lessons learned have been presented for the use of this method in future research. This research has shown that virtual walking tours can be used to carry out survey mapping of landscape values in order to draw out place meaning, values, perceptions of vulnerabilities and other indicators of place attachment, which can be used to provide rich place-based data for land use planning. The tools and methods used in this study involve few resources, and are therefore suggested as a way to gain a deeper understanding of what is important to communities at a minimal cost. By engaging with the complexity and quality of meanings that the landscape and

local environment holds for local populations, planners and developers can improve risk communication and ensure that any climate change or other hazard reduction infrastructure development reflects the needs, concerns and desires of whole communities, including those who might not be directed by transformations (Clarke et al., 2018).

6.1 Where can you go? Power structures, youth perspectives and ancestral place attachment

Some of the results of this study revealed only hints about certain themes, which could provide further insight into the research topic. Firstly, the level of community members' engagement at the political level was not clear, and it is possible that community roles in political processes could impact perceptions of place disruption from the barriers. Due to a lack of insight on this topic it was not possible to say how political structures influence elements of place attachment, especially in relation to how community consultation is carried out and the community's sense of ownership of changes that are made. It is suggested that this is taken into account in future research into place attachment and place disruption.

Age did not appear to have a bearing on the understanding of the possible impacts of climate change within the sample in this study, with participants of all ages (20-70) having some insight into climate change, but it could be useful to understand the attitudes, behaviours and cognitions of people under the age of 18, who were not included. Youth movements are at the forefront of climate activism, and the subject may be more salient to them. Since climate change is not new to humanity, however, and some research has even suggested a decline in engagement with the subject over the past four decades, with a peak in the early 90's (Wray-Lake et al., 2010), research into children's perspectives on climate change is still needed. Knowing what the public (of all ages) believes about climate change should help shape communication about consequent planning and adaptation measures.

A tentative suggestion is made that birthplace (combined with continuing to hold a stake in the community, though not necessarily permanent residence) may have some bearing upon the eventual acceptance of changes to the environment. While this study is too limited in scope to make a definitive statement about this finding or investigate it further, it is suggested that those who were born in the community might possess an ancestral sense of place which is more threatened by disruption than others who were born elsewhere. In this

context, it has led to total rejection of the avalanche barriers. More research into ancestral sense of place and place disruption is needed, and it is suggested that communication with this section of the population might be worth prioritising in planning or consultation work.

The harbour, and the gap that remains in protecting this part of the community's infrastructure, remains an ambiguous topic but an important one. It appears that it remains vulnerable in the case where a large avalanche might fall, and the possibility that the effect of the new barriers could cause a tsunami in the harbour will be assessed by the engineers in the stage following completion of the barriers. Modelling will predict whether there is indeed a risk to the harbour in Patreksfjörður and recommendations (such as harbour evacuation plans) will be made based on that information. For future planning of similar infrastructure in other locations, based on this research and knowledge of other events in the Westfjords such as the 2020 Flateyri avalanche, the final recommendation of this study is that social and economic resources are prioritised at the same level for protection as homes, due to their status as key sources of vulnerability in small remote coastal communities in Iceland.

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Appendix A

Háskólasetur Vestfjarða
University Centre of the Westfjords

Research ethics training and clearance

University Centre of the Westfjords
Suðurgata 12
400 Ísafjörður, Iceland
+354 450 3040
info@uw.is

This letter certifies that Frances Simmons has completed the following modules of:

(X) Basic ethics in research
(X) Human subjects research
(X) Animal subjects research

Furthermore, the Masters Program Committee has determined that the proposed masters research entitled How does place attachment relate to perceptions of climate change-induced landscape changes & risks in the Westfjords of Iceland – a case study in Patreksfjörður meets the ethics and research integrity standards of the University Centre of the Westfjords. Throughout the course of his or her research, the student has the continued responsibility to adhere to basic ethical principles for the responsible conduct of research and discipline specific professional standards.

University Centre of the Westfjords ethics training certification and research ethics clearance is valid for one year past the date of issue unless otherwise noted.

Effective Date: 18 June 2021
Expiration Date: 18 June 2022

Prior to making substantive changes to the scope of research, research tools, or methods, the student is required to contact the Masters Program Committee to determine whether or not additional review is required.

Háskólasetur Vestfjarða
University Centre of the Westfjords

Appendix B

Icelandic below/Íslenska fyrir neðan

You are invited to take part in an online interview, a "virtual walking tour" of Patreksfjörður, as part of my Master's thesis research. The interview will take place online on Zoom, and will last approximately 45 minutes, but you are free to talk for longer if you have the time and are enjoying the interview. The interview will be in English. You are free to withdraw from the interview and the research at any time. My research is looking into how people perceive their environment and what they associate with living in Patreksfjörður. It will be used to help me write my Master's thesis at the University Centre of the Westfjords, and it is possible that this will form the basis for a published article in future.

It will also test out the methodology of an online walking tour, which might be used by a bigger project, CliCNord. The CliCNord project is looking at climate change resilience of small communities in Iceland and in the other Nordic countries (www.clicnord.org).

Your participation is greatly appreciated for the contribution it will make to this research.

Thank you for participating!

Þér er boðið að taka þátt í netviðtali, „sýndargönguferð" um Patreksfjörð, sem hluta af rannsókn minni fyrir meistararitgerð. Viðtalið fer fram á netinu í gegnum Zoom og mun taka um 45 mínútur en þér er frjálst að tala lengur ef þú hefur tíma og hefur gaman af viðtalinu. Viðtalið mun fara fram á ensku. Þér er frjálst að hætta viðtalinu og rannsókninni hvenær sem er. Rannsóknir mínar eru að skoða hvernig fólk skynjar umhverfi sitt og hvað það tengir við búsetu á Patreksfirði. Viðtalið mun nýtast mér til að skrifa meistararitgerðina mína við Háskólasetur Vestfjarða og er hugsanlegt að það verði grunnur að birtri grein í framtíðinni.

Það mun einnig prófa aðferðafræði sýndargönguferða, sem gæti verið notað af stærra verkefni, CliCNord. CliCNord verkefnið er að skoða seiglu loftslagsbreytinga lítilla samfélaga á Íslandi og á Norðurlöndunum (www.clicnord.org).

Þátttaka þín er kærkomin fyrir framlag hennar til þessa rannsóknar.

Þakka þér fyrir að taka þátt!

Participant anonymity

The data collected in the interview will be made anonymous, so no participant will be identified by name. The interview transcriptions will not be shared with anyone other than my supervisor Uta Reichardt and co-supervisor Benjamin Hennig (Háskóli Íslands / University of Iceland). I will make sure that it will not be possible to trace what you say back to you by anyone else who might read my thesis.

You will be invited to receive a copy of my thesis and attend my thesis defence (presentation in person or online). The expected date of completion is April 2022.

I will ask you at the start of the interview whether you are happy for the interview to be recorded. Please note that this is just to help me with my analysis, and the recording will not be shared. It will be deleted when I have completed my research. You are free to ask not to be recorded at the start, or to end the recording at any point during the interview.

Nafnleynd þátttakenda

Gögnunum sem safnað verður í viðtalinu verða nafnlaus, svo enginn þáttakandi verður auðkenndur. Viðtalsafritunum verður ekki deilt með öðrum en umsjónarmanni mínum Uta Reichardt og samleiðbeinanda Benjamin Hennig hjá Háskóla Íslands. Ég mun ganga úr skugga um að ekki sé hægt að rekja það sem þú segir til þín, af öðrum sem gætu lesið ritgerð mína.

Þér verður boðið að fá afrit af ritgerðinni minni og mæta á vörn hennar (kynning í sal eða á netinu). Áætluð verklok eru í febrúar 2022.

Ég mun spyrja þig í upphafi viðtalsins hvort þú sért sátt/ur með að viðtalið sé tekið upp. Vinsamlegast athugaðu að þetta er bara til að hjálpa mér við greiningu mína og upptökunni verður ekki deilt. Henni verður eytt þegar ég hef lokið rannsókn minni. Þér er frjálst að biðja um að vera ekki tekinn upp í upphafi eða að hætta upptökunni hvenær sem er meðan á viðtalinu stendur.

Images/Mynd: Tyler Wacker

Appendix C

Hello, my name is Frances and I am a Master's student at the University Centre of the Westfjords. Thank you so much for taking the time to talk with me. How are you doing today, how is it in Patreksfjörður…?

My thesis is about how people in Patreksfjörður perceive their environment and what they associate with the place.

I have sent you some information about the interview already, but do you have any questions before we start?

I would like to record the interview, but this is just to help me and it will be deleted after I have finished my research. Do I have your consent to record the interview? You can ask to stop recording at any time. I will make you anonymous in my thesis – no one will be able to identify you personally.

OK - the recording has started.

So we are going to take a little "walk" around town. I would like to visit the places that are important to you, and some places that I have chosen too. I have some questions to ask along the way. Feel free to ask at any time if something doesn't make sense.

Can you see the screen I'm sharing? We will follow some of these blue lines, these have a streetview. Please note that some of the photos in the streetview are a few years old – It would be great if you can tell me about how things have changed and also how you think the town will look in future.

I am interested in the places that are important to you in Patreksfjörður, as well as how you see the town now compared with how it was in the past, and how you imagine it will be in the future. The important thing to me is to hear your thoughts and opinions about everything you see so please don't be shy! And if you would like to change the view or go somewhere important at any time, I would like to do that, just shout out. If you don't know a word in English you can say it in Icelandic, and sometimes with words for very specific things that don't translate very well, it is better to tell me in Icelandic.

Location: Gas station

OK are you ready? Let's start at the gas station and take a look at the water and the mountains from here. We can imagine we have just arrived from the mountain pass. It's such a nice day, let's grab a coffee to go and take a walk before heading home! It's nice to stretch after a long drive don't you think!

Imagine you've been away somewhere for a few days - maybe you had to go to the city. How does it feel to arrive in Patreksfjörður?

What do you think are the three words that sum up Patreksfjörður to you? Take your time to think as we look all around us. Why did you choose those words - what stories or reasons come to mind to explain why you chose them?

How does it feel? Are there any particular sounds, smells, or tastes that this area reminds you of?

Look up at the mountains. What are the different sensations here? What could you touch, what smells are there? What can you taste? What grows or happens here?

Location: Walk up Strandgata, turn right on to Sigtun, then left onto Adalstraeti

Let's walk along this road. It's the way to the town centre where more things happen. What does the ocean mean to you? Is it important? Safe, scary, precarious..? Do you have any thoughts about the future of the ocean around Patreksfjörður?

Where are the most important parts of the town to you? Let's go there so you can show me why they are important.

Location led by participant

Location: 83 Adalstraeti looking at memorial

Approach part of town affected by 1983 slushflow:

As we walk along this road, is there any particular association you have with the area?

[if slushflow is mentioned] Were you affected by the slushflow? or do you know people who were affected or who remember it well? We don't have to stay here if you'd like to move on.

As we continue, we can check out the view – how does it make you feel? What does the fjord in itself represent to you, or more generally for the town?

Location: Top of Hlidarvegur

At Hlidarvegar let's look up to the mountains. What do you think about when you look at this landscape? Has anything changed here?

[if they mention the barriers] What do you think about the barriers? Do you think the avalanche barriers are enough to protect the town?

What do you think it will look like in future? Are there any problems that could come up related to the surroundings of Patreksfjörður?

Location: Pool and church

Here's the pool – do you use it? Are these places important for the community, the swimming pool or the church? When do people go there? Does the church have a role in the town if things are tough?

It looks like the man on the pavement is going to church and there is a funeral happening

We can keep walking and admire the view. It's a windy day today. How does it feel here in different weather? Does the town change throughout the year? What is different about Patreksfjörður in the summer?

Location: Adalstraeti 47

Here's the kindergarten playground. Did you go to school here? What do you think it is like to grow up here?

Location: Adalstraeti 27

Let's keep going up Adalstraeti and pause at the cinema – did you ever see any movies here? What do you do with friends or family…?

What is there to do in Patreksfjörður when the weather is bad?

Looking up the hill, what has changed since these pictures were taken for this streetview map? What do you think about that?

Location: Urdargotu - Holar

Let's walk up to get a good view of the town and those mountains – what do you think about now we're higher up on Holar?

OK, since we're online, we're now going to teleport back down to the street by the water.

Location: End of Engjar - under gully.

Is Patreksfjörður an easy place to live? Are there any positives or negatives that you think of now, that we haven't talked about already?

How likely is it that you would ever leave this town to live elsewhere?

Can I ask you a few questions about yourself now, to do with your background and how long you've lived in Patreksfjörður?

Demographic info: age, nationality, place of birth, currently living in Patreksfjörður? How long living in P? Migration history, work info. Social network - do they have family there, in a community group, club, etc.

Do you have any thoughts on taking this virtual tour around the town with me? What was it like? Could it be made better somehow?

Thank you very much for taking part. Please feel free to get in touch if you have any questions that occur to you later.

Appendix D

Virtual Walking Tour of Patreksfjörður - participant feedback

Thank you for taking part in the walking tour with me!

This was an exciting pilot project to test the method of online walking tours and interviews. I would like to hear your feedback in order to help learn more about the user experience of the method. Please fill this quick survey and let me know your thoughts (your answers will be anonymous).

* Required

1. How did you find accessing and using the technology needed to take part in the virtual walking tour? *

Mark only one oval.

	1	2	3	4	5	
Very difficult	◯	◯	◯	◯	◯	Very easy

2. Did you enjoy the experience of taking a virtual walking tour? *

Mark only one oval.

	1	2	3	4	5	
No, it was not at all enjoyable	◯	◯	◯	◯	◯	Yes, it was very enjoyable

3. What was the most enjoyable thing about the walk?

4. What did you think of the length of the walk? *

Mark only one oval.

- ◯ I would have liked a lot more time
- ◯ I would have liked a little more time
- ◯ It was just right
- ◯ It was a little too long
- ◯ It was much too long

5. Do you currently live in Patreksfjordur? *

Mark only one oval.

- ◯ Yes I live there full time
- ◯ No, I no longer live there
- ◯ Yes I live there, but only for part of the year

6. What is your age? *

Mark only one oval.

- ◯ Under 30
- ◯ 30-49
- ◯ 50-69
- ◯ 70+
- ◯ Prefer not to say

7. Did you feel inspired to talk about the town and its surroundings, and to share your memories during the walk?

Mark only one oval.

	1	2	3	4	5	
No, not at all	◯	◯	◯	◯	◯	Yes, very

8. Did you get the feeling of a real walk around the town during the virtual walk?

Mark only one oval.

	1	2	3	4	5	
No, not at all	◯	◯	◯	◯	◯	Yes, it felt very real

9. Would any of the following options have made the walk seem more "real"? *

Check all that apply.

- [ ] Hearing sounds that you would hear around the town
- [ ] Taking part as a group with friends/family
- [ ] Speaking Icelandic during the walk
- [ ] Starting from a different place
- [ ] Walking along a different route
- [ ] More time just "walking", in silence or with no questions
- [ ] Talking about other topics
- [ ] No opinion
- [ ] Other: _____

10. If you would like to explain your last answer or answered "Other", please write below

_____

_____

_____

_____

_____

11. In hindsight, would you have preferred to go on an actual walk through town, or was the virtual walk better for you? *

Mark only one oval.

- ◯ I preferred the virtual walk
- ◯ I would have liked to go on a real walk

12. Can you explain your answer to the last question? *

13. Were there any other places you would have liked to visit on the walk? Where?

14. Thank you again for taking part! Any other thoughts or comments are welcome and will help with my research, please write them below:

Sýndargönguferð um Patreksfjörð - viðbrögð

Takk fyrir að taka þátt í gönguferðinni með mér!

Þetta var spennandi tilraunaverkefni til að prófa aðferðina við netgönguferðir og viðtöl. Mig langar að heyra álit þitt til að hjálpa að læra meira um notendaupplifun aðferðarinnar. Vinsamlegast fylltu út þessa stuttu könnun og láttu mig vita hvað þér fannst (svörin þín verða nafnlaus).

* Required

1. Hvernig fannst þér aðgangur og notkun tækninnar sem þarf til að taka þátt í sýndargönguferðinni? *

Mark only one oval.

	1	2	3	4	5	
Mjög erfitt	◯	◯	◯	◯	◯	Mjög auðvelt

2. Fannst þér gaman að fara í sýndargönguferðina? *

Mark only one oval.

	1	2	3	4	5	
Nei, það var alls ekki skemmtilegt	◯	◯	◯	◯	◯	Já, það var mjög gaman

3. Hvað var skemmtilegast við gönguna?

4. Hvað fannst þér um lengd göngunnar? *

Mark only one oval.

- ◯ Ég hefði viljað miklu meiri tíma
- ◯ Ég hefði viljað hafa aðeins meiri tíma
- ◯ Lengdin var mátuleg
- ◯ Mér fannst hún aðeins of löng
- ◯ Hún var allt of löng

5. Býrð þú á Patreksfirði núna? *

Mark only one oval.

- ◯ Já
- ◯ Nei
- ◯ Já ég bý þar, en bara hluta úr ári

6. Hvað ertu gamall? *

Mark only one oval.

- ◯ Undir 30 ára
- ◯ 30-49
- ◯ 50-69
- ◯ 70+
- ◯ Ég vil helst ekki segja

7. Fannstu fyrir innblæstri til að tala um bæinn og nágrenni hans og deila minningum í göngunni? *

Mark only one oval.

	1	2	3	4	5	
Nei alls ekki	◯	◯	◯	◯	◯	Já mjög

8. Fékkstu tilfinninguna fyrir alvöru gönguferð um bæinn í sýndargöngunni? *

Mark only one oval.

	1	2	3	4	5	
Nei alls ekki	◯	◯	◯	◯	◯	Já, fannst það mjög raunverulegt

9. Hefði einhver af eftirfarandi valkostum gert það að verkum að gangan virtist „raunverulegri“? *

Check all that apply.

- [ ] Að heyra hljóð sem þú myndir heyra um bæinn
- [ ] Að taka þátt sem hópur með vinum/fjölskyldu
- [ ] Að tala íslensku í göngunni
- [ ] Byrjað á öðrum stað
- [ ] Gengið eftir annarri leið
- [ ] Meiri tími bara að "ganga", í þögn eða án spurninga
- [ ] Að tala um önnur efni
- [ ] Annað

10. Ef þú vilt útskýra síðasta svar þitt eða svara "Annað", vinsamlegast skrifaðu hér að neðan

_____

_____

_____

_____

_____

11. Eftir á að hyggja, hefðir þú kosið að fara í alvöru gönguferð um bæinn, eða var sýndargangan betri fyrir þig? *

Mark only one oval.

- ◯ Ég vildi frekar sýndargönguna
- ◯ Ég hefði viljað fara í alvöru göngutúr

12. Getur þú útskýrt svar þitt við síðustu spurningunni? *

13. Voru einhverjir aðrir staðir sem þú hefðir viljað heimsækja í göngunni? Hverjir?

14. Þakka þér aftur fyrir að taka þátt! Allar athugasemdir eru vel þegnar og munu hjálpa mér við rannsóknir mínar, vinsamlegast skrifaðu þær hér að neðan:

Appendix E

Coding structure and frequencies:

Location			355
	Raknadalur		2
	Coast to NW of town		7
	Geirseyri (beach)		9
	Breidafjordur		1
	Kollsvik		1
	Hafnarmuli		2
	Saudlauksdalur		1
	Ocean/fjord - general		11
	Mountain pass		7
	Bildudalur		1
	Talknafjordur		3
	Mountains overall		16
	Talkni		3
	Bardarstrand		3
	Miklidalur		3
	Litlidalur		18
	Geirseyrarmuli		5
	Blakkur		2
	Scapadalur		2
	Harbour/Vatneyri		16
	Brellur		2
	Holar		3
	Myrar		35
	Urdargata		33
	Town centre by Ghost House		7
	"Ghost House"		9
	Cinema		11
	Guesthouse		5
	Kindergarten		11
	church		4
	Pool (including area)		31
	Hospital/avalanche wall		12
	Hlidarvegur		16
	Avalanche memorial (+)		22
	Adalstraeti 72 "Husid"		14
	Adalstraeti (Albina shop)		10
	Sigtun		1
	Strandgata		16
Cognition			0
	opinion/beliefs		0
		social	0
			Personal interpretation of environment 3
			"Outside" perspective 2
			Fisheries 16
			Self sufficiency / disconnectedness 6
			Lack of local environmental knowledge 1
			People do not engage with outdoors 4
			International community 3
		environmental	0
			Avalanches - impression of safety 8
			Avalanche barriers opinion 41
			Ocean opinion on safety 1
			Trust in engineers 3
			Isolation 7
			Lack of outdoor opportunities 5
	memories		48
		social	0
			Forgetting - deliberate 1
			Significant experience 3
			Personal memory 16
			Nostalgia 8
		environmental	0
			Avalanche direct impact 7
			Avalanche memory 13
	knowledge		0
		social	0
			Consultation on avalanche barriers 1
			Change in community (+) (+) 12
			Local knowledge - built environment/town history 19
		environmental	103
			Avalanche awareness 43
			Climate change 5
			Seasonal changes/impacts 11
			Salient weather conditions 16
			Local knowledge - environment 28
Affect			0
	three words		14
	Neutral perceptions		7
		Mountains neutral	2
		Unimportant/non-salient area	5
	Other negative perceptions		14
		"Ugly" part of town	1
		Mountains threat	5
		Harbour area - negative	4
		Smells	4
	Other positive perceptions		0
		Desire to stay/return (repeatedly)	5
		Sounds	4
		Love of nature/environment/weather	25
		Abstract or spiritual meaning in environment	20
	Threat		0
		Environmental	0
			Avalanches - threat 1
			Ocean - negative 3
			Pollution 4
			Environment - negative 1
		Social	0
			Migration 5
			Intention/reason to leave 10
			Youth 4
			Smallness/limitations of community 10
			Economic collapse/migration 4
			Community - negative 3
	Value		0
		Social	0
			Economic opportunity - tourism 2
			Harbour area - positive 10
			Home 16
			Community connectedness 34
		Environmental	0
			Mountains safe/positive 30
			Contrast with Reykjavik 5
			The View 38
			Importance of wider environment (+) 7
			Ocean - positive 19
			Proximity of both mountains and sea 4
Behaviour - ways of interacting			0
	with environment		0
		Foraging	8
		Recreational use of environment	31
	social / economic		0
		Rescue team	1
		Sustainable lifestyle choices	1
		Work	4
		Return to community	1
		Swimming pool	12
Methodology			114
	environmental observation within streetview		15
	Correction/disagreement/redirection in streetview		7
	Immersion in streetview		71
	Streetview experience		21

Colour key for broad topic areas. Within each category there were multiple specific codes.

	Topics relating to personal memories.
	Topics relating to street view immersion.
	Topics relating to avalanches and slushflows.
	Topics relating to the natural environment.
	Topics relating to the ocean or fjord.
	Topics relating to pride in what sets the town apart, e.g. "the view".
	Topics relating to pollution.
	Topics relating to economic activity and infrastructure.
	Topics relating to isolation or abstract meaning derived from the environment.
	Topics relating to society, such as community connectedness.

Colour codes and code frequencies:

Color	Code	Cod. seg. (all documents)
	three words	14
	Mountains safe/positive	30
	Avalanche awareness	43
	Mountains neutral	2
	Personal interpretation of environment	3
	environmental observation within streetview	15
	Avalanches - impression of safety	8
	Migration	5
	Avalanche direct impact	7
	Consultation on avalanche barriers	1
	Desire to stay/return (repeatedly)	5
	Foraging	8

●	Social	0
●	Environmental	0
●	opinion/beliefs	0
●	social	0
●	social	0
●	social	0
●	with environment	0
●	Location	0
●	Forgetting - deliberate	1
●	Economic opportunity - tourism	2
●	"Ugly" part of town	1
●	Avalanches - threat	1
●	Raknadalur	2
●	Rescue team	1
●	Mountains threat	5
●	Avalanche memory	13
●	Avalanche barriers opinion	41
●	Climate change	5
●	Recreational use of environment	31
●	Significant experience	3
●	Intention/reason to leave	10
●	Harbour area - positive	10
●	Correction/disagreement/redirection in streetview	7
●	Change in community (+) (+)	12
●	"Outside" perspective	2
●	Ocean - negative	3
●	Sounds	4
●	Unimportant/non-salient area	5
●	Contrast with Reykjavik	5
●	Environmental	0
●	Social	0
●	Cognition	0
●	memories	0
●	environmental	0
●	environmental	0
●	environmental	0
●	social / economic	0
●	Neutral perceptions	0
●	Coast to NW of town	7
●	Sustainable lifestyle choices	1
●	Home	16
●	Ocean opinion on safety	1

●	Harbour area - negative	4
●	Immersion in streetview	71
●	The View	38
●	Seasonal changes/impacts	11
●	Personal memory	16
●	Love of nature/environment/weather	25
●	Fisheries	16
●	Youth	4
●	Pollution	4
●	Affect	0
●	knowledge	0
●	Other negative perceptions	0
●	Work	4
●	Geirseyri (beach)	9
●	Trust in engineers	3
●	Community connectedness	34
●	Streetview experience	21
●	Salient weather conditions	16
●	Smells	4
●	Environment - negative	1
●	Self sufficiency / disconnectedness	6
●	Importance of wider environment (+)	7
●	Abstract or spiritual meaning in environment	20
●	Smallness/limitations of community	10
●	Nostalgia	8
●	Local knowledge - built environment/town history	19
●	Other positive perceptions	0
●	Behaviour - ways of interacting	0
●	Return to community	1
●	Breidafjordur	1
●	Swimming pool	12
●	Economic collapse/migration	4
●	Ocean - positive	19
●	Lack of local environmental knowledge	1
●	Isolation	7
●	Local knowledge - environment	28
●	Methodology	0
●	Threat	0
●	Kollsvik	1
●	Community - negative	3
●	Proximity of both mountains and sea	4
●	People do not engage with outdoors	4

●	Lack of outdoor opportunities	5
●	Value	0
●	Hafnarmuli	2
●	International community	3
●	Saudlauksdalur	1
●	Ocean/fjord - general	11
●	Mountain pass	7
●	Bildudalur	1
●	Talknafjordur	3
●	Mountains overall	16
●	Talkni	3
●	Bardarstrand	3
●	Miklidalur	3
●	Litlidalur	18
●	Geirseyrarmuli	5
●	Blakkur	2
●	Scapadalur	2
●	Harbour/Vatneyri	16
●	Brellur	2
●	Holar	3
●	Myrar	35
●	Urdargata	33
●	Town centre by Ghost House	7
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●	Hlidarvegur	16
●	Avalanche memorial (+)	22
●	Adalstraeti 72 "Husid"	14
●	Adalstraeti (Albina shop)	10
●	Sigtun	1
●	Strandgata	16

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