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TEMPO-MATERIALITIES

Encounters with time along Arctic island coasts

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ABSTRACT

Time is at the heart of this doctoral research which engages with the Arctic island coasts of Jan Mayen, Bjørnøya and Hopen. As a means to work with different dimensions and scales of time along these coasts, I have chosen to examine the materials I encountered during excursions to the islands. Through this enquiry I have observed and speculated on the processes, conditions and changing states that give a sense of agency to these coastal materials thus revealing different expressions of time.

There are significant changes impacting these islands that infiltrate their terrestrial, marine and aerial environments. These are influenced by both anthropogenic and natural factors. In order to understand these changes occurring on a number of spatial scales I have explored, developed and applied different concepts of time that, I suggest, are suited to a material study of Arctic island coasts. Key questions in this research ask if there is a need to work with Arctic coastal environments differently from other terrestrial environments. In considering some of the more typically used concepts of time in landscape architecture, I proceed to question if alternative concepts are needed to address accelerated and unprecedented material changes along Arctic coastal environments. A broader question is posed asking if an immersive approach informs a greater understanding of time in landscape architecture. I take my position from within the discipline of landscape architecture. However, to address my research questions I have consulted a range of other disciplines that include cultural geography, anthropology, archaeology, art and geology.

Methodologically the research is qualitative. I situate my heuristic study along the coasts of Bjørnøya, Jan Mayen and Hopen and I apply a number of methods that demonstrate how pluralities of time unfold and interact in various ways. In-situ knowledge is transferred to a studio environment to further interrogate expressions of time entombed and expressed in the materials studied. This practical foundation underpins my arguments to extend notions of time in landscape architecture in addressing unpredictable and non-linear change. Another key component to this research is to express the relative and experiential aspects of Arctic island coasts. This has been done both as a reflective exercise to my research and to highlight the values of human and more-than human relations. I have adopted the term *practicing time* in this study to articulate my thinking and doing in engaging with time throughout the research process. It embodies a conscious and immersive approach to continually engaging with time.

My research culminates with a proposal of a tempo-material framework. The foundation to this framework builds upon theoretical and practical enquiries from this research. It establishes a range of time concepts and scales that range from deep-time to spontaneous temporalities.

SAMMENDRAG

Tid utgjør den tematiske kjernen i denne doktorgradsavhandling om kysten langs de arktiske øyene Jan Mayen, Bjørnøya og Hopen. For å kunne jobbe med forskjellige tidsdimensjoner langs disse kystlinjene, har jeg valgt å undersøke de materialene og materielle objektene som jeg fant under mine besøk på øyene. I disse undersøkelsene observerte og reflekterte jeg prosessene, tilstandene og forandringene som gir disse kystlandskapene agens og avslører ulike tidsdimensjoner.

Disse øyenes landskaper, vannmiljøer og luftmiljøer påvirkes av betydelige endringskrefter. De påvirkes av både menneskeskapte og naturlige faktorer. For å forstå endringene som skjer, innenfor en stor bredde av romlige skalaer, har jeg utforsket, utviklet og anvendt forskjellige tidsbegreper som jeg mener egner seg i studiet av arktiske øyers kystlinjer. Et sentralt spørsmål i denne forskningen handler om hvorvidt det er behov for å arbeide med arktiske kystmiljøer på andre måter. Jeg ser på de mer typiske tidsbegrepene brukt i landskapsarkitekturen og stiller spørsmålet om det ikke er nødvendig med å ta i bruk alternative begreper for å håndtere de arktiske kystmiljøenes akselererende og spesielle materielle endringer. Avhandlingen stiller også det større spørsmålet om hvordan en mer innlevd tilnærming kan gi en større forståelse av tid i landskapsarkitekturen. Mitt faglige utgangspunkt er innenfor landskapsarkitekturen, men for å svare på forskningsspørsmålene mine, har jeg hentet kunnskap fra en rekke andre disipliner som kulturgeografi, antropologi, arkeologi, kunst og geologi.

Metodisk er forskningen kvalitativ. Min heuristiske studie foregår langs kysten av Bjørnøya, Jan Mayen og Hopen, og jeg bruker en rekke metoder som viser hvordan en pluralitet av tidsperspektiver utfolder seg og samhandler på ulike måter. In-situ kunnskap overføres til et studiomiljø for ytterligere å undersøke hvordan tid er innleiret og uttrykt i materialene som jeg har studert. Dette praktiske fundamentetunderbygger mine argumenter om å utvide forestillingene om tid i landskapsarkitektur for å kunne adressere uforutsigbare og ikke-lineære endringer. En annet sentralt moment i denne forskningen handler om å uttrykke de relative og erfaringsmessige aspektene ved arktiske øyers kystmiljøer. Dette har foregått både som en reflekterende øvelse i min forskning og for å understreke verdien av menneskelige og mer-enn-menneskelige relasjoner. Jeg bruker begrepet practicing time for å artikulere min tenkning og mitt arbeid i studiet av tid gjennom hele forskningsprosessen. Det handler om en bevisst og innlevd tilnærming til tid.

Min forskning kulminerer i et forslag til nytt tempo-materielt rammeverk. Grunnlaget for dette rammeverket er de teoretiske og praktiske undersøkelsene fra forskningen. Rammeverket etablerer en rekke tidskonsepter og -skalaer som spenner fra dyp tid til spontane temporaliteter.

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Excursions to the islands of Jan Mayen, Bjørnøya and Hopen would not have been possible without the Norwegian Meteorological Institute. I am indebted to Helge Tangen, Jon Kolsum and Justyna Wodziczko at the Meteorological Institute in Tromsø for granting permission to conduct research and travel to these wonderful and unique islands. During my time on the islands there are individuals who took the time to show me the islands which greatly enriched my knowledge of these islands. Thank you so much to Venke Ivarrud, Ragnar Sønstebo, Hege Terum Kvitberg, and all the staff that are based at Jan Mayen, Bjørnøya and Hopen's meteorological stations. You provide such an amazing service no matter the weather! On Jan Mayen thank you to the Norwegian Defence Forces (Forsvaret) for accommodating my visit and providing the most spectacular flight back to Oslo. Travelling to the islands was provided by the Norwegian Coastguard (Kystvakten). Thank you to the officers and crew of the KV Svalbard, KV Harstad and KV Andenes.

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My previous teaching experience in Tromsø inspired and helped me to develop this research project. During my PhD I have been fortunate to have had continued contact with landscape architecture students at the University of Tromsø, through seminars and reviews. Thank you to Thomas Juel Clemmensen and Mari Bergset for these invitations. In Ireland, I have shared my Arctic coastal experiences with architecture students at the University of Limerick. Thank you to Anna Ryan Moloney for arranging these short but invaluable visits.

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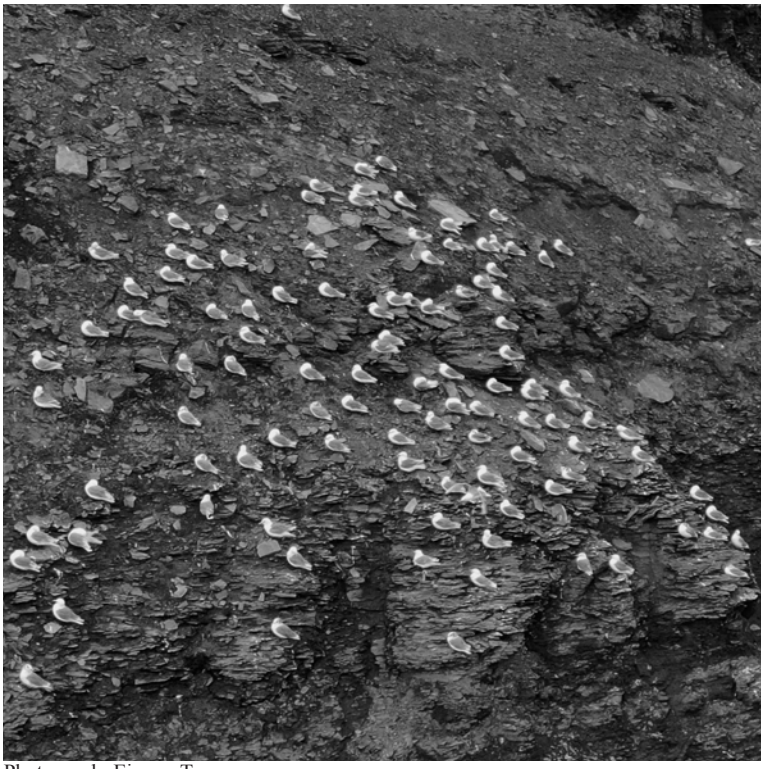


Photograph: Eimear Tynan

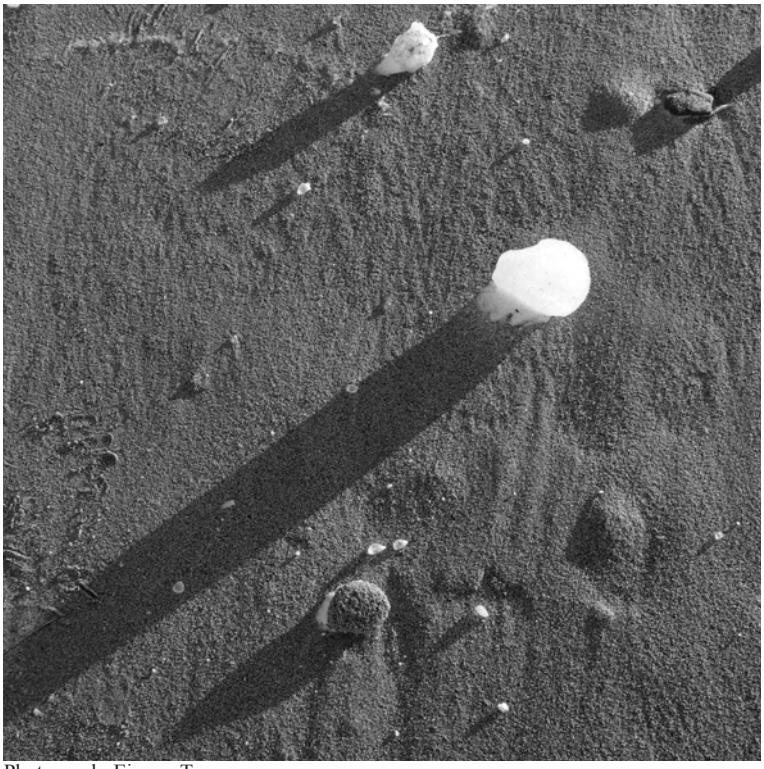
Hopen, 21^{2t} August 2018

My final day on the island! It was a much foggier start to the day but it cleared up during the morning like on the previous days here. I spent the morning photographing and casting the drone out along the coast in front of the meteorological station – the land appears to be just crumbling into the sea. Tom, the station manager, told me that in 2010 they were able to drive the tractor between the station and the coast but that's impossible now because the ground is too fragile. In the last two years, the coast along this particular stretch has retreated by two meters. The imposing cliffs to the north and south of the station stand guard on either side of this remote outpost. The seabirds provide a relentless screeching and squawking surround-sound in this relatively sheltered part of the island. Their light coloured bodies look like confetti against the dark cliffs. To capture this chaotic activity along these cliffs I will do some sound recordings after lunch before we set out on our 12-hour sail back to Bjørnøya.

Photograph: Eimear Tynan

Jan Mayen, 06th August 2018

We park the jeep outside the old weather station (Gamle Metten) which is perched high on a hill with a steep drop to the sea below. I am surprised to see that several buildings are still standing. The wooden buildings are bleached to a silvery grey except for the main building which is preserved and is spruced up in a deep red paint. The only indication that this collection of buildings is a part of a former weather station is the presence of some meteorological instruments that are still standing, but just about! A buckled, rusted old railway track sweeps across the site and comes to an abrupt halt near the cliff. It was once connected to the strand below by a cable system but that's long gone. We carefully meander our way down to the strand below which is strewn with driftwood. Here, I try to align my camera with the same view as a historical photograph that was taken in 1949 to see the changes that have occurred since then. It isn't easy to find the exact position. It's as if the strand has been raised significantly since the previous photographer stood here. But these fine details don't matter too much because I am facing a great big lump of cliff that has collapsed since the historical photograph was taken.



Photograph: Eimear Tynan

Bjørnøya, 08th March 2019

Another freezing day on Bjørnøya but the sun is shining and I am eager to get outside. I walk towards Kvalrossfjære. It feels magical revisiting this beach again but this time everything is frozen solid. When I arrive at the beach there are no signs of any old walrus bones, driftwood or plastic that I had photographed previously. They must be buried under the snowdrifts this time. It is difficult to determine where exactly the land meets the sea but some crinkled, striations offer clues as to where the waves have come to a halt by the low temperatures. Globules of ice are strewn across the beach peppered with long sun-dial shadows. While photographing I notice a very peculiar sound coming from the sea that I have never heard before. It resembles a slow, high-pitched, creaking wooden door followed by a series of fast-paced thudding sounds. As I approach, what I perceive as a firmly frozen sea, I realise it is the sea ice heaving to the moving tide. I spend the next 40 minutes or so sitting on large floats of sea ice contently recording these alien sounds.

1 INTRODUCTION

The preceding excerpts are from my fieldwork journal that I wrote during my time on the Norwegian Arctic islands of Jan Mayen, Hopen and Bjørnøya in 2018 and 2019. These three islands were the sites for my doctoral research which proposes renewing an understanding of time within the theory and practice of landscape architecture.

To undertake this task I have chosen to focus on the materials that I encounter along these coasts and to explore the temporalities that are inherent to these materials through situated and immersive research. I refer to this as a tempo-material approach. The time of these materials is crucial in this study because it is through an attunement to time that change can be detected. My intention in adopting a tempo-material approach is to offer alternative ways of thinking and knowing about Arctic island coasts through a time-centred view. This practice-based approach aims to strengthen and enrich dialogue about time in landscape architecture theory.

In response to environmental changes that are unfolding across the Arctic I seek to provide a range of site-specific readings of these island coasts to gain insights into these changes. More broadly, the environmental changes that are occurring are manifesting in different ways from sporadic events to gradual, yet unprecedented disruption. In order to grasp the multitude of changes that are playing out over different spatial and temporal scales I assess the ways in which landscape architects work with time and proceed to offer alternative ways to activate time in the discipline.

This doctoral research was conducted as a PhD by compilation which comprises an exegesis and four publications. The exegesis is composed of six chapters. Chapter 1 is an introductory chapter outlining: the main themes that will be examined in this research; theoretical and practical framings; as well as a summary of the four publications that were written in connection with this research. Chapter 2 is a review of literature with a focus on three main topics. These are high Arctic regions, islands and coastal studies; a critique of conceptualisations of time that are currently used in landscape architecture and the proposal of new concepts that are needed in light of accelerated changing environments; and finally an examination of the materialities of Arctic island coasts and their broader relations that extend beyond these coasts both spatially and temporally. Chapter 3 presents site descriptions of the coasts of Jan Mayen, Bjørnøya and Hopen. Chapter 4 details the methodology, methods, techniques and tools that were applied during this research.

Chapter 5 presents, in full, the four publications that support this body of research. Chapter 6 concludes this exegesis with suggestions on how landscape architects can expand on the way time is theorized and practiced in helping to address change along coastal environments. It is important to draw attention to the publications that formed an integral part of this research. These are located in the appendices and I encourage the reader to read these prior to reading Chapter 5.

This introductory chapter will establish a number of contexts in which this study sits. These include the physical Arctic context which is undergoing significant environmental change; theoretical contexts where I wish to situate this time-oriented study from the perspective of landscape architecture; and practical contexts where I outline how I wish to conduct fieldwork through a time-centred approach. Alongside these contexts I will introduce the three Arctic islands of Jan Mayen, Bjørnøya and Hopen and explain their pertinence to this research. These islands share many common characteristics but the changes that they are currently undergoing are unique to each island. The final section in this chapter will briefly describe the content of each publication that form an integral part of this research.

1.1 MATTERS DRIVING THIS RESEARCH

This study is rooted in the discipline of landscape architecture. In order to expand on ways in which to engage with materials and time in this Arctic setting, however, I draw together ideas, philosophies and approaches from a range of other disciplines. This is to establish theoretical frameworks and to inspire new ways to consider time in the landscape. A significant factor that motivates this research is the range of change that is occurring in the Arctic at this present time. Arctic regions are undergoing unprecedented changes comprising climatic, ecologic, social, economic and political concerns that permeate aerial, terrestrial and marine environments. The changes being observed are unfolding over different durations and scales of time, some of which are gradual while others are more immediate. Along the coasts of Jan Mayen, Hopen and Bjørnøya some of these changes, associated with pressing environmental issues have become, and are becoming apparent.

1.1.1 Expanding concepts and considerations of time in landscape architecture

Landscape architects are increasingly working with environments under pressure and strain and ones that have already started to change in unprecedented ways. Environmental changes being experienced across the globe go far beyond physical disruption and destruction, and extend to social, political, economic, cultural and

ecological realms. These changes are unfolding over different frames of time–from disrupted seasonal trends to more gradual long-lasting changes occurring over decades and centuries such as sea level rise. The consequences of these changes are, and will be, experienced differently across the globe.

These changes have spurred the discipline of landscape architecture to consider and design for futures that mean recognising that our landscapes are continually shifting and moving at different paces. Kristina Hill (2021) discusses the sense of urgency in which landscape architects must work, in light of climate change, and the need to engage with the flows of a site rather than persist with the falsehoods of site fixities. This is indicative of ongoing reflection in current landscape architectural theory as well as critique concerning modes of practice in light of extensive environmental change.

Landscape architecture, as a result, has been jolted to consider time differently from what was once adequate for the needs of the discipline. The cyclic patterns of the seasons and the growth and distribution patterns of vegetation, for example, have been significantly disrupted in many regions of the world. The unrelenting rising sea levels and flooding add to the list of pressing issues for the discipline. This has hastened some landscape architects to confront these unpredictable and extreme environmental changes and to design differently through anticipatory and adaptive means.

Scholars, such as Anita Berrizbeitia (2018), Rob Barnett (2013) and Dirk Sijmons (2021) have offered directions in which the discipline can position itself in light of the changes that are needed to be addressed. Berrizbeitia, for example, foresees working with a new set of disciplines to cater for the future while Barnett emphasises working more meaningfully with the more-than-human. Practitioners in landscape architecture, meanwhile, such as Kate Orff (2020) promote working closely with the physicality of sites with the intention to expose stories of the site to users of a landscape. Jane Wolff (2021) asserts the need to engage closely with communities and their stories to better inform the environments they inhabit. Time is integral to these scholars and practitioners but in very different ways.

The Anthropocene has also crept into landscape discourse[1] with a sobering realisation of the planetary scale that humans operate through the lens of this proposed geological epoch. The Anthropocene has been a fascinating tool, framework and catalyst for bringing attention to time in landscape studies. This

1 For example in the work of Sijmons (2021) and Milligan (2022).

powerful term has, in one way, caused introspection meaning that disciplines have looked inward in examining their role and responsibilities in the current era of monumental environmental change. However, it has also caused extroversion amongst disciplines and arguably this leans more toward academia whereby disciplines are finding valid reasons to work with one another. Time is not always an explicit element in research or discussion surrounding the weighty topic of the Anthropocene. It does, however, provoke great consideration and reflection about time with regard to its pace, scale and material effects.

To grasp how the larger temporal frames of climate change and the Anthropocene are playing out more specifically along my selection of Arctic islands requires a renewed examination and reflection of time from within the discipline of landscape architecture. In response to these changes, along with a wish to better articulate subjective experiences of these coasts, I suggest alternative conceptualisations of time that have not been typically used in the discipline. I take this further by challenging how to practically engage more fully with time by employing a range of methods that focus on different materials I encounter along the coasts.

1.1.2 The Arctic: from the periphery to centre

The Arctic is warming up three times faster than the rest of the globe. A report from the Arctic Monitoring and Assessment Programme (AMAP) highlighted rapid and widespread changes to weather patterns, as well as an increase in the frequency and intensity of extreme events (2021a). Some of the consequences of these changes that are discussed in the report include coastal erosion, increase in resource extraction, changes to ecosystems, and changes to livelihoods in indigenous communities. These changes, amongst others, are not restricted to Arctic regions but have global implications. A notable example of this is the melting of Arctic glaciers and Greenland's ice cap which will contribute to significant global sea level rise. Some academics have referred to Arctic regions as 'canaries in the coal mine'[2] meaning that these regions are indicators of change. The changes occurring in the Arctic are expected to be experienced globally but these will manifest in different ways. The Arctic is responsible for the regulation of climate and ocean systems and particularly so in the Northern hemisphere. Changes in the Arctic have not only local but global repercussions that impact terrestrial, marine and atmospheric spheres.

Parallel to this attention towards the Arctic is a growing interest in island studies. One could argue that both the Arctic and islands have shifted from being

2 Ip (2018); DeLoughrey (2019); Pugh and Chandler (2021).

peripheral to central topics of discussion debate concerning climate change and the Anthropocene. Jonathan Pugh and David Chandler name the first chapter of their book: 'there are only islands after the end of the world' (2021). Compared to other geographical features, they argue, islands consistently emerge in discussions regarding rising sea levels, colonialism, nuclear testing sites, ecological degradation etc. Dismissing islands as symbols of environmental destruction or as laboratory-like environments, the authors look to islands as 'key sites for understanding relational entanglements'. These relations and interconnections may be approached through a number of spatial and temporal scales thus highlighting, not only the vulnerability of islands themselves, but of the entire earth.

To contextualise the changes that we are confronting in the present requiresappreciating a breadth of time that exceeds the brevity of human time. There is also an enormous and often overwhelming elasticity of time playing out as it appears to expand and contract in different ways. An example of this is the development and loss of permafrost[3] in Arctic regions. This layer of frozen ground has developed over thousands of years. As it thaws, due to a warming climate, railway lines, bridges and over-ground pipelines buckle, and buildings subside and collapse. In this example, there is the long, drawn out timeframe through the creation of permafrost that is followed, more recently, by its sudden degradation and disappearance. In order to appreciate the scale of what has happened to buildings and infrastructure in such a short period of time, a retrospective view is important.

1.1.3 Arctic islands in this study

This research is based on the Arctic island coasts of Jan Mayen, Bjørnøya and Hopen (Fig.1.1). These islands will be discussed in detail in Chapter 3 of this exegesis. I introduce them more briefly here. The three Norwegian islands are located in the more northerly regions of the Arctic which is referred to as High Arctic.[4] Over the centuries the coasts of these islands were thresholds of activity ranging from walrus hunting to whale processing, and from coal mining to the establishment of meteorological stations. Historical accounts, from journals and photographs, provide insights on how people have previously engaged with these coasts as well as accounting for coastal conditions that were prevalent along these island coasts.

3 Permafrost is defined as ground that has been frozen for two or more consecutive years (French, 2018).
4 The High Arctic regions are defined according to biological, climatic and environmental characteristics. The terrestrial areas are associated with polar deserts (arid conditions). Vegetation typically consists of grass, sedges, moss, lichens and some low growing flowering plants (Grønnestad, 2016).

Fig.1.1. A map showing the location of Jan Mayen, Bjørnøya and Hopen. The islands of Bjørnøya and Hopen are part of the Svalbard archipelago. Map: Eimear Tynan

I will present four characteristics that are shared amongst these three islands as a general introduction to their cultural, social and environmental identity. Firstly, common to all three of these islands is the presence of meteorological stations. These stations have been operating for approximately one hundred years and have contributed to information on climatic trends that have been observed in this region.[5] The stations themselves may have a small terrestrial footprint but their influence stretches across a large oceanic area. Staff working at the stations delivers twice-daily weather reports to shipping vessels in the area by radio.

The second important characteristic of these Arctic islands is that there are no indigenous or permanent populations living on them. This is particular to the Norwegian high Arctic regions[6] unlike the presence of indigenous communities in the northern reaches of Greenland, Canada, the United States (Alaska) and Russia. Temporary inhabitants on Jan Mayen, Bjørnøya and Hopen comprise of staff working at the meteorological stations where they work on six month rotations. Jan Mayen also has 14 staff working at a base for the Norwegian Armed Forces which shares and provides living quarters for the 4 meteorological staff on the island.

The third characteristic concerns the shared history of scientific endeavours that persist to this day. Scientific expeditions began in the late nineteenth century. Photographic and written archives demonstrate the waves of geologists, surveyors, botanists, palaeontologists, astronomers, physicists, and of course, meteorologists visiting these islands. Today scientific research continues on all of the islands particularly during the summer months when conditions are optimal. Scientists today study a vast range of subjects such as environmental pollution, geology and palaeontology, geophysics, ornithology, and biodiversity.

The final characteristic common to the three islands is that they are all protected nature reserves that incorporate terrestrial and marine areas around the islands. This is important most particularly for Jan Mayen and Bjørnøya where intensive fishing takes place in these areas of the Arctic. In addition, the reserve zone around Bjørnøya has protected the island from busy marine transport routes and

5 There are other stations in high north regions of the Norwegian Arctic located on the Svalbard archipelago of which Bjørnøya and Hopen are a part. However, many of these stations have either been stood down (such as at Green Harbour and Sveagruva stations) or have been automated (such as at Isfjord Radio and Ny-Ålesund). In the case of Longyearbyen, the main town in Svalbard, weather stations have been set up in different locations in this area and is currently located at the airport since 1975 (Nordli, 2010).
6 It must be stressed that there is a Sámi population in the Norwegian Arctic. The area that this research is located, however, is north of where the Sámi population is based. On Jan Mayen and the Svalbard archipelago there are no indigenous populations (Hough, 2013).

the encroaching zoning of petroleum licensing from the Norwegian government. Like in the seventeenth century when the seas around these islands were full of competing whaling activity, the seas around the islands of Jan Mayen, Bjørnøya and Hopen are increasingly vibrant with activity from the fishing, tourism, petroleum and deep-sea mining industries. With this in mind, perhaps the future of these islands will be more oriented towards the seas around the islands rather than the islands themselves.

These four shared characteristics that I have outlined mean that, on one level there is a network established between the three islands. On another level there are specificities to these islands that make them unique in their own right and these will be outlined in the following section and described in more detail in the third chapter of this exegesis.

1.1.4 Material changes along Arctic island coasts

This section gets to the core of why the coasts of Jan Mayen, Bjørnøya and Hopen are dynamic and timely environments to study. The previous section started by referring to the rich cultural pasts of the islands with a range of industries leaving their marks behind. Dag Avango and Peder Roberts emphasise the significant material remains of these activities that are tightly connected to the coastal environments of Svalbard:

> a significant amount of material remains from over 400 years of intensive natural resource exploitation in the archipelago. Svalbard contains the standing and ruined remains of seventeenth-century whaling stations, eighteenth-century hunting stations, nineteenth-century research stations, and most notably twentieth-century mining sites— prospecting camps, mines, transport infrastructures and mining settlements which dot the coastlines (Avango and Roberts, 2017:193).

The coasts of the islands in this study share the histories that Avango and Roberts describe. Historical sites are found around the fringe of all three of the islands and give insights on how different waves of people have engaged with these coasts, for different purposes, over time.

Materials that are found on these sites offer clues on the type of activities that took place. Where whale and walrus hunting took place there are often skeletal remains to be found in these locations, such as at Kvalrossfjære (Bjørnøya) and Kvalrossbukta (Jan Mayen). On Hopen and Jan Mayen there are the remains of

small wooden huts where fox trappers used to stay. Then, there are non-organic materials that are associated with infrastructure connected to other activities such as coal mining (Bjørnøya), whale/walrus processing (Bjørnøya and Hopen) and the remains of former weather stations (Bjørnøya and Jan Mayen).

The significance of drawing attention to the materiality of historical sites on these islands is two-fold. Firstly, exploring the history of the site is a means of engaging with time. This includes the human history of the islands and the history of the materials themselves which are of other temporalities. A series of questions toward the material illustrates the richness of time inherent to each material: How old is the material? How long will the material be on this site? Are there processes surrounding these materials that will extend or shorten their presence? Where will its journey take it and how long will this take? Such questions reveal many stories about the materials, the answers to which may be factual or speculative.

These questions pertaining to materiality and time are integral to this research in exploring the specificities of a site and provoking consideration for relations beyond a site. This way of thinking extends a way of knowing a site in which spatial predominance is simmered and rather than measuring materials in space, they are approached as active agents that relate in different ways to a site.

The second point I wish to make on relating historical sites with materiality and time relates to the climatic issues brought forward in the previous section. These coastal sites are transforming and disappearing due to the manifold consequences of climate change. The climate on the islands is warming up. In the case of Bjørnøya and Hopen they are becoming wetter too. This has huge ramifications on the materials that remain from historical activities along the coasts. These changes are occurring over different timeframes. Wooden structures, for example, decay faster in warmer and wetter weather conditions. At a more gradual pace the ecologies of these islands are expected to change too meaning, for example, that plant species will increasingly encroach on these sites. On a more immediate scale coastal erosion has already destroyed and severely damaged many of these historical sites.

In addition to material change relating to historical activities, there are new materials continually depositing onto these shores. These are regularly reported as pollutants and take the form of polychlorinated biphenyls (PCBs) and persistent organic pollutants (POPs). The coasts are a meeting point where materials from the air, land, sea, as well as materials from and human/non-human visitors accumulate. Questions arise on how these become a part of the coasts and for how long. In

discussing plastics in the oceans, sociologist Jennifer Gabrys points out that plastic accumulation is not just 'the literal accretion of residual matter in the seas, but also to the build-up of plastics within environmental processes and corporealities' (2013:209). On the Arctic islands in this study there are large quantities of plastic debris washing up on the shores but there is also microscopic materials, for example, ingested by birds nesting on these islands. This triggers further enquiries on how long these macro and micro materials will remain in these environments as well as the consequences these will have on other materials existing on the islands.

1.1.5 The world in a grain of sand

Putting coastal materials centre stage of this study has the potential to reveal multiple dimensions of time as well as expose relations between these materials. Furthermore, the different states, conditions and processes of these materials have the capacity to reveal other temporalities. This, consequently, raises questions on the different scales of space and time that these materials really encompass. The geologist Michael Welland, taking sand as an example, expands on this point:

> picking up a few grains of sand connects us not only to a particular beach or riverbank, but to the most recent journey that those grains have made, to the mountains from which they originated, to countless older journeys and cycles, and to the history of our planet…. Reading the stories that a sand grain has to tell can only be accomplished through understanding the context, the system, in which that grain has played its role (2009:290-91).

Welland's description helps to capture the extensive and complex tempo-spatial expressions of sand. The journeys of sand span dimensions of space and time that are difficult to comprehend but it is by holding the sand, attuning to it, and contemplating its origins and futures that relations to a site and the wider world can begin. Welland's contemplation on a few grains of sand may be applied to any material that one encounters. It expands and exposes the life of a material and establishes relations to the world in multiple ways.

Welland ends his description by indicating the "role" a grain of sand has in wider systems. This is important to highlight, particularly in light of today's global environmental change, where relations between humans and the more-than-human are under scrutiny. This has been explicitly brought to the fore through the theorizing of the controversially termed geological era of the Anthropocene that we are now living in. The Anthropocene has highlighted the earth-shifting power

of humans and how the "roles" of materials are predominantly dictated by human systems of control rather than being a part of natural systems.[7]

1.1.6 Connecting coastal and temporal Arctic landscape studies

There are several perspectives from which to read the dense stories of the Arctic island coasts that are entangled with time and materials. The perspective I have chosen to take explores relations between human and more-than-human agencies that are continually interacting with these coasts on a range of spatial and temporal scales. However, to find the answers to the research questions I posed in section 1.2.1 my approach is to work closely within specific coastal sites on the islands of Jan Mayen, Bjørnøya and Hopen. In short, the specificities, involving time and coastal materialities of these sites drive my research ambitions.

Before launching into the specificities of these coasts it is important to gain an understanding of the spatial and temporal contexts to which these islands belong. This unavoidably addresses the subject of scale where close relations emerge between the islands and the rest of the globe if, for example, we take climate change into account. The temporal scales occurring on a global scale resonate with the time of the islands – this may be viewed through the slower, deep time of sand or through the accumulation of plastic debris that can wash ashore with a high tide. To undertake a situated account on these islands means that other temporalities come into force – intricacies of time that cannot be picked up by satellites or other modes of remote sensing. To attune to the temporalities of these coasts means applying a range of design methods that embrace immersive, experiential and heuristic modes of enquiry. It also involves appreciating the land, sea and air and the temporal relations that are present between them.

1.2 FOCUS OF THE STUDY

The time and materiality of Arctic island coasts are at the heart of this research. The discipline of landscape architecture has long privileged space over time[8] but in an Arctic context, where accelerated changes are playing out, time needs to be brought to the fore. The vibrancy of Arctic coastal environments, conditioned by humans, non-humans, climate and natural processes, invite an unearthing of diverse temporalities to understand the complexities of change. However, as a starting

7 The Anthropocene term has been used to describe humans as a global 'geologic force', for example, in the work of Lewis and Maslin (2015); Chakrabarty (2018) and Bjornerud (2018). However, many scholars have also drawn attention to the political, social, ecological and economic consequences of humans as a geologic force such as from Tsing et al. (2017); Yusoff (2017); DeLoughrey (2019); and Sijmons (2021).
8 Landscape architects such as Günther Vogt (2010) and Noël van Dooren (2018) have voiced concern of the predominance of space over time in landscape architecture.

point to this time-centred and site-specific enquiry I focus, first and foremost, on the diverse materials of Jan Mayen, Bjørnøya and Hopen's coasts. My enquiry will also extend to the temporalities of the different states, conditions and processes of the coasts that interact with these materials. Parallel to studying these more-than-human temporalities I integrate my own subjective (human) impressions and experiences. These illustrate a consciousness and awareness of time as I explore the pluralities of time around me during my research.

Working with time also requires articulations and communication of different expressions of time pertinent to Arctic island coasts. In light of environmental change in an Arctic coastal context this requires reflection on how time is theorized in landscape architecture and a critique on the effectiveness of commonly referenced concepts of time, such as linear and cyclical time. The expressions of time that I wish to identify and explore in this study require capacities to articulate change that relate specifically to what is unfolding along these coasts. In addition, subjective articulations of time, which are sorely lacking in landscape architecture, will also be incorporated into this research.

The points I have drawn attention to in this section will be positioned into a larger conceptual framing in the following section. The purpose of this is to illustrate where and how I align my tempo-material enquiry with established theories and approaches.

1.2.1 Main research questions

The background to this research that I have laid out establishes a set of contexts that help to position and give direction to my research enquiries. The environmental context provides the foundation from which this study embarks. This Arctic island context is undergoing accelerated change that is unprecedented in these regions. The cyclical climatic rhythms that persisted for centuries are fraying and the ways in which humans are engaging with the Arctic is intensifying which is impacting on the environment in a number of ways. These changes manifest in and through the materials of these regions. As already mentioned, I have chosen a selection of island coasts to explore these changes through the materials that I encounter which allows for a localised, site-specific study. However, in order to engage with change, I must engage with time.

The theoretical and conceptual context that I have briefly discussed illustrates that the subject of time is gaining interest from a number of disciplines. This includes landscape architecture but there are few texts that explicitly explore and appraise how we work with and theorize time. For this research, this means looking towards

other disciplines that have more established theorizations of time which can assist in my tempo-material enquiries.

In light of these contexts, there are three overarching questions as well as six sub questions that will be addressed:

1. Is there a need to work with Arctic coastal environments differently from other terrestrial environments?
- What defines a coastal environment?
- How are Arctic coastal environments different?

2. Building on conventional concepts of time used in landscape architecture what alternative concepts are needed to articulate accelerated and unpredictable change along Arctic coastal environments?
- Why are alternate concepts of time needed?
- How can these be developed more specifically for the discipline of landscape architecture?
- How can they be applied?

3. How can a practice-based and situated approach inform a greater understanding of time in landscape architecture?
- Can local, site-specific temporal readings of Arctic island coasts help confront wider environmental and climatic crises affecting other coasts around the world?

These questions guide the research through theoretical and practical modes of enquiry. They are all inter-connected and are approached from different perspectives through the production of four publications that are an integral part of this research. In developing these questions during the early stages of this research it was important to clearly position the key themes of Arctic island coasts, materiality and time. The answers to the questions posed in this research open up a range of possibilities on how landscape architecture can engage closely with time in an Arctic coastal context.

1.2.2 Issues, challenges, and potentials of this research

In landscape architecture there is a sense of urgency in relation to designing and working with environments that are undergoing a range of changes on different spatial and temporal scales. The discipline is confronted with urgencies that include climate disruption, pandemics, depletion and destruction of habitats, toxic residues and pollution, and resource scarcity. Such changes demand that we react

now whilst considering the likelihood of extreme changes far into the future. This has forced us to consider theoretically and practically how to confront global environmental issues and this presents challenges for the discipline. I regard there as being two broad challenges that the discipline is currently grappling with.

Firstly, in order to meet the challenges posed by environmental issues it is likely that landscape architects will have to engage with other disciplines that may not traditionally have been part of a landscape design process. In her essay, 'Criticism in the Age of Global Disruption', landscape architect Anita Berrizbeitia (2018) illustrates what she foresees as engagement with other disciplines/collectives. These include teams of technical experts, community activists, AI (Artificial Intelligence) and robotics. Berrizbeitia's past, present and future charting of the discipline is from the perspective of landscape practice. Parallel to these forecasted trends in landscape practice, the discipline is currently seeking out other disciplines to bolster its theoretical foundations in helping to confront environmental change. Recent landscape architecture publications attest to this with contributions from authors based in environmental humanities, history, philosophy, anthropology, literature, geography and earth sciences.[9]

This leads to my second point where it is evident that the fast-paced changes being experienced across many environments are reflected in an increased interest in time and temporality. Donna Haraway points out that 'urgencies have other temporalities' (2016:37) and in many ways landscape architecture is trying to identify and articulate the range of time structures, units and scales playing out today. The Anthropocene has emerged as a notable topic of interest in landscape architecture.[10] The topic has unleashed writings ranging from deep time to vulnerabilities in society, and from environmental destruction to material movement around the globe. These examples reveal a new consciousness of time – from the immediate destruction/construction of environments to the more gradual exhaustion of the earth's resources.

The issues and challenges that I have described give a context to where my study is positioned in the discipline of landscape architecture and why there is a sense of urgency in confronting issues, particularly those relating to climate change. I have chosen to work with the topic of time specific to the materialities of Arctic island coasts and these present their own issues and challenges. Only recently has

9 For example: Braae and Steiner (2019); Bremner and Cook (2020); Kahn and Burns (2021); Waterman, Wolff and Wall (2021).
10 For example in the work of Prominski (2014 and 2019); Heatherington (2015 and 2021); Sijmons (2021), Milligan (2022).

the discipline of landscape architecture begun to engage theoretically with time. This, as a result, presents issues in finding established texts that are dedicated to the subject of time. To address this, extensive reading across a wide spectrum of literature has been needed for this research.

1.3 FRAMING THE INQUIRY

As a means to establish an approach that can help address my research questions there are two more detailed framings that are required–they are theoretical and practical.

1.3.1 Theoretical framing

This section sets out three distinct areas of where I position this research. First, I will continue with the topic of time by outlining the theorists and philosophers that I identify with in helping to establish specific expressions and conceptualisations of time for Arctic island coasts. I then examine post-phenomenology which helps in mediating and opening up relations and co-existence between humans and non-humans. Lastly, I turn towards non-representational theory (NRT) which supports situated and immersive modes of research. In addition, it relates very much to concepts of time that embody process and emergence.

Time

The purpose of developing a theoretical framework is primarily to extend conceptualisations of time that may be applied to environments which are constantly in flux, such as along Arctic island coasts. It is a complex task when these coasts are conditioned by users (humans) who frequent these shores as well as by a range of materials that are influenced by terrestrial, marine and aerial processes. Jackie Bowring and Simon Swaffield highlight 'the struggle of the landscape architect to navigate timescales, natural processes, and the inevitable uncertainty of the physical world' (2013:96). This challenge means that I must seek out answers that may lie in concepts and theories from other disciplines that have more established understandings of time.

In light of the islands' context that I have previously described, which refers to spatial and temporal considerations that are enfolded in climate change and the Anthropocene, it is a logical step to explore how other disciplines are finding positions in these widely discussed topics. However, this step must also include criteria from which this research can effectively proceed. The following three criteria are proposed to help develop concepts of time that: 1) Have the capacity to articulate change that includes disruption and emergence; 2) Do not differentiate between human and more-than-human temporalities; and 3) incorporate

experiential dimensions of a coast. Collectively, these criteria can help shape the ways in which I can consider and explore time along Arctic coasts.
Geographer Tim Edensor places great emphasis on the dynamism of landscape whereby it 'seethes with multiple rhythms and temporalities, as elements within it are continuously becoming, emerging, dying, and transforming' (2017:11). Anthropologist and archaeologist Barbara Bender, meanwhile, states that 'Landscape is time materialized. Or, better, Landscape is time materializing: landscapes, like time, never stand still' (2002:103). Contributions to the theorizing of time may be found across many disciplines such as geography[11], archaeology[12], geology[13], anthropology and ethnography.[14] There is general agreement amongst these disciplines, including landscape architecture that landscape is continually moving and changing.

Attention is needed, however, on how landscape architecture expresses movement and change in the landscape. Conventional references to time used in landscape architecture are linear and cyclical timeframes.[15] Landscape architect Nöel van Dooren explains that linear time is the 'progression of time in between two moments involving now and then, earlier and later, past and future, and the conviction that time moves in one direction' (2016:93). Cyclical time signals repetition and is often referred to through solar cycles which, for example, are experienced as day and night; and lunar cycles which, along with the sun, strongly influence the regular ebb and flow of the tides. While these references to time have their uses in landscape architecture they are insufficient in articulating environmental change that I touched upon in section 1.1 which drew attention to environmental disturbance, urgencies and unpredictability.

In returning to the disciplines that I listed above in the first paragraph, there are alternative conceptual references to time that re-emerge across these disciplines that include duration, process and pluralities of time. These can be traced back, in some cases, to philosophers who originally developed these concepts of time. Of prominence are the philosophies of Henri Bergson (1859-1941) and Alfred Lord

11 A selection of geographers who discuss time in their work include: Crang (2011); Dodghson (2008); Edensor (2010, 2014); Lorimer (2012, 2017); Massey (2005); Matless (2018); Yusoff (2005, 2015, 2018).
12 A selection of archaeologists and historians who theorize on time include: DeSilvey (2017); Chakrabarty (2018); Gange (2019); Olsen (2010).
13 A selection of geologists who discuss time in their work include: Bjørnerud (2018); Welland (2010); Zalasiewicz (2017).
14 A selection of anthropologists and ethnographers who discuss time in their work include: Bender (2002); Ingold (1993); Irvine (2014); Nielsen et al. (2020); Simonetti (2019); Strang (2015), Krauss (2013).
15 These are described in Motloch (2001).

Whitehead (1861-1947).[16] One key common motivation linking these philosophers was the need to address the qualitative dimensions of time. An interesting facet to the time philosophies of Bergson and Whitehead is that there can be a range of qualitative experiences of time that can occur even though they are quantitatively identical (Helin et al., 2014).

The concepts of duration, process and plurality or multiplicity are useful concepts that have been explored by a range of disciplines thus offering alternative, yet overlapping, perspectives. These concepts help in serving my tempo-material approach for a number of reasons. Firstly, these concepts do not distinguish between humans and non-humans and therefore can be applied equally to materials and my subjective accounts of Arctic coasts. Secondly, they are not contained or restricted in their meaning or application (as opposed to the line in linear time, and the circle in cyclical time). Instead, there is an openness of time with infinite possibilities on how time can manifest in different materials. Related to this notion of openness is the advantage that these concepts can incorporate issues of disruption and unpredictability which is crucial in the Arctic and coastal context of this study.

The final point I wish to make, which permeates these concepts of time, is a consideration for scales of time. This is well articulated in the disciplines of geology[17] and more recently, the environmental humanities.[18] This is a necessary element to draw into this research particularly with regard to my discussions on the Anthropocene which incorporates issues pertaining to climate change as well as the 'geological expansions' of deep time (Wood, 2019). These will be elaborated on in the second chapter of this thesis. Within these diverse conglomerations of timescales spatial scales must also be considered. In this regard, I pay attention to individual and specific qualities of coastal materials whilst making connections to the local coastal environment to which they belong as well as to environments beyond these coastal sites. To articulate these relations, references to timescales are needed.

Post-phenomenology

In drawing attention to the more-than-human materials of Arctic coasts this study

16 The philosophies of Bergson and Whitehead have appeared in the work of Pedersen and Nielsen (2013); Lorimer (2012); Gabrys et al. (2013).
17 For example in the work of Bjørnerud (2018); Welland (2010).
18 For example Wiggin et al. (2020); Tsing et al. (2017); Another publication that is not from the environmental humanities but that warrants a mention is Facer et al. (2022) with input from the arts, humanities and social sciences.

is aptly situated in a post-phenomenological context. Post-phenomenology is particularly well researched in cultural geography and offers insights into new ways of researching landscape.[19] A defining difference between phenomenology and post-phenomenology is that the former has a tradition for 'anthropocentric bias' (Roberts, 2019:547) while the latter grants 'a greater role to the material agency that is downplayed in much phenomenological thought' (Edensor, 2020:22). A leaning towards a post-phenomenological approach for this research, therefore, lies in the reduced hierarchal relationship between humans and more-than-humans and allowing space for the two to exist with and alongside one another.

Geographers James Ash and Paul Simpson outline three key elements that differentiate phenomenology from post-phenomenology. The first relates to rethinking intentionality between subject and object whereby the subject experiences with the world rather than making assumptions prior to experience. Second, is the recognition of objects having autonomous realities rather than being produced through subjective experience. Third, is the reconsideration of the capacity of objects to develop relations with the world like humans. This, according to Ash and Simpson 'elevate[s] the status of objects and accept[s] that they encounter the world through similar structures (if not capacities) as phenomenology argues human beings do' (2016:59).

The three differences that Ash and Simpson outline is pertinent to this doctoral study by asserting the agencies of both humans and more-than-humans thus helping to reduce the nature/culture divide that still persists strongly in landscape architecture today. It also offers consideration of emerging relations that exist between objects themselves as well as between subject and object. In doing so, there is also a shift in thinking from the singular to the plural in consideration of co-existence with the other. The concepts that are emerging within post-phenomenological thinking align with discussions pertaining to the Anthropocene where there are shifts in thinking towards more-than-human agencies that sit within temporal and spatial scales that can exceed anthropocentric thinking and experience.

Non-representational Theory

In his commentary on time and the human senses chemical engineer and scientific philosopher Kenneth Denbigh draws attention to the limitations of humans to depict and perceive time. He states:

19 According to Ash and Simpson (2016) the term post-phenomenology was developed by philosopher of science and technology Don Idhe in 2003. Some notable texts on post-phenomenology in cultural geography include: Rose and Wylie (2006); Ash and Simpson (2016); Roberts (2019).

> We have no sensory apparatus for giving knowledge of temporal relationships. The eye and the sense of touch provide an immediate awareness of spatial extension, but we have no senses which offer any knowledge of temporal extension (1981:16-17).

Instead, he claims, it is the faculty of memory that helps us to distinguish what was from what is.[20] Perhaps this explains how much easier it is to perceive space compared to time where our senses can astutely understand space almost immediately. Mathematician G.J. Whitrow concisely explains that 'space comes all of a piece' while time 'comes bit by bit' (1980:2). And perhaps this also explains why we, as designers, display stronger skills in presenting and representing space over time. This research tries to confront this longstanding issue on how to identify, work with, and articulate time in the context of Arctic coastal environments.

To explore the varying dimensions of time requires a capacity to perceive change, as well as being mindful, attentive and attuned to the infinite scales and units of time that are present. In this research I attempt to find and explore multiple dimensions of time by applying diverse and overlapping methods through an immersive and embodied approach. Such an approach corresponds with non-representational theory (NRT).

The theory was proposed by geographer Nigel Thrift (1996) who admitted that it is best described as an approach rather than a theory. Geographer Emma Waterton explains that 'Thrift prompted a shift in thinking towards conceiving of the world in practical and processual terms, or as the fluidity of things in a world that is in a perpetual state of becoming' (2019:92). NRT posits that the body is not separate from its context or environment but is continually interacting with it thus giving way to a fluidity that allows for performances and manifestations to emerge (Macpherson, 2010). NRT also takes into account the context in which the body is situated which resonates with a post-phenomenological approach.

NRT has been written about extensively in cultural, human and political geography[21] and also, but to a lesser extent, in anthropology and ethnography.[22] Geographer John Wylie explains that since around the year 2000 there has been a shift in human geography research from 'representations of landscape, nature, identity, space, place, the body and so on, to studies investigating various

20 This point resonates with the earlier work of French philosopher Henri Bergson who emphasised the role of memory in our living in the present: 'With the immediate and present data of our senses, we mingle a thousand details out of our past experience' (1896: 33). It is important to note that Bergson's philosophy on time and memory was not about recollection but rather the past lives in the present.

21 Geographers who have written on the topic of non-representational theory and who have been consulted in this research include Wylie (2007); Lorimer (2005, 2008); Thrift (2008); Macpherson (2010); Anderson and Harrison (2010); Anderson (2014); Edensor (2015, 2020); Ryan (2016).

22 Notable examples include Vannini (2015) and Pink (2015).

performances and performativities of these tropes' (2007:163).[23] This underpins some of the challenges that I present in my work concerning how to engage and represent the temporal fluxes inherent to Arctic coasts. NRT helps in negotiating such dilemmas by acknowledging that not everything can or should be captured but at the same time alternative perspectives on how to engage in different ways with environments around us are encouraged.

Despite landscape architecture being a design discipline concerned with space and time the representation of time-orientated conditions such as fluidity, movement and exchange are still in its infancy. There has been an emergence in recent years to make explicit the changing phenomena of place through varied modes of representation.[24] The use of sound, video and interactive models is increasingly used to represent the movement and change of materials. A recent online exhibition by the trans-disciplinary research project called Monsoon Assemblages (2021) illustrated a range of modes for representing changing monsoonal environments. Techniques include the use of video, sequential drawings and time-lapse photography to capture change and the passing of time. Such examples illustrate the necessity of multi-modal ways of working (producing and representing) in an effort to communicate different environmental phenomena.

1.3.2 Practical framing

The theoretical framework that I develop over the course of this study influences how I conduct my fieldwork enquiries. I wish to return briefly to a point discussed at the end of 1.4.1 with regard to quantitative and qualitative time in a landscape architect's engagement with a site. There has been a huge increase in the last twenty years with 'sensing' landscapes digitally either remotely[25] or by using in-situ sensors. When asked about the transition from analogue to digital modes of working in landscape architecture, Günther Vogt replied that 'in this hectic digital age there is a lack of critical distance, of awareness of one's surroundings. Quite literally what is lacking is emptiness and quiet, and for me finding these is very important' (Vogt, 2015:100). I concur with Vogt's perspective, not from an anti-digital or anti-technological standpoint, but in returning faith to the intuitions of

23 Wylie (2007) explains that performance is understood as the world being 'continually in the making – processional and performative – rather than stabilised or structured via messages in texts and images' (p.164).
24 For example the work of the American landscape practice SCAPE in their project titled 'Public Sediment: Resilient By Design Challenge' where they have produced a video showing their proposal of an extensive coastal environment developing over time; A second example is the work of Danish firm Stig L. Anderson (SLA) in their project 'Sankt Kjeld's Square and Bryggervangen' where video is used to show their completed project. There is much attention to how their design proposal changes and performs in different weather conditions; And finally a design studio course taught by landscape architects Ilmar Hurkxkens and James Melsom (2021) in their experimental digital landscape fabrication techniques to examine coastal sand processes.
25 Remote sensing 'is a method of collecting and interpreting data on objects from a distance…Its most frequent application is from aerial or space platforms' (Lapaine, 2018:189).

the designer and an attunement to the environment whereby all of the senses are engaged.

The practical phase of this research employs a range of methods that record coastal materials in different ways. This phase also includes my experiential commentary as I further expand on different observations and thoughts while conducting fieldwork. Throughout this process I take account of how time plays out in the tools and techniques I use. New sets of questions emerge such as: how long is the method applied? What temporalities may be depicted in the materials using each method? Does a combination/overlapping of methods provide more or the same number of temporalities? How long is the tool active during each method? What methods are most effective in articulating the experience of the designer?

With these questions relating to research practice, a loose framework can be proposed that considers method, environment and designer:

1) Time of the method: considers the time of the tools and techniques that are used and applied and takes into account how these perform in different coastal conditions.

2) Time of environment: this takes into account the materials and the associated conditions, states and processes of the coastal site.

3) Time of the designer/researcher: encompasses the experiential, affective, reflective and intuitive responses of the designer to the coastal site.

This practical phase of the research concludes with a reflective return to the theoretical framing with answers on how different modes of practice can inform a landscape architecture-specific ontology for working with time in the discipline. This is an important point to carry through in my research. In landscape architecture, there is a mediation involved between the measured or quantitative aspects of space and time, and the qualitative aspects where experience, values, impressions and intuitions come into play. However, the way in which we express and represent the quantitative and qualitative aspects of a site in our work is very different.

The quantitative aspects are easily seen through the measurements of a site and time can also be clearly depicted through the scheduling of a project for example. However, the qualitative aspects of a site are less straightforward. Plants on a site, for example, are sometimes reduced to numerical scales of value based

on the species and age. The designer, meanwhile, subtly enfolds and integrates their experience and intuitions of a site through the design process. A significant motivation for this study is to make more explicit the qualitative dimensions of time along Arctic island coasts and to explore if other expressions of time can enhance the way we work with changing environments.

1.4 METHODS AND MAKING

1.4.1 Research through designing

The methodological foundation to this research is 'research through designing' (RTD). I use 'designing' rather than 'design' to place emphasis on action, engagement and process. RTD concerns what can be learned, experienced and communicated by performing design activities' (Jansson et al, 2019:13). In the process of this research it also draws support from other disciplines to help to bolster arguments and reasons for making different research choices.

RTD is a research approach that is commonly used in landscape architecture research and most prevalent in doctoral research. However, the examples that are published are varied and employ disparate modes of research practice. In 2016 the Journal of Landscape Architecture featured a short appraisal of research and design articles published in its journal. The author, Martin Prominski placed RTD projects into three categories: 1) Design work specifically done in a research project; 2) Own design projects from practice; and 3) Student work from design studios or workshops. I situate my research in the first category where 'there are no precedents such as case studies that could serve as a basis for answering a specific research question (Prominski, 2016:27). While my research is design oriented in seeking answers to my research questions it has a carefully assembled theoretical framing of various trans-disciplinary threads that help to inform my ways of thinking, making and reflecting.

So, how exactly is my research design oriented? My research primarily employs a situated approach along Arctic coasts. In a typical design process of landscape architecture I regard my research as being positioned in the early phase of the process when the designer attends to the environmental, climatic, legal, social and built parameters of a site. However, one significant difference in my research is that I do not have a design brief to work with which effectively calls for a designer to physically change the function or use of a site. Instead of a design brief, I have formulated research questions that drive my research process. Another difference is that my focus, during my time along these coasts, is on the materials from a selection of coastal sites. I do not work within the confines of an enclosed site like

most landscape architects must adhere to.

1.4.2 Situated knowledge and the in-between

Within the methodological framework of RTD this research adopts a qualitative approach using mixed-methods through situated and immersive modes of practice. The locations in which I use a range of methods are not restricted to the coastal sites on the islands. Instead, I take into account different modes of working– before I embark on my fieldwork; while I journey to and from the islands by plane and boat; in-situ fieldwork on the islands; and processing my work after my excursions. Each of these phases has different locations some of which are fixed and some of which are moving. I formally categorise these phases as the archives, the in-situ fieldwork, the in-between, and the studio.

To consider different knowledge generation in different locations is experimental. The purpose is to explore how transitions through different sites and situations require constant re-attuning to the different manifestations of time that can emerge. This link between different modes of situated knowledge is not theorized in landscape architecture. However, I believe, from my experience as a practicing landscape architect, that it needs to be. There are very different types of doing, thinking and reflecting when a designer typically moves from studio, to car, to site, and back to studio again. In the case of working on rather distant Arctic islands, the long travel periods to the coastal sites magnify this point. Being on a boat for up to several days allows for time to soak up the changing air and sea conditions that surround these islands. Even on a boat there is situated knowledge to be considered that offers another context to the islands.

1.4.3 *Practicing time*: tools and techniques

I apply a range of different methods, commonly used in landscape architecture practice, across different situations and stages of this research. Through the application of these methods I reflect upon the ways in which time is exposed in the materials I study. I refer to this conscious and immersive approach of continually engaging with time as practicing time. Parallel to working with the temporalities I find in the materials I work with, I also account for my own experiential and subjective accounts of these coasts.

The tools and techniques used in this research are deployed in different phases and situations of the research. These may be summarized as follows:

1. The archives – this involves consulting written historical accounts relating to the islands and their wider Arctic context. I will also explore historical photographs

which will give insights on a) how people have engaged differently with the different parts of these island coasts over time, and b) offer clues on historical conditions and states of these coasts. In addition, I briefly consult weather records from the meteorological stations on the islands to gain an overall perspective on how climate change is affecting each of these islands.

2. In-situ fieldwork – this phase employs the widest range of methods including photography, field-note taking, and audio recording.

3. The in-between – this phase incorporates in-between locations on the islands where I primarily use walking to go from A to B. It also accounts for travel to and from the islands where I use photography and field-note taking.

4. The studio – processing of the varied material gathered on the islands is undertaken using model-making, map-making and formal writing in the form of article publications.

Collectively these four phases of the research provide different ways of engaging with time and materiality through the application of different methods. The location of these phases also illustrates how I engage differently with materials. An example of this is travelling by boat to the islands which is largely documented through visual means where I take photographs from the ship's bridge. Conversely, working with historical photographs on the coasts situates me in a much more tangible environment where I am exposed to a broader range of conditions. Each of these locations, using different methods, therefore, reveal different temporalities of these coasts and their marine contexts.

1.5 RESEARCH PUBLICATIONS

This thesis follows a PhD by compilation, comprising an Exegesis, three peer-reviewed articles in international journals and one unpublished book chapter. I have been the sole author for each of these Publications. The complete publications are located in the appendices at the end of this exegesis.

1.5.1 Publication 1:

Tynan, E., 2020. *Arctic islands, Archival Exposures (On Jan Mayen, Bjørnøya, and Hopen islands)*, Shima Journal, 14(1), pp.67-89.

Shima Journal is a peer-refereed academic journal with a focus on island studies. It is published twice a year in open access online form. I submitted my article in response to a special issue called Ice, Islands and Icebergs with Johannes Riquet as

editor for this issue. My article was submitted in November 2018 and re-submitted after the peer-review process in November 2019.

Summary of publication:
A selection of historical coastal sites from the islands of Jan Mayen, Bjørnøya and Hopen were used as a basis to examine how materials, used by former visitors to these islands, have changed over time. A combination of historical photographs with contemporary situated readings of these sites was used to analyse coastal material change. There is a critical reflection on fieldwork practice in landscape architecture where I promote the need for an immersive and relational approach. This coincides with a 'relational turn' in contemporary island studies to which I refer. Doreen Massey's 'geographies of knowledge' is exercised as a means to underpin the journeying through different research environments–from the archive to the island coasts. In response to each site mixed qualitative methods are employed that include repeat photography, field-note taking and sketching. Through these illustrated and descriptive modes of research the temporal conditions of these sites are explored where material changes to these sites are made explicit. Historical archives are, in effect, activated as a new contemporary interpretation is explored. The sites, in their present-day state demonstrate the destruction and decay of the materials associated with historical activity. However, in response to an accelerating warming Arctic there are new, living encroaching ecologies establishing on these sites and entangling with the historical materials. I conclude by asserting that this situated account, using methods commonly used in landscape architecture, allow for important new insights and local knowledge about these coastal sites.

1.5.2 Publication 2:

Tynan, E., 2022. [Pre-print]. *Shifting coasts: Developing New Coastal Concepts. Building Material* (Architectural Association of Ireland).

Building Material is the journal of the Architectural Association of Ireland. It is concerned with contemporary discourse on practice and scholarship in architecture in Ireland. I submitted my article for the issue that sought to explore ideas of topography. The article was first submitted in March 2020 and re-submitted in November 2020 after the peer-review process.

Summary of publication:
This article examines contemporary issues affecting coasts that landscape architects and architects must increasingly address. I confront the problematics of applying terrestrial words to describe coasts and suggest that new modes of thinking about

coasts is required in order to articulate the fluid, unstable and shifting nature of these environments. In order to do so, I turn towards the sea and propose two coastal concepts that offer ways to establish and strengthen relations between land and sea, and to work more closely with temporalities that are specific to coasts. The first concept is built around the physicality of coasts where I underline the porosity and elasticity of these intermediary spaces in opposition to the cartographic conventions that assign a line to divide land from sea. The second concept serves to draw attention to the temporal characteristics of coasts with explorations on how to anticipate new material futures for coasts. In the final part of the article I take a selection of Arctic coastal sites from the islands of Jan Mayen, Bjørnøya and Hopen. Here, I examine these sites through photographic and descriptive means to explore the fluidity and diversity of materials that unfold where the sea meets the land. Collectively these methods highlight site-specific conditions and materials inherent to these coasts.

1.5.3 Publication 3

Tynan, E., 2021. *What time is this coast? Temporal encounters in the Arctic*. Journal of Landscape Architecture, 16(2). pp.10-25.

The Journal of Landscape Architecture (JoLA) is a journal of the European Council of Landscape Architecture Schools (ECLAS). It is published three times a year. I first submitted my article in June 2020 and after two rounds of peer-review I made a final submission in May 2021.

Summary of publication:
This article challenges the limited conceptualisations of time used in landscape architecture and proposes three concepts of time that have the capacity to express durations and pluralities of time inherent to human and more-than-human agencies of a coastal environment. A frozen shore on the island of Bjørnøya is the main location for this research where I argue that even if it appears fixed and static there are multiple and emergent conditions, states and processes continually playing out. I incorporate three types of situated knowledge – on the sea, along the shore, and in a studio space in an effort to provide a comprehensive time-based engagement with the materials from this coastal site. Methods used on the sea and shore include photography and field-note taking while model-making is used in a studio setting as a means to analyse findings from my time on Bjørnøya. Through this multi-method approach I integrate and test the three concepts of time and appraise their values in helping to express a range of temporalities that I explored in this study. I conclude by urging the theorizing and application of more concepts of time in landscape architecture in helping to articulate change in our environments which is

increasingly an issue for the discipline.

1.5.4 Publication 4

I was invited to contribute to a book publication (Routledge publishing) organised by the Finnish research group *Floating Peripheries: Mediating the sense of place*. I made connections to this artistic research group when I presented a paper called 'Sounding out Arctic coastlines' at a conference held in Roveniemi, Finland in January 2019. This book chapter publication is currently undergoing a peer-review process. However, it has been approved by my supervisors and AHO's research committee for inclusion in this research. The title for this book chapter is 'Temporal perspectives on Arctic peripheries' and was first submitted in November 2020.

Summary of publication:
This book chapter examines the Arctic island of Bjørnøya from three different temporal perspectives. The first perspective engages with historical time and offers an overview of how representations and perceptions of Arctic peripheries and centres have evolved from pre-modern times to the present. I consult historical accounts to gain insights of how the Arctic was once perceived from the outside. Contemporary references to Arctic peripheries reveal increasing criticality towards borders and boundaries that define this region. The second temporal perspective shifts to deep time where I trace the geological journey of what is now called the Arctic island of Bjørnøya. The story is told through fossils found on the island which provide clues on how the island has taken a long and gradual journey from equatorial regions to the Arctic crossing through multi-climatic environments that is now encased in the island's geology. The final perspective explores experiential time scales from my journey to Bjørnøya to walks along its shores. This exposes the conditions of the coast and is expressed through visual and aural means.
A temporal approach to Arctic peripheries exposes multiple viewpoints that incorporate perceptions, representations and materialities of the Arctic. These three perspectives draw attention to how a time-oriented approach offers vastly different stories of this island.

1.5.5 Publication connections

The four publications share common threads that are rooted in time, materiality and Arctic island coasts. In different ways they provide answers to the overall research questions of this thesis which are stated in section 1.2.1. Briefly, there are six elements that are shared between these publications through attention towards the tempo-materialities of a selection of Arctic coastal environments.

First, I challenge how coasts are defined and conceived, providing both a general context in publication 01 and 03 (Shima journal and JoLA) and right through to the specificities of these island coasts in all publications.

Second, different Arctic contexts are provided in all publications ranging from historical to climatic, and from geological to political. These contexts are important to examine as they affect the past, present and future materialities of these islands.

Third, a range of methods are applied throughout these publications. In each case different expressions of time are discussed. This underpins my intentions to develop close connections between theory and practice in this research.

Fourth, as the publications have developed I have strengthened my arguments and position on why alternative conceptualisations and thinking about time are needed in landscape architecture. I feel that these were best presented in my final two publications.

Fifth, I have given attention to how situated research can incorporate different locations (‘geographies of knowledge’) each of which express time differently. This was theorized most comprehensively in the first article and applied in the first, third and fourth article.

Finally, I have attempted to offer ways to bring experiential dimensions of material engagement into fieldwork through writing and illustration. This was accounted for most explicitly in publications 02, 03 and 04

1.6 CONCLUSION

The context to which these Arctic islands belong is warming up, on average, at three times faster than the rest of the globe. Some of the consequences of these warming temperatures may be seen and experienced through the materialities of the Arctic island coasts of Jan Mayen, Bjørnøya and Hopen. Historical activities have left their mark on these islands with diverse materials concentrated on certain parts of the coast. Today, a range of debris accumulates on these islands brought by the sea, air, humans and non-humans. This has resulted in rich assemblages and entanglements of natural, historical and contemporary material compositions that are constantly under the wrath of coastal conditions and processes.

Each of these materials, as well as the conditions in which they inhabit, possess diverse expressions of time that invite temporal enquiry on how change is unfolding along these coasts through a range of durations and scales ranging from

the deep time of plastic debris to the spontaneity of an earthquake. The overarching temporal context that these coasts are embedded is in the new geological epoch of the Anthropocene which places much attention on the tensions between human and non-human systems which I explore through a material and temporal lens.

In confronting the changing materialities of these coasts the overarching questions is ‘how, as landscape architects, can we begin to make sense of this?’ My response comprises both theoretical and practical proposals. Theoretically, I propose examining how we engage with time in our discipline because in order to understand change we must carefully reflect upon time. I proceed to outline the inadequacies of conceptualisations of time that are typically used in the discipline and propose new concepts that can help in addressing emergent, disrupted and fluid environments. I also add that these concepts should not necessarily distinguish between humans and more-than-humans in an effort to address the dualisms of subject and object that persist in the discipline.

In a practical sense, I explore how my theoretical framings can be applied practically along these coasts. As time is at the heart of this proposal I refer to this as ‘practicing time’. This involves becoming attuned to the diverse expressions of time inherent to coastal materials which also requires consideration for the temporalities of coastal conditions, states and processes. In this time-centred practice I include my own experiential perspectives that are a part of the time concepts that I propose.

The outcomes of this research include proposals on how landscape architects can engage with time along coastal environments. This study, structured by a series of questions, sparked much reflection on the discipline of landscape architecture. Rather than be overly critical on a relatively young discipline, I instead stress the need to look towards other disciplines to inspire new ways of thinking and working with time. This I believe will best prepare the discipline to wide-ranging and complex environmental issues we must confront. Although this study is situated along Arctic islands coasts, the issues of unprecedented and accelerated change are shared in many other parts of the world and I hold some hope that the outcomes of this study may be applied to other vibrant environments.

CHAPTER 02 LITERATURE REVIEW

In this chapter I will describe the context to this research through the examination of five main themes. The first section begins with a question on whether it is appropriate to define Arctic coasts as landscapes. This incorporates looking more broadly at what defines the Arctic before placing focus on Arctic coasts. The second section draws attention to Arctic islands in the context of the Anthropocene and works towards answering what makes these islands unique and why. The Anthropocene helps to establish entanglements of space, time and materiality which lead to the third section where I examine how time is used and theorized in landscape architecture. In the fourth section I propose five concepts of time which incorporate different philosophies and ideas that are relevant for studying Arctic island coasts. The final section proceeds to examine different ways in which to work with these environments by appraising practices in landscape architecture. I then offer considerations on immersive approaches to the study and practice of Arctic coasts.

2.1 DEFINING ARCTIC COASTS

2.1 Arctic coasts as landscape?

A fundamental question that I wish to address in this research is how best to define and describe Arctic coasts. To address this I assess if commonly used terminology relating to landscape fittingly applies to the high Arctic region in which I am working and specifically to Arctic coasts. This involves examining how the word *landscape* has evolved over the centuries and the consequential interpretations and tensions that have developed as a result. I critically examine these tensions in light of an Arctic region that is undergoing unprecedented change and so, with this, I consider not only the spatial associations with landscape but the temporal dimensions relating to Arctic coasts.

In their book *Is Landscape…?* Landscape architect Gareth Doherty and urbanist Charles Waldheim (2016) draw attention to the complexities of defining landscapes and invite multi-disciplinary perspectives on the term. The word *landscape* is heavily laden with different meanings and definitions. Western interpretations and meanings of landscape date back centuries sowing the seeds of debate and critique that persist to this day in landscape studies. In the 16th century, the Dutch word *landschap* denoted a bounded agrarian entity. James Corner (2014) adds that the

term also incorporated associations to rural settlement and productive land.[1] In the 17th and 18th centuries, the word *landskip* was cited in English literature[2] in which landscape inherited a very different meaning referring to scenic views which were directly influenced by pictorial compositions. Associate professor of architectural history and theory, Vittoria di Palma explains that:

> as the concept of landscape develops within the English (and later British) context, the term very soon expands beyond its initial sense and comes to be applied both to paintings, and, increasingly, to views of the surrounding environment. Yet it never leaves its initial, painterly roots behind (2016: 47/48).

Over time, therefore, landscape inherits different meanings–as land (in a physical, material and real sense) and as a visual, scenic construct based upon references to specific compositions of landscape paintings from the 17th century. As a result of these vastly different interpretations of landscape, cultural geographer Veronica della Dora points out that 'as a concept, landscape rests on a series of tensions: between space and place, the gaze and territory, reality and representation' (2011:244). Geographer John Wylie expands on these tensions adding that 'it is a tension between proximity and distance, body and mind, sensuous immersion and detached observation' (2007:1).

The tensions that della Dora and Wylie refer to are, in many ways, transferrable to studies relating to high Arctic regions. There are tensions between an inhabited Arctic (human and non-human) and the distanced gaze where the Arctic is understood through aerial imagery, from satellites for example. I have elaborated on this in my fourth publication *Temporal Perspectives on Arctic Peripheries* (under review) where I draw attention to historical and contemporary dichotomies pertaining to high Arctic regions. These include notions of distant and near, cold and warm, negative and positive, outer and inner, empty and full, wild and tamed, barbarous and civilised, all of which have varying degrees of tension. The tension between proximity and distance, however, has reappeared in this research in different ways. It resonates broadly with how the Arctic is perceived and understood, and more specifically it relates to how one engages with landscape.

In a later publication of Wylie's, from 2017, he revisits the topic of tension between

1 This point is also raised by: Kwa (2005); Ryan (2016); Buck (2017); and Brook (2019).
2 Landscape architect David Buck (2017) refers to Englishman Joseph Addison who wrote a series of articles called 'Pleasures of Imagination' from 1712 with references to *landskip*.

proximity and distance. He refers to the negative connotations of distance that is often ascribed to landscape which suggest a disconnectedness and apartness between people and the land. Wylie challenges these notions and distinguishes between visual distance that evolved since European Renaissance that promotes calculation and measurement over the landscape, and distance as a way of understanding and knowing the landscape. In the latter interpretation, he explains that 'We are distanced from the world, separated from it as the basis of our capacity to conceive and relate to it' (2017:19). This interpretation signals a stepping back from the landscape in order to understand existing and emerging relations that exist between distinct and separate elements.

2.1.2 The Arctic: Up close and from a distance

It is important to highlight Wylie's views on distance in my research for two reasons and also to challenge it for another reason. Firstly, in studies pertaining to Arctic regions there have been many references to how the Arctic is viewed and interpreted from outside the Arctic. In other words, how it is understood and perceived from a distance. Kampevold Larsen, for example, in her discussion on Arctic and sub-Arctic regions, states that the 'historical dynamic of distance involved in looking at landscape as manageable territory seems to be materializing in many areas of the North right now'(2018:91). This notion of viewing the Arctic from a distance is often associated with geo-political interests that are based outside of these regions but with power and influence to potentially exploit within these regions. In a similar vein, landscape architect James Corner warns that 'as a distancing device, landscape can be used (or deployed) by those in power to conceal, consolidate, and represent certain interests (whether of the aristocracy, the state, or corporate sector)' (1999:11).

Distance, associated with detachment and alienation from the landscape, are also brought forth in the ways in which Arctic regions are represented. In his discussion on how Polar Regions are, and have been represented pictorially, geographer Denis Cosgrove observes:

> Google Earth, for example is effectively a popular GIS, allowing personal interaction with a virtual world with seamless scale change from satellite images to aerial photos to topographic and statistical cartography, giving a powerful illusion of real presence that simultaneously distances us from the animate world and brings the locality of anywhere on earth into our immediate individual space.

But its affective qualities remain quite diminished (2008:29/30).[3]

Satellite and aerial imagery are often the only means of accessing some Arctic regions and can offer crucial data concerning, for example, weather and sea-ice conditions. However, such distances warrant concern, not only because of the loss of affective qualities of place that Cosgrove mentions, but in a high Arctic context assumptions can be made that there is little there. The presence of ice and snow cover, seen from space, can deceive a viewer into comparing some regions of the Arctic as a white, blank canvas. This may be perceived, by some, as a region of emptiness that can endanger these regions as being open for extraction and exploitation.

The second point I wish to make about landscape distance is from within the discipline of landscape architecture. As Wylie took account of how a spatial interpretation of distance predominates in geography, there have been similar voices of concern in landscape architecture. Christophe Girot, for example, found that 'the introduction to a site project has all too often been reduced to systematic and quantitative formulas for analyzing the site from a distance' (1999:65). This motivated Girot to develop his *Four Trace Concepts* that are described in more detail in my first publication where I examine field work practices in landscape architecture. Other landscape architects that have been critical of visual and physical distance in landscape architecture include Günther Vogt, who claims that 'real distance goes hand in hand with an alienation from it' (Vogt in Foxley, 2010: 13).

However, it is also Vogt who appreciates that some level of distance is required to understand a place differently (Vogt, 2015). He refers to critical distance where a designer develops an awareness of surroundings. This resonates with Wylie's second claim of the need to acknowledge distance that incorporates the individualism and singularity of elements and the relations between them. In this research, I found the need to have critical distance because to gain a more comprehensive understanding of this Arctic region which demanded consideration of perspectives from different times and different disciplines. In this study, distance was strongly connected to scales of space and time where perspectives are constantly shifting.

3 Geographer Chris Perkins reiterates the distance that is created through mapping interfaces created by Google and Apple. He states that although 'place can be made anew each time a user accesses an online map', these mapping interfaces 'distance us from direct sensory encounters with places' (2020:360).

The third point I wish to make with regard to distance is to question if a distance really exists between humans and non-humans in the era of the Anthropocene? Professor of English Stacy Alaimo's description of the Anthropocene, for example, challenges assumptions of distance:

> The entangled, interconnected environmental, economic, and political systems of the anthropocene demand that, even in our everyday lives, we attempt to make sense of what is at hand, through mapping transcorporeal connections across our own bodily inhabitations, as they intersect with social, economic, and planetary systems… We cannot externalize a world to be mapped, as our own anthropocene bodies are imbued with substances and material agencies that interconnect us with wider forces, enmeshing the knower with what they seek to know (Alaimo cited in Seibert, 2021: xiii).

There is a growing body of literature that is closely examining human/non-human relations and entanglements particularly in the environmental humanities[4] and blue humanities.[5] From within the discipline of landscape architecture there are also signs that notions of distance are indeed being challenged. Landscape architect Martin Prominski, for example, claims that 'a distanced contemplation is impossible if non-humans and humans are inextricably intertwined' (2019:180). Other landscape architects taking a material-focussed approach to reading landscape such as Jane Hutton (2020) and Matthew Seibert (2021) open up social, climatic, political, historical and planetary relations. These relations are not about a harmonious 'being at one' with nature. On the contrary, they point toward discord, chaos and inderminancy thus suggesting other forms of tension. However, I concur most strongly with Alaimo's statement in considering entanglements between humans and non-humans where there is an acknowledgment towards the flows of matter that are continually playing out, most of which are beyond human control.

2.1.3 Arctic coasts as environments

The three points that I have described in the previous section presented some of the complex relations and tensions in studying Arctic regions in the Anthropocene, and from the perspective of landscape architecture. This leads, more specifically to Arctic coasts where I will question if terminology relating to landscape is appropriate or not. Through my research in preparing my second publication

4 Brown (2013); Brown and Martynyuk (2016); Alaimo (2016); Gabrys (2018); Yusoff (2018); Davis (2022).
5 Chen et al. (2013); Neimanis (2017); Jue (2020); Jue and Ruiz (2021).

Shifting coasts: Developing New Coastal Concepts (in press) it emerged that Arctic coasts were ill-fitted to be defined as *landscape*. This was also apparent when I appraised these coasts as *palimpsests*, *topographies* and *topologies*. Architect Alessandra Ponte has raised concerns on the use of landscape when referring to her studies undertaken in Northern Quebec:

> Here in the North of Quebec the classic concept of landscape doesn't seem to apply, and it is not just because of the sheer scale, the implausible vastness of the territory one is traversing. Landscape speaks of central perspective, of the singular point of view, of a painterly practice of framing, capturing, labelling and packaging an experience, usually reduced to its optical dimension, into a neat and reassuring series of images. (2014:135)

This has led her to adopt the word *environment* and to shake off the problematics that are repeatedly encountered with the word *landscape*. In a student-led interview where Ponte is asked about this shift in adopting the word environment she replies 'It took some years and a lot of travelling in space and time. "Environment" seems more appropriate today to describe things without the burden of European traditions of landscape' (Cash and Studebaker, 2017). I have found that there is indeed something liberating about referring to Arctic coasts as environments rather than landscapes.

In addition to the reasons that Ponte has raised, another advantage of referring to Arctic coasts as environments is that they are not confined to terrestrial associations. Environments can incorporate the sea and the air which are integral to coasts. The word offers a porosity and fluidity between land, sea and air which is precisely what I felt was needed in helping to describe coasts. It is for these reasons that I have chosen to refer to the Arctic island coasts in this study as environments as opposed to landscapes, topographies or topologies. The journey to reach this conclusion was equally important to my work as it helped to establish and position my own perspectives on Arctic coasts more clearly.

2.1.4 Mediating the materialities of coasts

The previous section highlighted the complexities in defining Arctic coasts and concluded that they are best referred to as Arctic coastal environments. This section will hone in further on coasts and will proceed to examine the different terms that are associated with coasts. The terminology reveals another layer of complexity through the myriad of words and terms that attempt to describe it.

Coasts are often conveyed as an interface, an edge, an ecotone, a transient space, a barrier, a liminal zone, marginal or littoral. Although the coast may be simply defined as 'land that is next to or near the sea'[6] its entity can transform from being a fluid space, belonging to the sea during high-tide to a dry, and more stable space during low-tide. The more scientific term *littoral* incorporates different tidal zones and moves beyond the notion of one line that divides the land from the sea –'by definition it includes both land and sea; it is indeed land sea shore, or that part of the land which is influenced by the sea' (Pearson, 1985:1). Ecologist Rachel Carson who spent decades studying marine and coastal environments describes the edge of the sea as:

> a strange and beautiful place. All through the long history of earth it has been an area of unrest where waves have broken heavily against the land, where the tides have pressed forward over the continents, receding and then returned. For no two successive days is the shore line precisely the same…Today a little more land may belong to the sea, tomorrow a little less. Always the edge of the sea remains an elusive and indefinable boundary (1998:1).

There are inherent qualities to a coast that are shared universally. Firstly, there is a sense of in-between-ness with regard to its position bordering land and sea. And secondly there is the pronounced movement of materials due to tidal processes that Carson refers to. Cultural geographer Leah Gibbs states that 'At the shore the land's seeming solidity and stability meet the liquidity and constant motion of water: a marked shift in flux' (2017:204). Similarly architect and cultural geographer Anna Ryan explains that 'The coast has long struggled with an illusion of it as being fixed and permanent in nature, a concept alien to its essential mobility' (2016:27). She emphasises the role of time along a coast and thus uproots the coast into a space of motion and movement. Coasts exemplify mobility where diverse materials assemble and disassemble with each passing tide. Jean Sprackland provides a personal account of the incessant erosional and depositional processes along a shore:

> The rubble of the tide-line – which was heaped high when I was here last week – has all gone, swept back into the sea to be washed and mixed and sorted again. For those castoffs, the journey is never over, and there is no such thing as home (2013: 49).

6 Oxford English Dictionary

Sprackland presents the vulnerability of the nomadic materials deposited along the sea shore alongside the unrelenting and inexhaustible powers of the sea. The exchange of materials along the coast that Sprackland describes gives it a sense of porosity. This is explored further in my second publication *Shifting coasts: Developing New Coastal Concepts* (in press) where I discuss the exchange of materials that are inherent to coastal processes. The materials that are encountered along the coast endure processes that have capacities to organise or scatter them into chaotic disorder. Nothing sits easily along a coast.

In landscape architecture Kate Orff (2020) and Jane Wolff have presented examples of how they have worked with the material aspects of coasts in their work. Their contexts are predominantly urban coastal environments which are far removed from the Arctic islands in this study. However, there are some elements that these landscape architects bring forward in enlightening the ways in which coasts can be better understood. Kate Orff, for example, approaches coasts on large scales that are not conventionally adopted by landscape architects to better understand the contexts that the coasts are a part of. From this enlarged perspective networks pertaining to human and non-human elements may be appreciated differently.

Jane Wolff (2017, 2021), meanwhile, brings two different aspects that inspire my approach to coasts. Firstly, she engages closely with communities to unveil past and present day stories embedded along the coastal environments. In this study, I have invested much time learning about how different visitors to the islands have left their marks, some more explicit than others. I have also worked alongside meteorologists, the present-day inhabitants of these islands, to understand how they conduct their daily tasks there.

The second aspect that Wolff pays close attention to is how material mobilities engender stories and alternative readings of a coast. This is also pertinent to my work as the values and qualities of different parts of the island coasts have changed over time according to the different users that have inhabited these environments. In my first publication, for example, I have described how the remains of different historical sites on the islands of Jan Mayen, Bjørnøya and Hopen have radically changed over time particularly through the close examination of the materials that have remained on these sites. The stories enfolded into these materials offer insights into the values people had of the materials while I consider their contemporary and future state and roles. What is clear at this point is that coasts are where processes of land and sea converge which leads me to the following section where I draw attention to the role of the sea in understanding coastal environments.

2.1.5 Looking out the sea

Little attention has been paid to the materiality of the sea from a landscape architecture perspective and language normally falls short in our descriptions of it. Mike Brown and Barbara Humberstone suggest that this may be due to the fact that 'conceptualising the sea as featureless, unknowable or a wilderness is a reflection of ideas, imagery and metaphors that have permeated Western consciousness via literature and art' (2015:14). Anthropologist Jake Phelan foregrounds how the sea is integral to our lives stating that:

> to pass over a region so lightly – one that covers the majority of the earth's surface, that affects countless people's lives through fishing, tourism, travel or flooding, that mediates global trade, is a battleground of national powers, and has a dominating role in global ecology – seems ill-advised (2007:1).

Fortunately attention towards the sea has been brought forward through a new wave of publications that form a part of what is known as the Blue Humanities. This relatively new area of multi-disciplinary research attends to matters of seas and oceans as the name suggests whilst providing alternative perspectives on coasts.[7] There are two important strands of thinking in the Blue Humanities that are useful to this research. First, it helps in challenging terrestrial bias, perception and knowingness. By this I mean alternative perspectives are provided that work *with* ideas of instability and fluidity. Jon Anderson and Kimberly Peters begin with a critique of conventional geographical thinking that is equally applicable to landscape architecture:

> We have seen how geography has always been a 'land' discipline, but in this way is [sic] also became a 'locked' discipline, fixated on the sedentary, static and terrestrially rooted rather than processes of flow, hybridity and mobile routes (2014:11).

Geographers Kimberly Peters and Philip Steinberg propose a *wet ontology* that can provide 'a way of thinking that destabilizes sedentary and surficial notions of "place" and "being" while revealing a dynamic world of relational becoming' (2014:127). They draw attention to extending our ways of knowing beyond surfaces and to engage with depth.[8] This notion fits well with my proposed use of

7 Literature which I consider belonging to the Blue Humanities and have helped in this research include: Chen (2013); Anderson and Peters (2014); Strang (2014); Brown and Humberstone (2015); Neimanis (2017); Strang et al. (2018); Attala (2019).
8 Steinberg and Peters published a second paper on the topic of wet ontologies a year later in 2015.

environment as noted in 2.1.3 as opposed to *landscape* in my coastal study because it offers depths in and through aerial, terrestrial and marine spaces.

The second strand of thinking from the blue humanities that inspires this study draws attention to materiality and, more specifically, relations between human and non-human. Anthropologist Veronica Strang explains that 'Flowing between and connecting the human and non-human on multiple systemic scales, water is particularly 'good to think', offering new local and global perspectives on material relations' (2014:133/134). Throughout her article, Strang, reminds the reader of how water operates on a number of spatial and temporal scales. Melody Jue, takes a very different approach to Strang in her work by expressing a personal and quite literally immersive perspective of human and non-human relations through the medium of the ocean. She expands on the elemental properties of water such as salinity, temperature and pressure which I found particularly interesting as it reminded me of somebody describing weather conditions while out on a walk except Jue's environment was *in* the ocean. Insights from the blue humanities that I have drawn from here were given most attention in my second publication *Shifting coasts: Developing New Coastal Concepts* (in print) where I call for more attention towards thinking through water and wet ontologies.

2.1.6 Representing coasts

Landscape architecture is a discipline that predominantly communicates through visual means, namely, drawings and illustrations. Coastal environments are conditioned by 'currents, winds, seabed topography, seasonal changes, the diurnal and monthly rhythms of the tides combine to create a constantly varying world. Seasonal variations are central to patterns of life in coastal areas' (Cooney, 2004:324). The shore presents a spatio-temporal tension between land and sea but contemporary maps often display a coastal edge with a thin blue line. This presents a boundary between two entities rather than a zone of connectivity. There have been several criticisms, from geographers and landscape architects, of this persistent simplicity and reduction of a coast that reinforces a division rather than a mergence between land and sea.

Certainly the coast manifests itself as a unique threshold between land and sea but it is not a clean cut line as reality and experience tells us. In the opening chapter of *Design in the Terrain of Water*, landscape architect Anuradha Mathur and architect/planner Dilip da Cunha ask:

> Why is it that despite waters everywhere precipitating, seeping, soaking air, soil and vegetation, collecting in interstices, pores,

> terraces, cisterns, and aquifers, evaporating, transpiring, and sublimating, we see water somewhere, confined within or behind lines and generally coloured blue in maps? (Mathur and da Cunha, 2014, p.1).

Architect, Cecelia Chen distinguishes between the inhabited dimension of a coast compared to the lines it is reduced to on a map whereby 'the lived thickness of the coast is distinct from the thin abstract coastline drawn on a map' (2013:282). This issue is also raised by the late cartographer, artist and mathematician Tim Robinson who dedicated many years mapping different parts of Ireland's west coast who notes the inadequacies in following cartographic conventions when he attempts to convey his experiences of the coast on paper:

> The commercially available mechanical tints seemed inadequate symbols for beautifully shelving beaches and the ever-changing interpenetrations of rock and water, and I preferred to let my pen run on for hours in minute lyrical effusions of dots and twirls. All around the coast, a fiction, the high-water mark, posed a similar problem; rather than indicate it by a line I relived with my pen the hourly give-and-take of land and sea (2007:15).

Robinson's description of the challenges in representing the Irish coast is taken up in my second publication *Shifting coasts: Developing New Coastal Concepts* (in print). In my third publication *What time is this coast?* (2021) I elaborate further on the difficulties in representing coasts and how I tried to overcome this practically by using mixed methods. However, not all aspects of a coast can ever be represented and that is where Non-Representational Theory (NRT), mentioned in the introductory chapter of this thesis, acknowledges the complexities of landscapes. It entices researchers to engage with landscapes in diverse ways as a means to articulate its impermanent, moving, emerging qualities.

2.2 ISLANDS OF THE ANTHROPOCENE

This research has also looked closely on how islands, more generally, are currently being theorized in different disciplines. Many island studies, which I will proceed to describe, have been examined through the lens of the Anthropocene which draws attention to political, social and climate issues that are playing out differently across the globe. Arctic islands have, I believe, been grossly overlooked in these studies and this section helps to establish the uniqueness of these islands with regard to their histories, materials, cultures and climate.

The effects of climate change in the Arctic, discussed in the introductory chapter are very often connected to discourses relating to the Anthropocene. The *Anthropocene* is a geological epoch and was first proposed in 1999. During an earth system science conference the chemist Paul Crutzen proclaimed this new epoch should replace the Holocene.[9] A year later Crutzen together with ecologist Eugene Stroemer wrote a paper explaining that the earth had entered a new geological epoch due to the significant impact of human activity–'it seems to us more than appropriate to emphasize the central role of mankind in geology and ecology by proposing to use the term 'anthropocene' for the current geological epoch' (from Davies, 2016:43). Controversy has since followed the suggestion of this term. One such controversy concerns the start date from which the Anthropocene began. In other words, where on the Earth's geological stratigraphy can this layer be depicted?[10]

There are several proposals under consideration on when the Anthropocene began but disagreement persists on such matters. The three more common proposals relate to agriculture, the industrial revolution and the nuclear era. Firstly, the Anthropocene may be traced to when agriculture started thousands of years ago when large areas of land were cleared and native vegetation was replaced with crops and grazing lands. Fire is also associated with this era of change giving rise to CO_2 levels in the atmosphere.[11] Secondly, the Anthropocene began during the industrial revolution. It is often described in two phases with the first burst of $C0_2$ in the atmosphere from 1800-1850, and the second phase after 1945 when levels of $C0_2$ accelerated.[12] Thirdly, is from the nuclear era from the first testing of the atomic bomb.

The Anthropocene, according to historian Dipesh Chakrabarty 'requires us to think on the two vastly different scales of time…Earth history and world history respectively' (2018:6). Unlike previously defined geological epochs that are named retrospectively, the Anthropocene is a much messier affair because it is labelled from within an epoch. Chakrabarty adds that 'irrespective of when we date it

9 Journalist Christian Schwagerl notes that 'The word landed among the experts like a time-bomb. Anthropos: the Greek word for "humans," cene: from kainos, the Greek word for "new," Anthropocene: the new epoch of humans' (2014: 9).

10 These markers are formally called Global Boundary Stratotype Sections and Points (GSSP) but commonly referred to as 'golden spikes' (Ellis, 2018).

11 A concise assessment of the proposal of early agriculture being a marker for the start of the Anthropocene epoch is provided by Simon Lewis and Mark Maslin (2015). Steffen et al. (2007) argue that pre-industrial societies did not have a global impact but instead, left local and transitory marks and therefore is not a suitable marker for the Anthropocene.

12 The industrial era provides a convincing 'golden spike' with the sudden increase in carbon dioxide. Yusoff (2017, 2018) brings a socio-geologic element into the picture stating that this period also marks the beginning of capitalism.

from…we are already *in* the Anthropocene'(2018:6). The Anthropocene has invited a broad range of opinions and critique of the Anthropocene from disciplines *outside* the realms of geology and stratigraphy. Taking into account the dominant human input of the Anthropocene it is unsurprising that the term has percolated through disciplines in the social sciences, humanities and design. In the natural sciences too, for example, there is consensus amongst science communities working with climate change that the changes we are experiencing now are human-induced[13] or *Anthro*pogenic. This both emphasises and links climate change with the Anthropocene.

Professor of comparative literature, Pieter Vermeulen (2020) reminds us, however, that:

> While the Anthropocene is popularly still tied to anthropogenic climate change, the term also covers processes such as ocean acidification (which is a consequence of increasing carbon dioxide levels), global population growth, resource depletion, massive species extinction, and ecosystem simplification more generally' (2020:9).

All of these impacts and effects that conveniently sit under the gargantuan umbrella of the Anthropocene have meant that no place on earth is immune from anthropogenic change. Many of these places that have been previously overlooked or regarded as peripheral have been drawn into the globalizing nature of the Anthropocene. These places include Arctic regions and small island states. In fact, small islands were highlighted in a recent Intergovernmental Panel on Climate Change (IPCC)[14] report (2021) where a series of predicted changes to Caribbean and Pacific islands were highlighted. However, Arctic islands were not included in this special section of the report.

Interest in islands has grown exponentially in recent decades. There are several journals[15] and research groups and programmes[16] that are now dedicated to islands. They are generally interdisciplinary in their approach but there is notable interest from the arts and humanities sectors many of which have begun to examine islands

13 For example Oreskes (2007); Blunden et al. (2020); The Intergovernmental Panel on Climate Change (2021).
14 The IPCC defines small islands as 'ocean regions containing small islands with consistent climate signals and/or climatological coherence (2021:215).
15 Some islands journals include: Shima Journal (founded in 2007); Island Studies Journal (founded in 2013); Urban Island Studies (founded in 2009); and the Journal of Marine and Island Cultures.
16 For example: Pacific Islands Studies at the University of Oregon; The Small Island Cultures Research Initiative; Islands and Small States Institute at the University of Malta, Island studies course at the University of the Highlands and Islands (Scotland); Island studies at the University of Prince Edward Island (Canada).

in light of the Anthropocene. The following section will provide a descriptive framing, highlighting the uniqueness of Arctic islands in light of the Anthropocene.

2.2.1 Arctic islandness

Social scientist Godfrey Baldacchino, a predominant figure in island studies, has written about the notion of *islandness*. First he lays out some of the problems with the word *island* which he considers a reductive term. He claims that 'an island cannot be naively understood in its strict material, reified form: a delineated, predetermined, bordered space; it is so thoroughly seeped in ''emotional geography''' (2012:57).[17] Stephen Royle and Laurie Brinklow suggest that 'Islandness is meant to embody the essence of island living, the attributes that make an island what it fundamentally is, and which it has by necessity, without which it loses its identity'(2018:11). An earlier contribution from Stratford (2008) expresses the affective dimensions of islandness. Collectively then, I may interpret these contributions as ways that enrich what an island is whilst drawing out the salient qualities unique and specific to these places. In a later publication Baldacchino unpacks what *islandness* is which comprises of five variables that offer an 'emergent distinctiveness or essence of islands' (2018:xxv). These are: 1) Boundedness, 2) smallness 3) isolation 4) fragmentation, and 5) amplification by compression. I will implement this framework as a means to explore and interpret what I consider the distinct islandness of Jan Mayen, Bjørnøya and Hopen.

1) *Boundedness*

The common definition of an island is a piece of land surrounded by water. Baldacchino (2018) develops this further stating that 'the encirclement of islands by the aquatic medium sets the stage for a 'land–sea' dialectic'. He mentions the porosity of natural boundaries inherent to islands. In representational terms this raises a conflict between how boundaries are communicated which I discussed earlier this chapter. The boundedness of the Arctic islands in this study can be appreciated from a number of perspectives owing to the conditions of the site as well as the designation of different boundaries.

On visiting Bjørnøya's coast in March 2018, when sea ice surrounded the island, the printed paper map that I brought presented a very different island from the one I was seeing. This I discuss in more detail in Chapter 4. Lines on the map representing the coast, contours, streams and tracks were erased and replaced with

17 Other writers have also chosen to replace the word *island* with *islandness*. Grydehøj and Swaminathan (2018) for example, discuss island stereotypes which often have negative connotations such as being backward and timeless.

other highly-textured layers. The blue colours representing water and the brown hues of land were superseded by a tapestry of white, blue and grey. In reality the island merged with the sea ice giving the impression that it extended for several kilometres. After this visit to Bjørnøya I discontinued using the word *coastline*. I felt the word undermines the complexity of coasts. The idea of boundedness is complicated on these Arctic islands. When ice takes hold of these coasts the land area appears to extend chaotically beyond cartographic confines and distinguishing between land and sea is imperceptible in places. They inherit a new disguise that does not sit long enough for a map to fix them in time. These coasts expose complex temporalities, durations and rhythms enfolded in the processes inherent to each material.

Another type of boundedness that each of these islands have inherited is not only cartographic but also political. Each of these islands are designated as nature reserves. Maps of the islands show a line encircling each of the islands. During the course of this research I briefly examined marine traffic around the islands and was quite taken aback at how many marine highways by-pass the islands with Bjørnøya, in particular, standing out. In Fig.2.1 we see that rather than the physical coast or ice bounding the island, marine traffic bounds the island because of the nature reserve delineation.

2) *Smallness*

The essence of an island cannot, strictly speaking, be about smallness. There are too many examples that displace such notions with the island of Greenland being one. However, even taking this into account islands are, according to Stephen Royle, 'usually small' (2014). Smallness can refer to the physical size of the island.

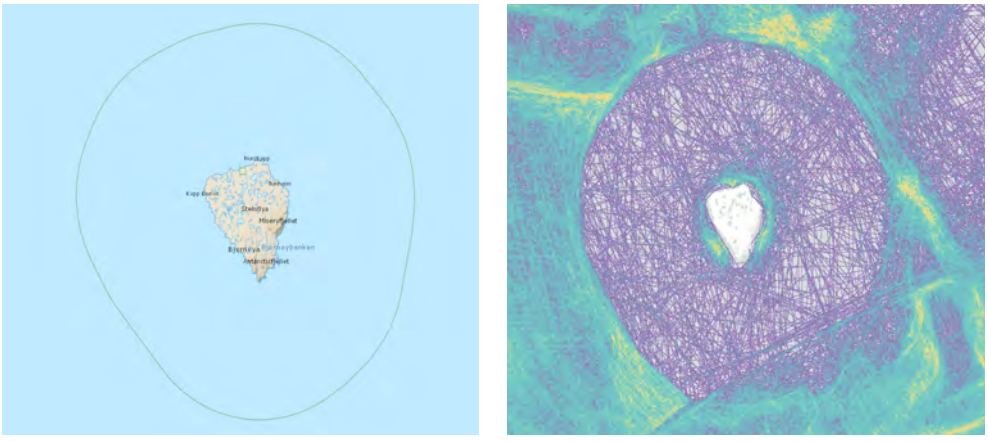


Fig.2.1. (Left) Bjørnøya's nature reserve area. Source: Norwegian Polar Institute. (Right) Marine traffic around the island in 2020. Source: Marinetraffic.com

Gillis emphasises the closeness of the sea on smaller islands ‘whose climates, biota and human occupants are inseparable from the surrounding sea’(2014:162). In other words, it inhabits a littoral ecotone. Fig.2.2 illustrates the different sizes of Jan Mayen, Bjørnøya and Hopen at the same scale.

On the Arctic islands of Jan Mayen and Bjørnøya the sense of sea was not always felt in the areas I visited. In some areas, when I veered away from the coast and traversed the inner areas of the islands I was confronted with barren, stony expanses that was often disorientating. Coupled with this was the frequent presence of fog that could quickly shut down any comfort of seeing a coastal horizon. However, due to the small size of the islands it was easy to walk in any direction knowing that I would encounter the coast and re-establish my bearings.

3) *Isolation*

The smallness of an island can also exaggerate its isolation from the rest of the world where the surrounding sea or ocean dominates. High Arctic Norwegian islands have, historically, earned a reputation for being isolated (Steinberg et al,

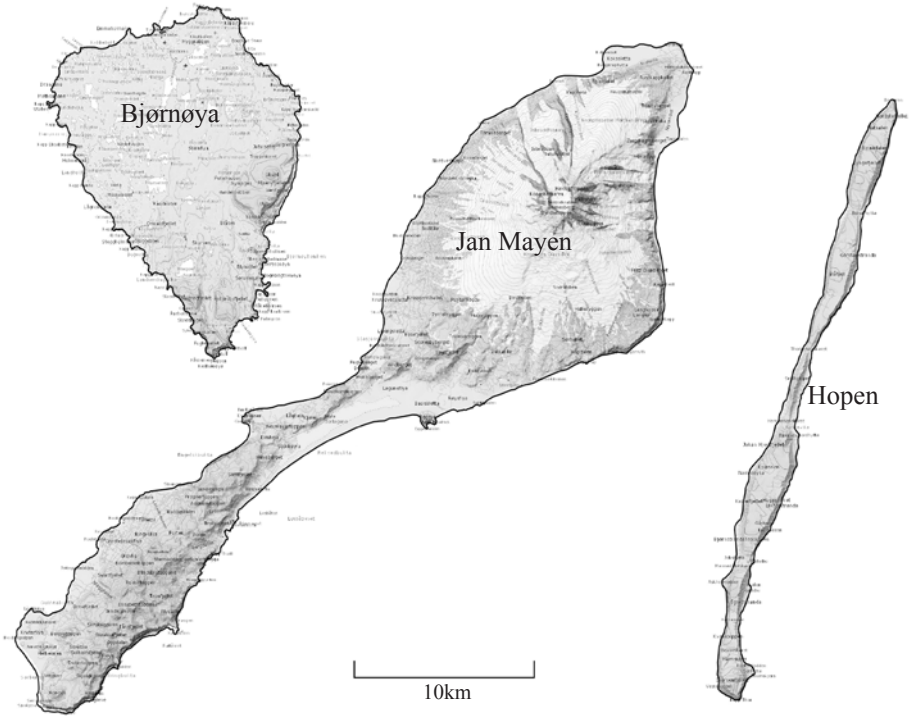


Fig. 2.2. Jan Mayen, Bjørnøya and Hopen illustrated at the same scale. Source: Norwegian Polar Institute and geonorge.no. Map has been edited by author.

2015) and for stirring up feelings of loneliness for some who have ventured there.[18] Looking at the location of Jan Mayen, Bjørnøya and Hopen on a map one would be forgiven in thinking these are all isolated islands and geographically speaking they are. However, reading the histories of these islands may challenge this notion. All three islands have provided temporary homes for hunters, whalers, scientists, soldiers and, today, meteorologists.

Robert Macfarlane draws attention to sea routes taken by sailing vessels which he calls *sea roads*. He describes them as 'dissolving paths whose passage leaves no trace' on the sea. He invites the reader to undertake the following:

> Invert the mental map you hold of Britain, Ireland and western Europe. Turn it inside out. Blank out the land interiors of these countries – consider them featureless, as you might previously have considered the sea. Instead, populate the western and northern waters with paths and tracks: a travel system that joins port to port, island to island, headland to headland, river mouth to river mouth. The sea has become the land, in that it is now the usual medium of transit: not barrier but corridor (2012:93).

Applying this exercise to the Arctic islands, and keeping in mind their maritime histories, flips from their associations of isolation towards their relations to the south and to each other. Although the islands are certainly remote, it is arguable that they are isolated when looking more closely at how they connect to the wider world.

4) *Fragmentation*

Baldacchino takes the example of archipelagos in his explanation of fragmentation. The concept of an archipelago, he explains, 'foregrounds interactions between and among islands themselves' rather than looking at an island independently (2018:xxix). In this study, this is worthy of exploring with regard to the islands of Bjørnøya and Hopen which are a part of the Svalbard Archipelago.[19] The archipelago is extensive covering an area of 60,667 square kilometres.

A large number of islands belong to this archipelago with Spitsbergen[20] being the largest island accounting for 62% of Svalbard's area. The geographical area facts

18 For example Ritter (1954).
19 Svalbard became a Norwegian territory following the signing of the Spitsbergen Treaty (now referred to as the Svalbard Treaty) in 1920.
20 Svalbard was historically referred to as Spitsbergen. The two names are commonly mixed up.

of this archipelago are fascinating to follow because the islands are actively in flux due to its thawing permafrost and melting glaciers. For example, the archipelago's area shrunk by 600km^2 in the last 40-50 years as a result of glacier retreat from some of the islands' sea front (Dallmann, 2015). Despite Bjørnøya and Hopen being officially and politically part of an archipelago, in reality there is no sense of closeness with the other islands due to their remote locations. In this sense, the fragmentation concept that Baldacchino refers to is stretched to its limits.

However, this category of islandness invites another type of archepelagic thinking that brings the meteorological network to the fore. For approximately one hundred years the establishment of meteorological stations on each of the islands has created a sense of miniature islands on the islands themselves. The self-contained units house meteorologists, technicians and cooks for six month periods, year round. They are a part of a large network of stations in the Norwegian Arctic that are composed of automatic and inhabited stations.[21] This Norwegian archipelago of weather station islands was temporarily broken up during the second world and replaced by an extensive network of German stations.[22] After the war, however, the Norwegian stations returned to service.

In a physical sense the islands in this study do not have a sense of being a part of an archipelago. It is, rather, the network of meteorological stations that give a sense of relation between the islands.

5) ***Amplification***

'Amplification by compression' is the final notion that Baldacchino (2018) suggests in helping to frame *islandness,* but he does so cautiously. On the one hand 'amplification by compression' refers to the island being a microcosm of the larger outside world and on the other he stresses each island's uniqueness. From an Arctic perspective, the islands in this study certainly touch upon both of these.

A relevant example of 'amplification by compression' is by Deloughrey (2019) and Pugh and Chandler's (2021) attention to islands in light of the Anthropocene and climate change. They refer to the island of Tuvulu in the Pacific as being symbolic canaries in the coal mine in light of global climate change. This island, with a population of approximately 10,000 people, is already experiencing extreme

21 The other inhabited stations on Svalbard are: Longyearbyen airport, Ny Ålesund, Barentsburg and Isfjord Radio.

22 This was part of a more extensive North Atlantic weather war where Germans deployed 15 weather bouys in the North Atlantic and Barents Sea and established 14 land-based automatic weather stations (Aasgard, 1946; Selinger, 1986; Dege, 2004; Nilsen et al., 2016).

consequences of climate change such as rising sea levels and endangered fresh water supplies. Like the canaries being used to warn miners of lethal levels of carbon monoxide in a mine shaft, this island is seen as early warning signs of change that will happen globally.

While many Pacific islands are in danger of drowning a stark contrast to this was announced in 2019 in the Russian Arctic. The Russian navy revealed that five islands had appeared in 2016 due to the retreat of the Nansen Glacier in the Novaya Zemlya archipelago. This has led to the naming of these new islands. Similarly in Svalbard new place names are given annually to locations for different reasons.[23] These may include the appearance of a new lake or land feature from glacial retreat and melting; or places that are in need of names to improve location precision for rescue missions in remote areas; or in some cases older names which are deemed inappropriate now have been replaced with new names. Place naming and the constant updating of maps is another indication of the restless Arctic and reasserts the importance of Arctic islands in Anthropocenic discussions.

Another example where there are strong global to local consequences is the reduction of sea ice in the Arctic. When scientists measure sea ice they take into account the extent of sea ice, its thickness and its seasonal duration. Taking the island of Hopen as an example the reduction of sea ice has had a significant impact on polar bear populations on the island. According to a report by a group of scientists (Derocher et al, 2011) studying the relationship between declining sea ice and polar bear dens on the island , ice thickness has thinned by 40cm in the last 40 years. They added that the arrival of sea ice around Hopen in Autumn has shifted from late October to mid-December during the period 1979-2010. This dramatic change has severely impacted on polar bears using the island for denning because the late arrival of the ice means that few female bears reach the island in time to establish a den. The impacts of reduced sea ice can be seen along the coasts. Along the eastern coast, and specifically the area in front of the meteorological station, the coast eroded by 2m over a three year period (2015-2018). This has resulted in the relocation of infrastructure, such as the helipad and sauna building, and some of the meteorological sensors.

Climate change and climate crises have reinforced thinking, reflection and action on considering the earth as a complex system rather than an assemblage of separate, self-contained parts or regions. This, of course, is not a new way of thinking but there has been notable consideration in recent literature emphasising

23 The Norwegian Polar Institute is responsible for place naming in Norwegian polar regions.

the complex, non-linear connections between local and global and vice versa through the lens of the Anthropocene. The Anthropocene looks towards humans as geological agents but when we consider unprecedented changes to anthropogenic climate change it appears that humans are also capable of tipping earth systems too. In response to Baldacchino's concern for island uniqueness, this was a motivating aspect during the development of this research on Arctic islands. There are many generalities painted over Arctic regions with little emphasis or perhaps interest in bringing their unique characters to the fore. It was important for me to go behind the waves of climate statistics and uncover the material and temporal changes of selected Arctic island coasts.

2.2.2 Restless Arctic island coasts

A question that was often visited and revisited over the course of this research concerned reasons on why Arctic island coasts are unique. The previous section provided an overview of this. However, I wish to delve a little deeper into the specific conditions of these islands that lend to their uniqueness which concern water, temperature and light.

Johannes Riquet (2020) helps to address this question by bringing attention to the rich watery mixes of which these islands are composed. The islands are immersed in a continually changing fluid condition, from the fog that frequently shrouds the islands during the summer, to the accumulation of snow and ice during the winter and spring. Professor of Geopolitics Klaus Dodds refers to the ancient Greek geographer Strabo in his description of sea ice as 'No longer either land properly so-called, or sea, or air, but a kind of substance concreted from all these elements' (2018:54). Indeed today's Arctic island coasts are worthy of similar description with their continuously transitioning states that permeate the air, sea and land. Environmental anthropologist, Veronica Strang captures what she calls the 'transmutability' of water:

> The most constant 'quality' of water is that it is not constant, but is characterised by transmutability and sensitivity to changes in the environment… It has an extraordinary ability to metamorphose rapidly into substances with oppositional qualities, that is, the highly visible, concrete solidity of ice, and the fleeting dematerialisation of steam. Each state is endlessly reversible, so that this polymorphic range is always potentially present. In every aspect, water moves between oppositional extremes: it may be a roaring flood, or a still pool, invisible and transparent, or reflective and impenetrable. It may be life-giving, providing warm amniotic

> support and essential hydration, or it may burn, freeze or drown. Each of these states has its own qualities and is imbued with its own meanings, and all are always there in potential (2004:49).

Elizabeth Leane et al. bring the performative aspects of ice to life with a description of the vibrancy of ice as:

> Hard, solid and weighty, and often associated with stasis (as in cryogenic freezing), ice is simultaneously dynamic: mutable, unstable, mobile and constantly in transition between the fluidity of water and the hardness of land (2020:2).

Historically, the islands of Jan Mayen, Bjørnøya and Hopen had an annual presence of sea ice around their coasts. From the 1600s up to the 1920s, sea ice was often experienced around Jan Mayen and Bjørnøya making challenging conditions for the safe landing of boats to the island (Hagenæs-Kjelldahl, 2006). Hopen is the only one of the three islands that continues to experience annual sea ice each year although the sea ice season has dramatically reduced. In the Arctic Ocean according to the Norwegian Polar Institute 'The extent of the sea ice cover has decreased sharply over the past 30 years, and the ice is disappearing faster than the climate models have been able to project'.[24] The decline of sea ice has major repercussions for these islands. Sea ice acts as a physical buffer to protect the islands from severe winter storms. Without this, coastal erosion is hastened. It also has implications for the islands' ecologies.

It is these unique watery conditions, characterizing high Arctic island coasts that make them especially vulnerable to rising temperatures. Sea ice, that once protected the three islands of Jan Mayen and Bjørnøya from the ferocities of winter storms and coastal erosion, are almost consigned to memory. On Hopen, meanwhile, the presence of sea ice has continued to decline while coastal erosion has hastened. In addition, the islands are expected to, not only get warmer, but wetter too in the future according to a climate report for Svalbard that sets out predicted changes between now and 2100 (Hanssen-Bauer et al. 2019).The islands will become more fluid than frozen as time as the century progresses.

Aside from the watery temperaments that condition these coasts, light also plays a major role in helping to characterize their uniqueness. Light is a very powerful material performer along coasts in that it has capacities to transform how we

24 https://www.npolar.no/en/themes/climate-change-in-the-arctic/#toggle-id-5

experience and perceive coasts. Architect and cultural geographer Anna Ryan observes that:

> Light on the ocean or at the coast has a particular character. The changing dynamics of coastal light is a significant experiential aspect of the meeting point of land with sea, a physical presence that effectively dramatises and heightens all of the other action that occurs (2016:15).

Architect Juhani Pallasmaa provides an analytical account of light whereby there are 'two separate systems that arise from light: vision and the circadian rhythms. The first locates us in space, the second coordinate our metabolic functions with time and the world' (2016). Pallasmaa also points out that it is only when we are deprived of such phenomena as light, air and water that we become aware of them.

The Arctic islands in this study are located between 70°N and 76°N meaning that they undergo long periods of darkness in the winter months known as polar nights,[25] and long periods of light during the summer referred to as the midnight sun.[26] Both the midnight sun and the polar nights can be challenging for the human psyche. The experiences of such extreme light conditions are well documented and date back centuries. Captain David Buchan, a lieutenant on a British expedition to Spitsbergen in 1818,[27] describes the midnight sun as follows:

> nothing made so deep an impression upon our senses as the change from alternate day and night to which we had been habituated from our infancy, to the continual daylight to which we were subjected as soon as we crossed the arctic circle (1843:32).

However, in these regions of the Arctic during periods of continual light or darkness, circadian rhythms are often disrupted as there is a poor sense of night or day. Buchan continues:

> At first sight it will, no doubt, appear to many persons that constant

25 In Norwegian this period is called *mørketid* meaning dark time.
26 Jan Mayen: Midnight sun 14th May-28th July, Polar Night 20th November-21st January; Bjørnøya: Midnight sun 01st May-10th August, Polar Night 07th November-04th February; Hopen: Midnight sun 25st April-17th August, Polar Night 31st October-10th February.
27 The 1818 expedition was lead by Captain John Buchan. They sailed to Spitzbergen on HMS Dorothea and managed to reach a little north of 80° before sea ice halted progress. A small glacier, Buchanbreen located on the northern side of Magdalene fjord, was named after the expedition leader. Beechey Island, a Canadian Arctic island, where Sir John Franklin wintered, was named by F. W. Beechey after his father, the artist William Beechey.

> daylight must be a valuable acquisition in every country; but a little reflection will, I think, be sufficient to show that the reverse is really the case…It is impossible by removing to a high latitude, not to witness the difficulty there is in the regulation of time (1843:33).

Christiane Ritter, an artist who spent one year living along the North coast of Svalbard in 1934 describes this sense of disorientation in the winter months during long periods of darkness:

> Why has so little been written about the great transition stage in Arctic nature which, after all, as far as time goes, takes up half the polar year? And, moreover, it is precisely at this time that a decisive change takes place in the human mood, when the reality of the phenomenal world dissolves, when men slowly lose all sense of fixed points, of impulses from the external world (1954:113).

Despite the initial challenging adjustments to her darkened environs Ritter discovers another world unfold 'onto the mute and mighty ice stage on which the magnificent play of the polar night is enacted' (1954:127). The Arctic night she describes as 'indescribable enchantment'.

Those that have lived through the Polar nights appear to inherit a more heightened sensitivity towards any form of light experienced. Historical sources have also shown that other forms of light, such as the moon, stars, aurora borealis and ice blinks, have captured the attention and the imagination of visitors to these regions. An early description of the aurora borealis or northern lights, for example, from 1671 illustrates its mysterious ways and the difficulties in describing them:

> It looks like flying fire, and stretches up into the sky like a high and long palisade. It passes from one place to another, and leaves smoke in the places it leaves. None but those who have seen it could give any idea of the quickness and agility of its movements; it lasts all night and disappears at sunrise. I leave it to those learned men who are better versed than I in natural philosophy to discover the cause of this meteor…(White, 1671:206).

The awe of the aurora borealis were also shared with Norwegian visitors to the region who were more accustomed to seeing the lights than, say Dutch or English explorers. Hjalmar Johansen who accompanied Fridjof Nansen, on the infamous attempt to reach the North Pole published an account of their journey. Johansen

(1899) described the northern lights as 'they quivered across the mid-heavens in ever changing spirals and tongues of fire'.

The presence of the moon cannot be underestimated in the Arctic during the long polar nights. Christiane Ritter writes several descriptive observations of the moon. Here she discusses the absorbing power of the full moon in northern Svalbard:

> It is full moon. No central European can have any idea of what this means on the smooth frozen surface of the earth. It is as though we were dissolving in moonlight, as though the moonlight were eating us up. It makes no difference when we go back into the hut under the snow after a moonlight trip. The light seems to follow us everywhere. One's entire consciousness is penetrated by the brightness; it is as though we were being drawn into the moon itself (1954:133)

The celestial phenomena of the Arctic have featured strongly in several historical accounts and often with consideration on how they differ from southern climes. Contemporary climate reports, however, signal an end to many of the unique conditions previously and currently experienced in the Arctic. It is predicted that rising temperatures will replace snow with rain and sea ice will continue to retreat and eventually disappear. Although the sun and moon will continue their daily orbits of the Earth, the materials that the light shines upon will be radically different – and ones which will greedily absorb their light rather than reflect it.

2.3 THE TURNING TIDES OF TIME IN LANDSCAPE ARCHITECTURE

As a discipline landscape architecture has always worked closely with time. An initial site survey involves, for example, a brief recording of different plant species each type with its individual timeline.[28] To the observant landscape architect, the distribution of these plants corresponds with different soil, topographical and hydrological conditions all of which have other time-related characteristics. Buildings and structures are also noted which may have been built at different times and from different materials. And attention to the micro-climate of a site highlights the sheltered and exposed areas of the site as well as distinguishing between the wet and drier areas. A desk-top study compliments this in situ knowledge with climatic data showing annual rainfall patterns; prevailing wind speeds and direction at two different times of the year; and temperature patterns.

28 For example, the recording of annual, biennial and perennial plant species as well as observing the approximate age of mature vegetation.

However, this data often shows more regional patterns rather than giving accurate information for a specific site. Another important set of information that is important but not always considered is previous use of a site that may include cultural heritage importance and/or clues to how a site was previously used and by whom. These are just some examples in which time is enfolded in a site. How a designer engages with time is personal and also depends on the culture of a working practice or an educational institution.

Albena Yaneva, professor in architectural theory, describes two ways of exploring a building: the hasty sightseer and the slow ethnographer, which are worthy of mentioning with regard to the temporal dimensions of a site visit. A hasty sightseer she describes will:

> flee through the building, take a picture, and hope that the image will provide her with the possibility of coming back and slowly discover all those features that the short moment of perception hampered her from seeing. But she never comes back (2017:93).

The slow ethnographer, meanwhile:

> will be able to see and experience a building differently. She will move about, within and without, and through repeated visits, she will let the building gradually yield itself to her in various lights, speeds, and intensities, and in connection with changing moods, crowds of people and flows of things (2017:92/93).

Both descriptions envelop very different packages of time. The hasty sightseer adopts a very linear approach at a very quick tempo hoping that the mechanical memory of the camera will provide sufficient reminders of the visit to the building. The slow ethnographer embraces time. There is a repetitive approach that yields new and deeper knowledge as the ethnographer becomes immersed in all aspects of the rhythms of the building. The manner in which the hasty sightseer and the slow ethnographer engage with a building are ones that probably most designers can identify with. They are, in many respects, polar opposite examples but highlight the personal and experiential facets of time during a site visit.

The previous two paragraphs describe how time of the site and the time of the designer can be either distanced or immersive during an initial encounter but both illustrate the integral nature of time in the discipline. Attention to time and landscape, within the discipline of landscape architecture, has recently started to

emerge but before I discuss such progress I will briefly describe how time has more typically been considered and used in the discipline.

2.3.1 Conventional concepts of time used in landscape architecture

In the introductory chapter I drew attention to the more typical expressions of time used in landscape architecture (section 1.3.1). In this section I will discuss these in more detail and examine both the uses and limitations of such time expressions and conceptualisations. The temporalities that landscape architects engage with encompass multiple notions of time.[29] There are five predominant notions of time that are typically adopted in landscape architecture. These are linear or sequential time such as the growth of a tree; cyclical time that encompasses seasonal, daily, tidal repetitions of time; and ephemeral time such as swiftly changing weather conditions.[30] Landscape architect Jackie Bowring has raised the concept of spontaneous time in relation to earthquakes (2013 with Simon Swaffield) which could also extend to include volcanoes, tornados and tsunamis. Bowring has also written extensively on memory (2016 and 2021) which is another time reference in the form of individual and/or collective memory that can manifest through heritage or commemoration.[31] Despite such a diverse range of temporalities that we work with it is surprising that texts and discussions pertaining to time in landscape architecture remain scant. Instead, attention to space and objects has had a tendency to dominate.

There has, however, been a notable shift in recent landscape publications and online lectures/forums[32] where time is becoming an integral topic of discussions pertaining to changing and often rapidly changing environments. In 2018 Anita Berrizbeitia charted the future trajectories of the discipline in how it needs to operate with other disciplines to deal with increasingly complex issues concerning social, economic, political, climatic and environmental upheaval. The chart is fixed to a historical timeframe starting with mediaeval gardens and transitions to the Anthropocene where the list of environmental, economic and social problematics expands. Of note, is the current and expected expansion of the profession's environmental sphere and multi-faceted roles that are needed to address accelerating changes to society, landscape and climate.

In a more recent publication Dirk Sijmons (2021) shifts to a different, non-linear temporal context that assesses how the discipline can position itself in light of the

29 Duempelmann and Harrington (2014); Berrizbeitia (2018); Van Dooren (2016).
30 Motloch (2001).
31 Descombes (in Treib, 2018); Lassus (in Jacobs, 2000).
32 Jackie Bowring (2020); Catherine Heatherington (2021); Andrea Kahn and Carol J. Burns (2020).

Anthropocene (Fig.2.3). He proposes four 'philosophical positions' that landscape architects may choose in responding to the Anthropocene.

Sijmon notes that this was adapted from Clive Hamilton, Defiant Earth, the Fate of Humans in the Anthropocene. The vertical axis represents a potentially powerful humankind in relation to earth systems on the bottom. The top of this axis is a powerless humankind that has no impact on the earth's systems. The horizontal line, moving left to right concerns a passive to active earth. A passive earth means one that has inexhaustible resources while an active earth responds to disruption. Of the four positions that Sijmons presents, he explains that denialism and ecomodernism dominate the current environmental debate and can be described in terms and language familiar to the design field. The other two, posthumanism and Anthropocentrism 2.0, each demand a paradigm shift in thinking about the world;

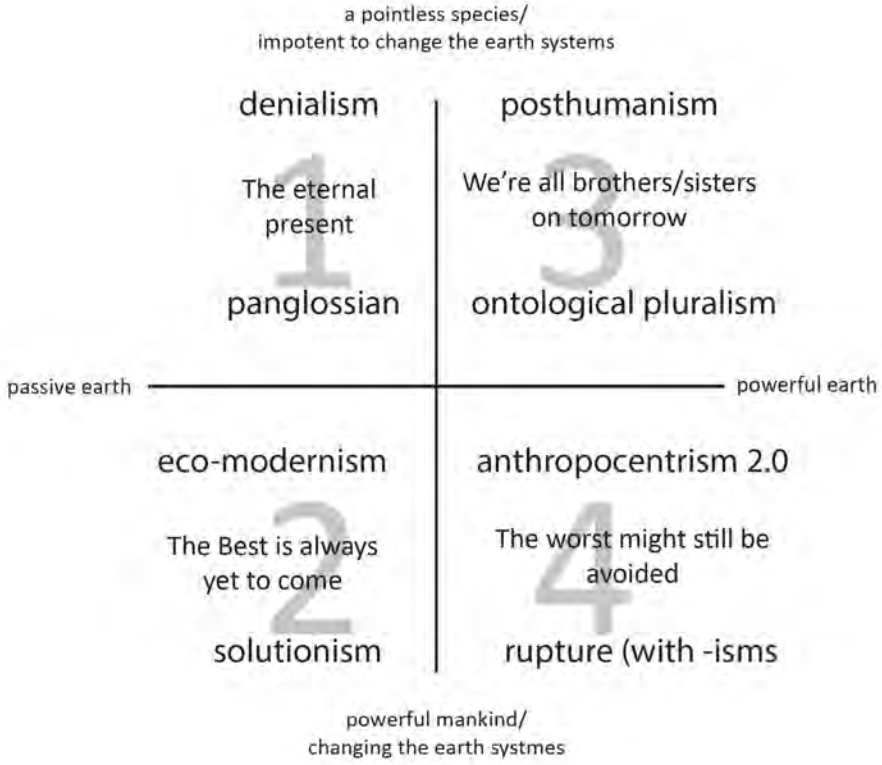


Fig.2.3. Typology of philosophical positions toward the Anthropocene by Dirk Sijmons. Sijmons notes that this was adapted from Clive Hamilton, Defiant Earth, the Fate of Humans in the Anthropocene. The vertical axis represents a potentially powerful humankind in relation to earth systems on the bottom. The top of this axis is a powerless humankind that has no impact on the earth's systems. The horizontal line, moving left to right concerns a passive to active earth. A passive earth means one that has inexhaustible resources while an active earth responds to disruption. Source: Sijmons, 2021. This diagram has been re-drawn by author for improved legibility.

both remain largely terra incognita for the design community. I find this quadrant of scenarios very useful in identifying the ways in which landscape architecture can position itself in the present with a future, beyond conventional timeframes, under consideration. It may be regarded as a meta-multi-scenario complex but worthy of further debate and discussion.

Berrizbeitia and Sijmons have taken an outsider view of where the discipline currently stands with careful consideration on how it can be further mobilized for the future. There are other examples of how the discipline is engaging more actively with time but on a scale and perspective different to these two authors.

A doctoral thesis by Noël van Dooren (2016) assessed how time is represented in landscape architecture both historically (the work of Humhrey Repton for example is described) and from contemporary Dutch landscape architecture practices. He appraises the drawing conventions in the discipline – plan, section, diagram that present major problems in representing time. He concludes by urging more innovative ways of representing time that should come from within the discipline itself. In a recently published book by Catherine Heatherington (2021) she examines various dimensions of time in designed landscapes.[33] She discusses the need to regard landscapes as having multiple temporalities which incorporate human (experiences and memory) and non-human (material and immaterial, organic and inorganic).

Finally, Rob Barnett's has made a significant contribution in developing conceptual frameworks of time in landscape architecture through his interpretations of the concept of Emergence (2013). In framing his ideas in landscape architecture, Barnett establishes key questions on 'how humans know the world, how they interact with it, and how the world is thought to receive and respond to humanity'. Through ecological and biological modes of thinking Barnett helps in strengthening relations between animate and inanimate materials, the human and more-than-human, and the physical and the mental thus confronting these long-standing dichotomies. He examines a range of philosophies pertaining to time such as the work of Henri Bergson, Elizabeth Grosz, Deleuze and Guattari, and Michel Serres. It is interesting to read this work without any reference to the Anthropocene but his thinking, is in fact, very topical to today's concerns and challenges with regard to environmental destruction and disruption to ecosystems. In returning to Dirk Sijmon's quadrant it is likely that Barnett would find a position in the

33 Heatherington's doctoral thesis (2015) also examined concepts of time through the subject of change in landscapes.

posthumanist philosophy.

2.3.2 The need to expand concepts of time in landscape architecture

The urgency in which to respond to environmental changes has thrown up many references to time. For example, there is ample scientific evidence showing that different plastics will remain in our ecosytems ranging from hundreds to thousands of years[34] as well as growing evidence of the prevalence of nano-plastics in human systems[35]; thousand year old ice sheets in Antarctica and Greenland are shrinking seasonally,[36]; and there is an increase in destructive storm swells that can flood extensive areas in a matter of hours. Wiggin et al. call this ‘a massive temporal collision’(2020:vii). These changes are fast and slow, and long and short in duration. The impacts are sobering with cumulative evidence that humans are largely to blame for such environmental destruction.

There are two time-related characteristics that I have found, through literature relating to the Anthropocene, that I feel are relevant for the study of Arctic island coasts. The first concerns the attention to the more-than-human. The Anthropocene has elicited the complex relations between humans and all the material and immaterial components immersed in our spheres of existence. In making these connections between the material and immaterial, different durations of time emerge. David Farrier’s deep time studies consider the plethora of future fossils that humans will leave behind. He considers not only the fossils embedded in geology that we are most familiar with, but he also highlights residues that humans will leave in the atmosphere too:

> The entire atmosphere now bears the marks of our passage, like a vast geochemical trace fossil of the journeys we have taken and the energy we have consumed. When the last residue of our carbon finally leaves the atmosphere, humanity will have lived and evolved through another four thousand generations (2020:9).

This is a good example of how thinking through deeper concepts of time, whether it’s the past or the future, catalyses deep reflections on the present. Kate Brown (Brown and Martynyuk, 2016; The Kenan Institute for Ethics, 2021) tracked the distribution of radioactive blueberries travelling from Ukraine to north America. Her stories highlight the spatial, temporal and material entanglements through the

34 Gabrys et al.(2013); David Farrier (2020); Kate Brown (The Kenan Institute for Ethics, 2021); Dmitry Turlyun (2021).
35 Damian Carrington (2021).
36 Thwait glacier in Antarctica for example.

journey of a blueberry.

This leads to the second time-related notion from the Anthropocene that accentuates the multiplicities of scale. The Anthropocene incorporates human and more-than-human temporalities and presents them in a plural co-existence. On a spatial level, the Anthropocene is not just about the terrestrial but embodies the earth's hydrosphere and atmosphere. They are all connected. While this is a very obvious fact it is not necessarily the way in which landscape architects think and work. Conventionally, the discipline has been very much concerned with terrestrial matters but as I have mentioned in previous sections there is a change with consideration for 'Blue' space with regard to coastal interventions. Attention towards the atmosphere in landscape architecture remains peripheral with very little written about this component of a landscape.[37]

These two time-related characteristics that I have discussed open up a range of other alternative ways in which to think about time. There is much emphasis on time relating to materials which I feel is needed in landscape architecture where there is still a heavy weight on time relating to vegetation. Another aspect that is touched upon in the preceding examples is scale relating to both time and space. This encourages thinking beyond a site and establishing relations between local, regional and global space. These points have been explored in different ways through my publication writing. In my first publication *Arctic islands, Archival Exposures* (2020), for example, I stress the complex entanglements of time between historical human engagement and a selection of Arctic coasts. I examine the material remains of past activities and consider their futures in changing Arctic environments. A second example is from my fourth publication *Temporal Perspectives on Arctic Peripheries* (under review) where I explore a range of temporal and spatial scales concerning the island of Bjørnøya in an effort to expose alternative ways to understand and perceive this island.

2.4 NEW PHILOSOPHIES AND CONCEPTS OF TIME FOR ARCTIC COASTS

I will outline the criteria for developing my proposal of a set of new concepts considerations of time that can help in articulating the complex temporalities of Arctic coasts. First, it is important to develop concepts of time that can account

37 In her doctoral thesis Alice Labadini raises the problematics of the study of 'atmosphere' in architecture: 'Atmosphere, as it has been and is used in architecture criticism, carries with it a certain subjectivist component that I find misleading. The centrality accorded to the human subject when talking of atmosphere in design is especially problematic when considered in relation to the theme of agency. With their heavy focus on subjectivity, atmosphere-steered discourses have mostly failed to recognise the independent capacity of landscapes to produce effects in space and affect the human body through them' (2017:59).

for non-linear or non-cyclical events or processes. In other words, concepts that can help express disruption or unexpected environmental change. Second, in light of the Anthropocene where relations between humans and non-humans are increasingly difficult to separate or define, it is important to have concepts that are applicable to both. Third, the experiential and immersive mode of working with Arctic coasts is an important part of this research and so, concepts should have the capacity to relay such aspects of site understanding and knowledge building. With these criteria in mind, I propose five concepts and considerations of time. The first three—process, durée and multiplicity—are grounded in the philosophies of Henri Bergson and Alfred North Whitehead. The remaining two—multi-scalar and inter-temporal—are ones that I have developed through a range of literatures closely linked to Anthropocene concerns and so I think of these as time considerations as opposed to concepts.

2.4.1 Process

Henri Bergson (1859–1941) and Alfred North Whitehead[38] (1861–1947) were key figures in the founding and development of Process philosophy.[39] Process philosophy is characterised by notions of becoming, emergence, movement and change. Helin et al. describe the approach of these early process philosophers where they:

> work from within things, staying with them, suspicious of abstracting too far into hierarchies of being; they stick with things and the experience of things, rather than reaching into a more certain, stable, and invariant world of ideas (2014:3).

The motivations for developing this line of thinking from Bergson and Whitehead were different. Bergson opposed the Cartesian dualism separating body and mind and sought to overcome this by emphasising their relations as well as connections to the immediate world. In relation to time, he was critical of modern science's modelling and reduction of time into units of measurement. This orderliness and flatness of 'clock time' failed to account for the qualitative and experiential dimensions of time. Barbara Adam explains that clock time is 'a conceptualization of time that is premised on an externalized, objective time created to human design' (2004:49).

38 Whitehead was 'a mathematician, a speculative physicist, a historian of science, a philosopher of science, and a philosopher in his own right (Halewood, 2005:57).
39 William James (as well as Heraclitus) are also included in this group but have not formed a part of this study. Instead, I have focussed on process philosophers who have influenced or are influencing architecture and landscape architecture.

Bergson and Whitehead were living in a time when huge scientific developments were unfolding including the discoveries of electricity, air travel and international telecommunications (Helin et al., 2014) as well as 'mass production providing the methodologies for both mass media and mass extermination' (Linstead and Mullarkey, 2003:5). Veronica Strang points out that 'with industrialization, artefacts for time-telling grew increasingly accurate, parsing time into ever smaller units attached not to celestial objects, but to earth-bound activities' which led to 'global temporal unification' (2015:107). These earthbound activities changed radically following on from industrialization. Paul Hendy outlines such changes:

> Before, the rhythms of labour – tilling the field, hauling in fish, spinning cloth – had often been matched to the rhythms of the human body, the rhythms of breathing, of bending, of hands and feet moving, by people singing work-songs… Work proceeded at a slightly different pace, one set by nature and local conditions: seasonal variations in weather, perhaps, or the life cycles of animals stirring, sleeping, breeding, hibernating. Industrialised work tore up these delicate organic relationships (2013:221).

Bergson's philosophies of time were in many ways reacting to the homogenization, abstraction and mechanisation of time which feed into his development of durée (duration) and multiplicities of time that will be elaborated on in the proceeding sections.[40]

Alfred North Whitehead, meanwhile, brought forward two important strands of thought in his Process Philosophy regarding materiality and subjectivity that have much significance for the framing of time concepts in this thesis. Firstly, Whitehead (1925) refers to the impermanence of matter by rejecting the notion of 'simple location'[41] which situates matter in a determined space and time without relating to other entities (Robinson, 2009; Gaskill and Nocek, 2014). This unsettles the notion of the fixity of space and time which has caused much critique in landscape related

40 An interesting response to 'clock time' is brought forward by philosopher Michelle Bastian who makes an important challenge to its 'suspicion, censure and outright hostility'. She claims that 'clocks have many more interesting possibilities than they are usually given credit for. Like maps, they too have complex relations to social life. Even further, they also have the potential to be reworked as creative responses to a host of social, political and environmental issues' (2017:42).

41 Whitehead explains that 'To say that a bit of matter has simple location means that, in expressing its spatio-temporal relations, it is adequate to state that it is where it is, in a definite finite region of space, and throughout a definite finite duration of time, apart from any essential reference of the relations of that bit of matter to other regions of space and to - other durations of time (1925:58).

studies.[42] Aside from this being particularly welcome in coastal studies where flow, flux and movement characterise these environments it is equally pertinent to all terrestrial, aquatic and aerial environments.

Secondly, and relating to the previous point, Whitehead ties materiality to process. Geographer Tom Roberts explains that, for Whitehead, 'materiality is inseparable from the processes through which particular entities become what they are' (2014:971). This may be translated as the process of *becoming*. Michael Halewood elaborates that 'the key to Whitehead's concept of becoming is that each becoming occurs in a specific environment and in a specific fashion' (2005:63). Bergson and Whitehead's process philosophies have been taken up in studies pertaining to landscape and materiality (particularly archaeology[43]). Tim Ingold, for example, acknowledges the work of both philosophers for his own work. 'From Whitehead, I took the idea that the world we inhabit is never complete but continually surpassing itself… Crucial to Bergson was the claim that in this movement of creation, of life and growth, lies the essence of time' (2011:13)[44]

In landscape architecture, Rob Barnett hails Bergson and Whitehead in the development of ideas and theories pertaining to emergence and becoming. In his work, Barnett (2013) proposes different ecologically-based approaches to working with complex landscape systems through the development of emergence theory specific to landscape architecture practice.

In this research, time conceived as process destabilizes linear thinking about time. An example of this is Michael Welland's description of the journeys a grain of sand takes which I described in the introductory chapter (section 1.1.5). In this example, a range of agencies are involved in the fate of a grain of sand each of which has their own temporal characteristics. The journey of this sand grain is not confined to a linear journey but takes a number of diversions that interact with other materials, conditions, processes and temporalities. This mode of thinking is crucial in my study of Arctic island coasts where local and regional environmental changes are disrupting notions of linear and cyclical time. Approaching these coasts as relational and processual allows a more fluid understanding between humans and non-humans, and between processes interacting between the atmosphere, biosphere, hydrosphere and lithosphere. In my third publication *What time is this*

42 Archaeologist Oscar Aldred (2021) and geographer Tom Roberts (2014), for example, refer to Whitehead's contribution in helping to dislodge long held beliefs of fixed space/time notions in their disciplines.
43 For examples Olsen (2010) and Aldred (2021).
44 Ingold refers specifically to Whitehead's publication *Process and Reality: An Essay in Cosmology* (1929) and Bergson's *Creative Evolution* (1911).

coast? (2021) I have examined how process may be understood from different theoretical perspectives and I have demonstrated how this can be applied in landscape architecture practice.

2.4.2 Durée/Duration

The concept of durée or duration is not entirely distinct from the philosophy of process that I have described. Instead, it may be seen as a concept that fits within the larger philosophical frame of process philosophy. In my description of durée I refer solely to Bergson who developed this concept in his 1889 publication *Time and Free Will: An Essay on the Immediate Data of Consciousness*. Geographer Barney Warf explains that ''Bergson adopted the Heraclitian emphasis on process over stasis, on becoming rather than being, stressing the continual process of change that he called la durée …' (2008:138). This concept of time, developed by Bergson, relates to what he called 'real time' or the experience of time as opposed to measured time.[45] To illustrate this point he takes an example of waiting for sugar to melt in a glass of water:

> For here the time I have to wait is not that mathematical time which would apply equally well to the entire history of the material world, even if that history were spread out instantaneously in space. It coincides with my impatience, that is to say, with a certain portion of my duration, which I cannot protract or contract as I like. It is no longer something *thought*, it is something *lived* (1911:10/11).

The concept of durée, however, is not restricted to the present. In his later publication from 1907, *Creative Evolution*, Bergson describes durée as 'the continuous progress of the past which gnaws into the future and which swells as it advances' (1911:4) and 'wherever anything lives, there is, open somewhere, a register in which time is being inscribed' (1911:16). This underpins the notion of continuity where processes or events of the past play out in the present. According to Bergson, durée is triggered through different responses–the past through memory, the present through experience, and the future through anticipation (Linstead and Mullarkey, 2013).

In Anthropocenic terms, Bergson's durée demonstrates its relevance today. Humanity is intimately and actively engaged with the shaping and making of

45 This opposes Isaac Newton's definition of duration which he wrote 'Absolute, true and mathematical time, of itself, and from its own nature, flows equably without relation to anything eternal, and by another name is duration' (cited from Adam, 2004:30).

geology which, in itself, brings deep time pasts to the present. Another example is the presence of plastics that infiltrates all environments with durations that inherit geological scales of time. The flows of time are, as a result, interrupted and skewed in the Anthropocene. Philosopher and feminist theorist Elizabeth Grosz provides a good account on the flows between past, present and future:

> what Bergson's understanding of duration provides is an understanding of how the future, as much as the present and past, is bound up with movement and impetus of life, struggle and politics. While duration entails the coexistence of the present with the past, it also entails the continual elaboration of the new, the openness of things (including life) to what befalls them. This is what time is if anything at all: not simply mechanical repetition, the causal effects of objects on objects, but the indeterminate, the unfolding, the emergence of the new (2000: 230).

A final point to raise, regarding Bergson's concept of durée, is that it acknowledges an interaction between humans and non-human matter but one that depends on human consciousness:

> We perceive the physical world and this perception appears, rightly or wrongly, to be inside and outside us at one and the same time; in one way, it is a state of consciousness; in another, a surface film of matter in which perceiver and perceived coincide. To each moment of our inner life there thus corresponds a moment of our body and of all environing matter that is "simultaneous" with it; this matter then seems to participate in our conscious duration (Bergson, 1922:45).

In their discussion on the timeliness and relevance of Bergson's time philosophies today, Jon May and Nigel Thrift raise questions on Bergson's stance on duration which they believe divides human and non-human matter. They conclude that 'the boundary between the organic and inorganic – in a world of viruses – is increasingly difficult to trace' (2001:25). I wish to briefly elaborate on this point in light of literature from the environmental humanities that I have mentioned previously in this chapter, where toxins (for example micro plastics) penetrate all environments and have no bounds between humans and non-humans.[46] While Bergson made significant progress in acknowledging and extending the concept of

46 For example in the work of Gabrys (2018); Ginn et al. (2018); Davis (2022).

duration to non-human matter this aspect of durée/duration needs a further push in light of environmental change today.

There are few examples of the concept of durée being used in landscape architecture. A doctoral thesis by Lee Heykoop from 2015 examined different conceptualisations of time, including durée in analysing temporality in designed landscapes. Later, a practice-based example was explored in an article written by Fiona Harrisson and Marian Macken (2018). They describe how they used durée in the teaching of a drawing studio to landscape architecture students. They examine different conceptualisations of time such as linear and cyclical time but use durée to express experience and inhabited performance of drawing.

In this study I have used the concept of duration in my third publication *What time is this coast?* (2021) and fourth publication, *Temporal Perspectives on Arctic Peripheries* (under review). The advantage of using this concept is firstly to express my experiential accounts of Arctic island coasts and secondly to articulate the continuity of time that can be applied equally to human and non-human matter.

2.4.3 Multiplicity

The notion of multiplicities is an important notion of time that is integral to this research. Rather than limit aspects of environments as being cyclical and/or linear it is important to stress that there are many expressions of time constantly playing out in very different ways. This may seem a very obvious statement to make. However, in landscape architecture this notion of diverse and simultaneous time is overlooked theoretically. To address this I will, again, bring a processual perspective from Bergson and Whitehead into the temporal framings of this research. While the notion of multiplicity is shared in Bergson and Whitehead's philosophies, Bergson places emphasis on multiplicities of time, whereas Whitehead discusses the multiplicity of relations that exist in nature. First, in *Matter and Memory* Bergson claims that:

> In reality there is no one rhythm of duration; it is possible to imagine many rhythms which, slower or faster, measure the degree of tension or relaxation of different kinds of consciousness, and thereby fix their respective places in the scale of being (1896:275).

Bergson's interpretation of multiplicities of time is very much one of flux and dynamism. When Bergson refers to multiplicity it is not, however, meant to be of a numerical kind. Rather it is one where 'a multiplicity like a qualitative duration divides but each time it does it changes in kind' (Pearson and Mullarkey, 2002:3).

Gilles Deleuze[47] expands on this stating that Bergson's multiplicity 'is *other* without there being *several*; number exists only potentially' (1988:42). In this study I have been mindful of this where I draw upon different expressions of time without listing or numbering what I have observed or experienced. Instead, I have accounted for what expressions of time are present on a coastal site and how they interact and evolve over time.

From a material perspective, archaeologist Laurent Olivier examines how time is conceived in his discipline. His concerns lie in the conventional approach to time where he compares it to a cinematic film that is ordered through a sequence of images. What is missing from this, he claims, is the lasting qualities, or durations, from the past (2001). This draws attention to the fact that time may be regarded as multi-temporal[48] with the idea of matter preserving past durations in the present. In my first publication, *Arctic islands: Archival exposures* (2020), I examine how materials remaining from historical activities along selected Arctic island coasts are not static objects. Instead, these materials, each of their durative qualities, continually interact with climatic and ecological agencies.

I wish to turn attention towards Whitehead's interpretation of multiplicity which draws attention to ideas of relations in nature. In his book *The Concept of Nature*, Whitehead takes an example of the monument, Cleopatra's Needle, an Egyptian obelisk situated on the banks of the Thames in London:

> At first sight we should hardly call this an event. It seems to lack the element of time or transitoriness. But does it? If an angel had made the remark some hundreds of millions of years ago, the earth was not in existence, twenty millions of years ago there was no Thames, eighty years ago there was no Thames Embankment, and when I was a small boy Cleopatra's Needle was not there. And now that it is there, we none of us expect it to be eternal. The static timeless element in the relation of Cleopatra's Needle to the Embankment is a pure illusion generated by the fact that for purposes of daily intercourse its emphasis is needless… Day by day and hour by hour we can find a certain chunk in the transitory life of nature and of

47 Gilles Deleuze (1925-1995) has often been cited in relation to the revival of Bergson's philosophies e.g. May and Thrift (2003) and Robinson (2008). Deleuze wrote a book *Bergsonism* (1991) which draws extensively on Bergson's thoughts and concepts.
48 Olivier states that 'the current state of the present… basically consists of a palimpsest of all durations of the past that have become recorded in matter' (2001:66).

> that chunk we say, 'There is Cleopatra's Needle… But a physicist who looks on that part of the life of nature as a dance of electrons, will tell you that daily it has lost some molecules and gained others, and even the plain man can see that it gets dirtier and is occasionally washed (1920:106-107).

Whitehead contemplates the different temporal, spatial and experiential perspectives of this monument. Archaeologist Oscar Alfred highlights the multiple scales of time that Whitehead considers and the 'illusionary state of stasis' (2021:167) when it remains unexamined. Whitehead draws attention to how the monument relates to other times such as the deep time of the earth prior to its existence and right up to the 'hour by hour' experience of it. In this way, the monument, considered by Whitehead as an event, inhabits a prismic role projecting a series of inter-related experiences and interpretations of the times inherent to the monument.

The example that Whitehead takes, can in many respects be translated to the materials of the Arctic island coasts in this study. A material can be interpreted as an event, rich and heterogeneous with multiple expressions of time. In addition, it relates specifically to its location which incorporates a multitude of other stories and time. In his discussion on Whitehead's notion of multiplicity, professor of English, Russell West-Pavlov, understands that 'Our own temporal existence is merely one strand within the complex hybrid temporalities of things-in-process' (2013:53).

Bergson and Whitehead offer interesting perspectives on ideas of multiplicity. Bergson addresses the multiple qualitative aspects of time that are continually in processes of becoming. Whitehead, meanwhile, draws relations between time and space, and time and experience. Together these are relevant in my study in helping to expand how time can be articulated from human and non-human perspectives.

2.4.4 Multi-scalar

The Anthropocene has urged attentiveness towards deep-time pasts and futures in parallel to the occurrences and events of the present. It assigns an unsteady position in which to view our presence and our world as it challenges power, control, ethics and beliefs. And yet, this has provided great opportunity to engage with conceptions of time that allow for imagination to blossom and to cross-pollinate with disciplines that once seemed far removed from landscape architecture. The idea of multiplicities of scale applies to both time and space but I wish to give preference to the temporal in developing my arguments on the need to renew

discourse on time in landscape architecture.

A multi-scalar notion of time is closely tied to the time concepts of duration and process where they can be unfolded to demonstrate multi-scalar dimensions. The duration of a human life versus the duration of a stone versus the life of a cloud are examples of different durative properties of objects that may exist in one space. There is the deep time of the stone's origins and future and the ephemerality of the cloud with the human timescale situated somewhere in-between. However, it is challenging to make some of these scales and then to comprehend the relations between these scales, particularly those that exceed human time. Geographers Graham Chapman and Thackwray Driver state that 'to understand what happened before you were born requires an imaginative leap to extend an understanding of time beyond your own lifespan' (2016:3).

Climate change and the Anthropocene demand an engagement with a range of time scales that landscape architects did not previously have to consider. The Anthropocene, according to professor of art history Ömür Harmanşah, 'has introduced an entirely new sense of temporality, allowing us to think in the long term with an increasingly widening sense of depth into the past and into the future (2020:41). Climate change, which in itself is plural and ongoing is enfolded and recorded in geologies of the past and present (Yusoff, 2013). However, with these vastly extended timescales there still exists a need to position ourselves in the time we are currently living in. Geologist Marcia Bjornerud underpins the importance of finding meaning in planetary scales of time:

> geologic textbooks invariably point out (almost gleefully) that if the 4.5 billion-year story of the Earth is scaled to a 24-hour day, all of human history would transpire in the last fraction of a second before midnight. But this is a wrongheaded, and even irresponsible, way to understand our place in Time. For one thing, it suggests a degree of insignificance and disempowerment that not only is psychologically alienating but also allows us to ignore the magnitude of our effects on the planet in that quarter second. And it denies our deep roots and permanent entanglement with Earth's history (2018:16).

Bjornerud re-centres human time and at the same time embeds us in 'Earth's history'. Rather than seeing this as taking an anthropocentric perspective I see it more as a helpful way to confront the role of humans in shaping the history of the Earth and giving meaning to the scales of time in which we find ourselves deeply embedded.

2.4.5 Inter-temporal

This final consideration of time helps to articulate some complexities and overlaps of time. It translates as the intersections that develop *between* temporalities. It relates most strongly to the concept of multiplicity that speaks of co-existences of time. Indeed Whitehead saw that 'nature is a theatre for the interrelation of activities' (Whitehead 1938:140). The notion of inter-temporality places emphasis on intersectional and inter-relational capacities of various expressions of time. An example of this is a coastal environment where the tidal processes that embody a rhythmic durational time may intersect with a spontaneous gust of wind on the sea surface whilst the tide may drag deep-time sand particles from the bottom of the sea onto the land. Here, there are relations recognised as well as the different scales of time inherent to the materials and the processes acting through them.

Professor David Wood urges thinking towards inter-relatedness where 'the human and the geophysical are to be thought together. We need to learn to embrace multiple interrelational causalities' (2019:102). This way of thinking is needed in order to make connections between expressions of time in order to appreciate the complex and dynamic agencies and forces at work.

The five concepts and considerations of time that I have proposed in this section have been developed specifically for my study of Arctic island coasts and my experience of these islands. They help to address the time *of* the islands themselves as well as their relations to global temporalities. In the following section I move to my final theme of the literature review that examines the different ways in how to articulate and express human engagement with coastal environments.

2.5 ENGAGING WITH ARCTIC COASTS

This section will provide a range of aspects to situated and experiential modes of practice in landscape architecture. The practice of fieldwork is an integral part of the discipline of landscape architecture and one that is described in much detail in chapter 4 of this exegesis. In the first part of this section will outline a series of examples of how landscape architects theorize and conduct in-situ fieldwork. The second part of this section explores ways in which to articulate the immersive aspects of working on site. The third and final part considers weather as a defining part of being on a site. This hugely important condition of a site is surprisingly overlooked in landscape architecture theory and so, I provide a selection of texts that I consider relevant to my work along Arctic coasts.

2.5.1 In-situ fieldwork: Precedents in landscape architecture

Before I embark on describing ways in which to engage with a site it is worth mentioning a selection of different approaches adopted by landscape architects who practice and theorize on the subject. The four examples that I provide demonstrate how these approaches yield different readings and understandings of a site at the initial stages of the design process.[49]

1. The *Four Trace Concepts in Landscape Architecture* by Christophe Girot (1999) is arguably one of the best known examples of an approach to in-situ fieldwork. I refer to Girot's approach in my first publication, *Arctic islands, Archival Exposures* (Tynan, 2020). Girot proposes four 'operating concepts' of 1) Landing; 2) Grounding; 3) Finding and 4) Founding. His motivation for these concepts is to work towards 'practices that also reactivate the cultural dimensions of sites' (1999: 59). Girot is aware of the unfamiliarity that most designers must confront when visiting a site for the first time and his concepts attempt to find ways in which a designer can plug into the memories of a site despite this unfamiliarity. The concepts, listed as adverbs, give a sense of movement and agency to the work of the designer on site. This approach is useful in that it considers the materiality and time of a site as well as encouraging a designer's intuition in response to a site. The approach is one of order and Girot insists that the four concepts 'must follow sequentially so as to enable the site to emerge in a comprehensible manner.'

Girot draws attention to the intuitions of a landscape architect in the first stage of his *Four Trace Concepts*. This should, perhaps, be developed and expanded upon in all four stages as intuition can be expressed in different ways on a site. For example, a designer's experience can allow for decisions to be made on the most effective methods to use or perhaps the designer knows and understands the conditions of a site that signal problems or opportunities. These types of intuitions are not sequential but rather a personal, experienced and immersive response to a site. Henri Bergson, who wrote extensively on intuition, remarked that 'it is to the very inwardness of life that *intuition* leads us' (1911:176). Gilles Deleuze expands on Bergson's philosophy stating that 'intuition involves a plurality of meanings and irreducible multiple aspects' it is a 'lived act' (1991:14). Girot's inclusion

49 There are numerous approaches to fieldwork and I have chosen four approaches that I have found worthy of revisiting in this research. Other approaches that deserve mentioning include the work of Jörg Rekittke (2015) who discusses fieldwork on the ground, by foot; and in the air; using drones; Katherine Jenkins (2018) who uses a multi-method approach concerning site analysis whereby situated readings of the site and representation techniques are considered; and with regard to working on a territorial scale Kate Orff of SCAPE landscape architects examined Mississippi River industrial corridor with photographer Richard Misrach producing a book that uses varying forms of representation to communicate data that they collected. See: Misrach and Orff (2012).

of intuition in the initial part of a site visit is therefore underplayed or even undervalued in his approach.

There is a second constraint to Girot's *Four Trace Concepts* with regard to his understanding of a site where he claims that the 'specific site functions like a partition or container' (1999:60). Appreciating the era when Girot proposed these concepts (when the word *site* had not really been interrogated or critiqued academically)[50] it is challenging to perceive a site as contained in light of climate change where there are constant actions and reactions between local and global scales. This is explicitly true for Arctic coastal sites where the blurred threshold between land sea and air is undefinable as I have stressed in my second publication *Shifting coasts: Developing New Coastal Concepts* (Tynan, in print).

2. A different approach to site enquiry is undertaken by Günther Vogt and his team of landscape architects who deploy a wide range of techniques in response to different landscapes and to landscapes of different scales (Foxley, 2010; Vogt et al., 2015). Their investigative in-situ work is closely connected to their studio work underpinning the strong relations between site and the development of material in a studio environment. Prior to their field trips, the Vogt team dedicate time to desktop studies relating to the site that may involve researching the geology, biology, hydrology and cultural history of a site. These foundations are supplanted with the designers' subjective responses to the site that principally involves walking, discussions with colleagues, sketching and photographing the site. The approach is not prescribed sequentially like Girot's *Four Trace Concepts* but involves a blurred overlap between methods and locations of enquiry. The way in which Vogt and his team approach fieldwork is an inspiring example to this research where there is careful preparation to establish a certain amount of knowledge about a site followed by an openness to explore the site that is guided by intuition.

3. The 'travelling transect' is another alternative approach to in-situ enquiry proposed by Gini Lee and Lise Diedrich (2019).[51] 'This method adopts the use of a transect, more commonly used in the natural and social sciences, which is essentially a line that cuts across a site, the scale of which depends on the research purpose. In Lee and Diedrich's version, the travelling transect method is a journey that is not solely about site analysis. The journey encompasses a range of locations–both indoor and outdoor– while weaving different methods through this

50 The first and second editions of the book titled *Site Matters* have advanced the ways in which a site may be theorized, positioned in a discipline, practiced and represented. First edition (Burns and Kahn, 2015) and Second edition (Kahn and Burns 2021).
51 This is related to earlier work by Diedrich, Lee and Braae, 2015.

transect.

Lee and Diedrich propose four sequences to this method: 1) Pre-travel where the transect begins and information is gathered about a selected landscape from various sources prior to the next sequence; 2) the landscape architects, equipped with tools, embark on their journey. Conversations, sketches, photography, taking samples etc. form a part of this phase. Deviations from the transect shift 'between the planned itinerary and the factual on-site experience' (p.95); 3) The third sequence is post-travel and takes place in a studio where the 'raw materials' are processed through interpretation and synthesis; 4) And finally in the fourth sequence, which is also post-travel, the work that was gathered and refined by the designers, is published and/or exhibited.

The 'travelling transect' asserts the necessary relations between preparation, site visit and studio. The transect is not just a physical line through a landscape but also a line of thoughts and thinking that thickens as the designers transition from pre- to post site visit. However, Lee and Diedrich's description give a sense of the journey as being smooth and uninterrupted and there is not a sense of what forms of transport the journey entails. The mode of travel, I feel, is very important because we (designers) experience and read a space very differently based on the speed that we move through it.

4. The fourth and final in-situ approach is from landscape architect Martin Hogue. The focus of his approach concerns materiality and how it transitions between site and studio/gallery. The transformation from the multi-dimensionalities of in-situ materials to the flattened two-dimensional representations in a studio/ gallery is central to his enquiry and critique on fieldwork in landscape architecture. He identifies three issues in his approach to recording materiality in landscape fieldwork. They are:

> the displacement of matter from the site to the studio workspace; the organization of this matter; and, finally, techniques for situating matter within the conventional two-dimensional space of landscape representation (2017:176).

Hogue directs attention to the predicaments of working with materials in a studio after in situ fieldwork and suggests multi-modal ways of recording field materials. As an example he takes historical precedence of the method of pressing of flowers

and rubbing materials to record their textures.[52] In addition, he discusses the values of exhibitory ways to display materials taking the example from Vogt's studio where field materials from specific sites are carefully arranged and placed on multilevel shelves. Another example is the project *le lustre* by Gilles Clément where site debris is encased in clear acyclic to produce an installation that resembles a chandelier. Although he does not use the word 'curation' that is what he points towards in that there is care and a consciousness of how to select and communicate information from a site.

The approach that Hogue adopts is very much focussed on a sensitivity towards the non-human elements of a site. In many ways it embodies a non-representational theory (NRT) approach because of the range of ways in which materials of a site can be transformed by the designer to highlight different things. Vogt's simple display of materials on a shelf may act as memory triggers for designers on how materials look and feel as well as reminders on where the materials originated. His example from Clément, conversely, is very much about display and performance whereby debris that would likely be overlooked by the public if it were on a site is carefully isolated and suspended in an exhibition hall.

The four examples that I have described in this section underpin many elements that I bring forth in my fieldwork on Jan Mayen, Bjrønøya and Hopen. These concern 1) connections between site and studio, and 2) engagement with materials on site. Lee and Diedrich stressed the importance of linking pre- to post-fieldwork. There transect method was composed of a journey through different locations that required the deployment of different tools and techniques. In my work, connecting desktop research, such as archival research, with the site was crucial in making sense of what I encountered and experienced on site. Vogt and Hogue reiterate the importance of the grounded, tangible connections that carry through from site to studio. Vogt, in particular, has an extensive portfolio that illustrates the varied way in which situated field research influences, inspires and grounds a design.

My interest in this research is to generate a mode of fieldwork research that places emphasis on the temporalities of Arctic coasts. This notion of 'practicing time' allows for a multi-scalar reading of a site that establishes relations between material, site and beyond. In order to do this, I work with the materials I encounter along these coasts and explore their relations with the environment they have become a part of. I use techniques and tools that are commonly used in landscape

52 Rubbing is a technique that involves placing paper over a material and rubbing it with a soft material such as pencil/charcoal to produce a relief of the material's texture.

architecture and ones which I am familiar with through my experience in practice, teaching and research.

2.5.2 Immersive approaches to working along Arctic coasts

Christophe Girot points out that 'a designer seldom belongs to the place in which he or she is asked to intervene' and he asks 'How can outsider designers acquire the understanding of a place that will enable them to act wisely and knowledgeably?' (1999:60). This *outsider* perspective is an important consideration in this research because of the lack of familiarity, not only with the coasts themselves, but with the rules and regulations that accompany trips to these parts of the Arctic. However, it was important to position my approach as a designer that deployed all of my senses and allowed for my intuition to lead my journeys along the coasts. In the following paragraphs I take examples from Veronica Strang, Anna Tsing, Edward Casey and Kathryn Yusoff in helping to theorize different types of immersion that can be brought into landscape architecture fieldwork.

Environmental anthropologist Veronica Strang points out that 'there is a fundamental difference between being an integral part of an animate, sentient material landscape, and merely traversing or acting upon one composed of physical things' (2015:109). The ways in which people engage with a site can be reduced to either of Strang's positions. However, there is often a feeling of the latter where one merely *traverses* or *acts upon* a site. This may be the case when one is in an unfamiliar environment. This may be reduced or even dissolved as one spends time and develops, what anthropologist Anna Tsing refers to as, the 'arts of noticing'. This is where we (humans) pay attention and notice relations between humans and non-humans.[53] In this sense one may embody Strang's more immersive perspective of integration with a *material landscape*.

The conditions of Arctic island coasts condition those who experience and perceive them. They control how long a person can endure or enjoy these coasts and this perhaps affects a person's sense of being. Philosopher Edward Casey explains that there are two ways of being-in-the-world – the *outgoing* and *ingoing* body. He describes the *outgoing* body where 'the lived body goes out to meet the place-world' (2001:414). This is very much a physical and spatial encounter with the body engaging with the world vertically, horizontally and laterally. *Ingoing*, meanwhile, is where 'the body not only goes out to reach places; it also bears the traces of the places it has known' (2001:414).This sense of being embraces

53 Tsing writes about the 'arts of noticing' in her book *The Mushroom at the End of the World* (2015). She elaborates directly on this in an interview (Tsing, A. and Lassila, M., 2017).

experience and memory.

Strang and Casey's accounts run parallel with geographer Kathryn Yusoff's evocative description of early Antarctic explorers where she refers to the 'interplay between mark making and being marked' (2007:211). Mark-making, according to Yusoff, involves creating a trace of history where the explorers physically mark their discoveries on the terrain. Being marked, meanwhile, is where the bodies of the explorers are marked by the extreme conditions endured in Antarctica. Yusoff points out that:

> The tension between mark-making and being marked locates the explorer at the threshold of representation and place. The trails and markings on the body (injury, loss, and insanity) serve as expanded histories of human presence and capture the arresting sensation of the Antarctic landscape (2007:218).

These examples draw attention to the challenges for landscape architects of knowledge making and how to represent aspects of a landscape that exceed the visual. How, in other words, can the imprints of a landscape experienced by a designer develop through representational conventions of design disciplines? The ideas, memories and feelings towards these Arctic coasts challenge ways in which to represent them and demand a broad range of methods to help articulate the vibrancies of these environments.

2.5.3 Weathering with Arctic coasts

In 1733, the English explorer Constantine Phipps made an expedition to Spitzbergen. In an excerpt from his journal he described how:

> On the 16th [of July 1773], at noon, the weather was remarkably fine and clear. The thermometer in the shade being at 49°, when exposed to the sun rose in a few minutes to 89½, and remained so for some time, till a small breeze springing up, made it to fall 10° almost instantly. The weather at this time was rather hot; so that I imagine, if a thermometer was to be graduated according to the feelings of people in these latitudes, the point of temperature would be about the 44th degree of Fahrenheit's scale (from Fjågesund, 2008:84).

This quotation describes the author contemplating the body's "felt" temperature to that measured by a thermometer or what, 150 years later, scientists would call

the *Wind Chill Factor*. The excerpt has, from the start of this doctoral journey, inspired me in my approach to Arctic island coasts where I have navigated my research between theory and my designerly intuition as well as mediating between technological and human sensing. In many ways it is an appropriate quotation for the islands in this study which have meteorological stations where daily weather observations take place.

In keeping with Phipps's weather considerations that highlighted the absolute measurement of the thermometer versus the relative bodily measurement, I wish to draw attention to the matter of weather scales. Edensor et al. state that 'the weather is a global phenomenon sensed locally' (2021:3). What is interesting is how weather is sensed on different spatial scales. Meteorological observations take place across the globe – on the sea (weather buoys and ships), in the air (weather balloons) and on the ground through automated and human readings. All these local observations feed into computer systems that allow for forecasts on a regional or continental scale. Time is also critical to these observations. In her account of early modern scientific observation, historian of science Lorraine Daston, states that 'time, sliced ever more thinly, became the universal grid imposed on phenomena as diverse as the ebb and flow of the tides, the undulations of an aurora borealis, the departure of bees from a hive, and the return of the swallows (2011:18). This has remained the case in meteorological observations where everything that is measured is also timed.

Weather influences the time of a place, the time we spend at these places and how we spend our time. In this research it also influenced how I conducted my fieldwork, for example, what methods were most appropriate to use in different conditions and for how long. Artist Olufur Eliasson has infamously used weather to inspire his work. He stresses the link between weather and time in the shaping of our environments and even where we live. Northern Europe is where the extremities of weather and time, such as wide-ranging seasonal variations, are particularly obvious according to the artist. The unpredictability of weather has caused a constant preoccupation of it for humans. An important aspect to Eliasson's work is his understanding of time scales particularly in relation to weather and is something that traverses into the interests of landscape architecture. Eliasson gives an example of weather forecasting:

> With the weather forecast we look at the time ahead of us, organising our expectations. One could say that we stretch our ever-progressing 'now' into the future to the highest possible degree of avoiding the unforeseeable…the weather can be communicated

> or experienced as an abstraction, but due to its durational and unpredictable aspects, it allows us to understand the level of that abstraction to a greater extent (Eliasson and May, 2003, p.133).

Eliasson makes a crucial link between our engagement with the more scientific aspect of weather forecasting and how we perceive and relate to this information. In compromising the division between the technological and human sensing of weather artist and writer Janine Randerson suggests that weather is approached as media. She explains that:

> The term *media*, when set in relation to weather, can be understood technologically as data, as well as culturally as part of our environment… As a medium, weather connects us to the world and to each other through the rain, wind, and sunlight that carry sensations to our human and machinic receptors (2018: xvii).

This brings me to the experiential accounts of weather that landscape architects confront in all site visits. The following authors provide influential examples on how they have described the experiential aspects of weather in their work. Some of these authors have approached the subject differently – through a more distanced articulation and others through more immersive means.
Tim Ingold states that the weather is:

> dynamic, always unfolding, ever changing in its moods, currents, qualities of light and shade, colours, alternately damp or dry, warm or cold, and so on. In this world the earth, far from providing a solid foundation for existence, appears to float like a fragile and ephemeral raft, woven from the strands of terrestrial life, and suspended in the great sphere of the sky (2006:17).

Ingold brings phenomena from the air and describes its entanglements with the earth. Geographer Kimberly Peters explains that 'we can understand weather not so much as an external force upon us, or a set of conditions 'originating' from the sky to the ground, but part of an open world of mixing and mingling' (2021:254).
An alternative perspective on weather is provided by Philip Vannini et al. where *weather* is transformed into a verb. They explain that:

> learning to weather places involves immersing oneself not only in a particular world of atmospheric conditions, but a meaningful and sensuous world: a sensory order weaved by sensations, skills,

> affect, and intersubjective values and dispositions shaped by endless articulations of comparisons with other, different weather patterns and places. Thus, just like we can never think of place without self (or vice versa), we can never think of places without their weather. (2012: 372).

Weather is indeed a constantly unfolding and enfolding force acting out through all environments and affecting the way in which humans engage and perceive the world. It also continuously interacts with the materials that are exposed to it and this is explicit along coastal environments. Edensor et al. discuss how weather processes interact differently with materials causing erosion, absorption, fracturing, percolation, reflection etc. All of these aspects of weather influence the qualities of materials and the ways in which people engage with them (2021). In an Arctic context, the dramatic changes in light and temperature have a huge impact on the coastal materials in this study as well as affecting how I engaged with them. This is described in my third publication *What time is this coast?* (Tynan, 2021) where I draw attention to the conditions of Arctic coasts and the influences this has had on how I conduct my research practice.

2.6 CONCLUSION

This literature review has laid the foundation to five main themes that continuously weave through the following chapters and the four publications of this doctoral study. The five themes explored definitions of Arctic coasts; Arctic islands in the context of the Anthropocene; the ways in which Landscape architecture typically theorizes time; a proposal of five concepts and considerations of time for Arctic island coasts; and finally, a review on the different ways in which to engage with a site with emphasis on immersion and experience. Throughout this review I have used examples and stressed the relations between theory and practice from the perspective of landscape architecture. This approach, that strives to strengthen relations between theory and practice, has underpinned all of the publications connected to this research. In chapter 4 of this exegesis I place emphasis on the practical dimensions of this research where I describe, in detail, a range of methods that I used. The theoretical explorations of this chapter combined with my practice-based enquiries have helped in the development and proposal of a tempo-material framework described in chapter 5.

CHAPTER 03 SITE DESCRIPTIONS

This chapter provides descriptions of the three Norwegian Arctic islands in the research. Jan Mayen, Bjørnøya and Hopen are located in rather remote areas of the Arctic and to reach them usually involves several days at sea. The oceans surrounding them have not only shaped their unique physical character but have played an integral role in how these islands have been perceived, inhabited and used over the centuries. Before I proceed in describing the islands themselves it is important to lay out a range of contexts to which the islands belong. These contexts incorporate spatial, temporal and material consideration through subjects concerning their location, climate, history and contemporary status. I will follow, in the second part of this chapter, with individual descriptions of the islands and explain some of the features that are common to all three of the islands. The third and final section will delve into the unique material attributes of these island coasts which contain traces from past activity as well as new, contemporary materials that wash ashore onto these islands every day.

3.1 ARCTIC ISLAND CONTEXTS

3.1.1 Arctic interpretations

In order to introduce the Arctic islands in this study, it is important to firstly clarify where the Arctic region starts and ends. There are several interpretations on where the Arctic boundary is located. The following map in Fig.3.1, demonstrates a range of these interpretations. It features a series of different coloured lines that correspond to different boundaries that define the Arctic in different ways. The most commonly used definition of the Arctic is the region north of the Arctic Circle located at 66°33′ N latitude (indicated by the black dotted line on the map in Fig.3.1). This signifies the threshold where the Polar nights and the Midnight sun[1] is experienced. This line is very much about the earth's position in relation to the sun. The blue line on the map relates to temperature and, more specifically, the 10°C isotherm in July. The green boundary meanwhile marks where the tree line ends. North of this line is considered too harsh for trees to establish. The navy and orange lines are defined by the Arctic Council. The navy relates to CAFF (Conservation of Arctic Flora and Fauna), and the orange to AMAP (Arctic

1 The polar night refers to when the sun remains below the horizon for more than 24 hours. The midnight sun refers to when the sun is above the horizon for more than 24 hours. On the island of Jan Mayen, for example the sun remains below the horizon from 20th November until 21st January, and the sun remains above the horizon from 14th May to 28 July.

Monitoring and Assessment Programme).[2] The following three boundaries mark the High Arctic (purple line), Sub-Arctic (light pink line) and Low Arctic (dark pink line) regions. These boundaries are defined according to biological, climatic and environmental characteristics. It is in the High Arctic regions where I define the locations of the three islands in this research. The terrestrial areas in the High Arctic are associated with polar deserts (arid conditions). Where vegetation exists, it typically consists of grass, sedges, moss, lichens and some low growing flowering plants (Grønnestad, 2016). Klaus Dodds and Mark Nuttall (2019) also add that these areas are also associated with long periods of darkness. It is worth noting that some of the lines in Fig.3.1 are far from fixed. For example, the tree and temperature lines will need future adjustment due to accelerating

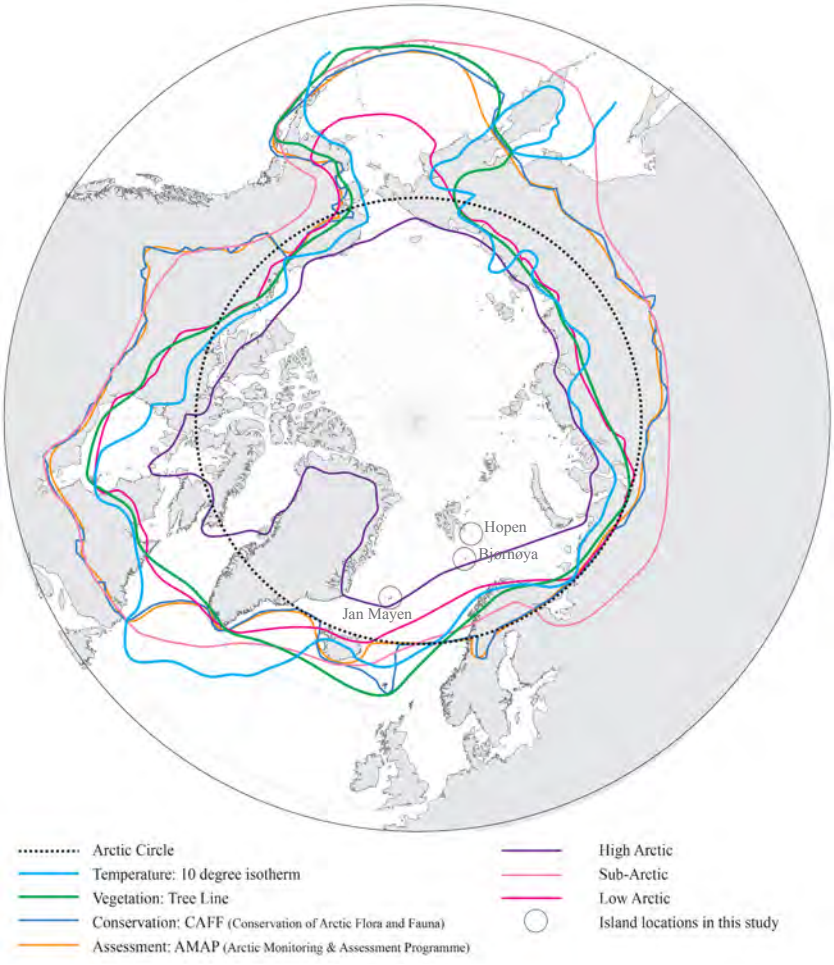


Fig.3.1 Map illustrating lines that refer to different definitions of what the Arctic is and where it is located. Map created by author.

2 Further information on how these programmes are coordinated may be found in a joint report (CAFF and AMAP, 2007).

rising temperatures in the Arctic regions. It is also important to acknowledge that while the definition of the High Arctic is suited to this study today, it is likely to be ill-fitted in the future as global warming plays out on these islands. By the end of the century, it is possible that Jan Mayen and Bjørnøya, for example, will be considered sub-Arctic in relation to changing environmental parameters.

3.1.2 Top of the world and tipping points

The Arctic has long been considered a peripheral region of the world. However, with issues pertaining to climate change, Polar Regions are taking centre stage. The subject of Arctic peripheries has been explored in my first and fourth publication connected to this thesis. In the first publication *Arctic Islands, Archival Exposures* (Tynan, 2020) I take a historical perspective on Arctic peripheries. In the fourth publication, *Temporal Perspectives on Arctic Peripheries* (under review), I examine peripheries from a geological, historical and contemporary/subjective perspective to demonstrate how points-of-view can be interpreted through different temporal lenses. In this section, however, it is important to elaborate on the climatic crises that are currently unfolding in the Arctic where many environmental changes are having global repercussions.

The Arctic region is warming at approximately three times faster than the rest of the globe (Fig.3.2) according to a recent report by the Arctic Monitoring and Assessment Programme (AMAP, 2021a). The consequences are extensive and include reduced sea ice, retreating glaciers, thawing permafrost, changing weather patterns, shifting sea currents, changes in the livelihoods of indigenous communities, a 'greening' of the Arctic where the tree line advances northward, and the advancement of human activities such as tourism and resource extraction Dodds and Nuttall, 2019; The Intergovernmental Panel on Climate Change (IPCC), 2019; Arctic Monitoring and Assessment Programme, 2021a; and Blunden and Arndt 2020). Some of these consequences are not confined to the Arctic but to the entire globe. For example, the melting of Greenland's ice sheet is expected to cause

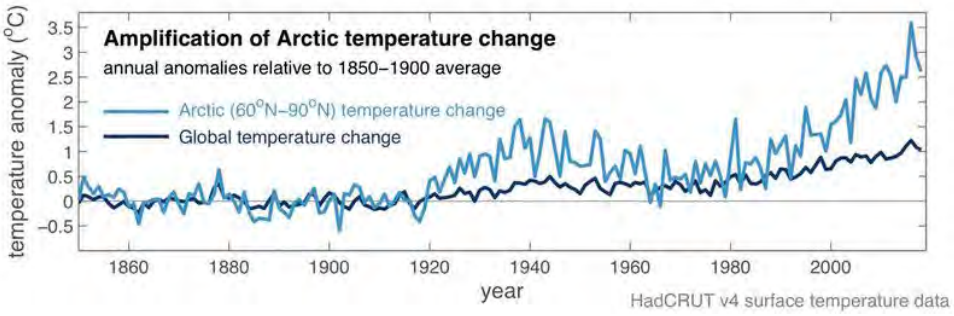


Fig.3.2. Graph showing Arctic temperature change compared with global temperature change over the same period of time. Source: Met. Office Hadley Centre.

global sea levels to rise by several metres (Scott, 2020). Such repercussions mean that changes in the Arctic are not only a spatial matter but concern material and temporal dimensions and scales.

I have compiled the following table (Table 3.1) to summarize the significant changes to environmental phenomena that are being experienced in a warming Arctic with consequences listed on a local and global scale of which the Northern hemisphere is particularly affected. The consequences are not restricted to environmental destruction and degradation but ripple through social, political and economic spheres.

Environmental phenomena	Local consequences	Global consequences
Thawing permafrost	• Infrastructure collapse and/or distortion of pipelines, buildings, roads etc. • Landslides and slope instability • Increase in coastal erosion • Relocation of Arctic communities	• Release of methane and carbon dioxide that contributes to global warming • Revival of viruses and bacteria e.g. in 2016 the release of Anthrax spores causing deaths of 1,200 reindeer in Siberia.
Melting glaciers	• Reduced availability of drinking water • Reduction in water for Hydroelectric power • Reduction of cool water in streams which affect some fish and insect species • Long term: drought	• Rising sea levels • Change in sea currents e.g. weakening of the gulf stream
Declining Sea ice[3]	• Increased coastal erosion • Change in marine ecosystems • Limited migration of land-based mammals e.g. polar bears	• Increase in sea transport across the Arctic • Greater access to oil and gas in Arctic oceans.
Wildfires	• Destruction of permafrost • Destruction of habitats • Migration and displacement of people and fauna	• Release of carbon dioxide into the atmosphere that contributes to global warming
'Greening of the Arctic [4]	• Plant migration e.g. woody plant species • Shifts in marine food webs • Increase in wildfires	• Increase in global warming [5]

Table 3.1. A list of environmental phenomena with local and global consequences.

3 Overland et al. (2018) claim that the volume of Arctic sea ice (September measurements) has reduced by 75% since 1979 while sea ice thickness has reduced by 60%.

4 There are also more recent concerns on the 'browning' of the Arctic resulting in dying and stressed vegetation. One major cause that has been identified is 'abrupt periods of extreme warming in winter, during which plants prepare for spring, only to be caught off guard by plummeting temperatures later' (Friedrich, 2018). See also Phoenix and Bjerke (2016).

5 More vegetation means more heat/light is absorbed rather than reflected back into the atmosphere leading to lower albedo levels thus leading to accelerated warming. A short report on the website of National Snow and Ice Data Center (2022) states that 'even though more growing plants in the Arctic will consume more carbon dioxide, they probably will not absorb enough of the greenhouse gas to offset other consequences of warming conditions in the region. A greener Arctic will not necessarily mean a cooler climate'.

The accelerated warming of the Arctic continues on an upward trajectory that is regularly illustrated in graphs by climate scientists. There is much discussion on earth systems heading towards a threshold often referred to as 'tipping points'. Environmental correspondent with *The Guardian* Fiona Harvey explains that 'Climate tipping points occur when a natural system, such as the polar ice cap, undergoes sudden or overwhelming change that has a profound effect on surrounding ecosystems, often irreversible' (2016). Oran Young, professor of Environmental Science and Management, outlines some of the features of tipping points. He claims that firstly, they are hard to anticipate, secondly, small alterations in a system can trigger large changes, and thirdly periods of turbulence follow tipping points (2012). There is, however, a point of no return that occurs when a tipping point crosses a threshold where change is irreversible. This is called a 'regime shift'. In 2016 the Arctic Council published a report outlining nineteen documented and potential 'regime shifts' in the Arctic that concerns marine, freshwater and terrestrial ecosystems. In the report some of the 'regime shifts' that are discussed include a shift to ice-free summers in the Arctic, landscape changing from tundra to boreal forest or to steppe, and the collapse of some Arctic fisheries.

3.1.3 Arctic island coasts

Many of these changes in the Arctic are explicit and clearly visual. Professor of geopolitics Klaus Dodds and anthropologist Mark Nuttall observe that in the Arctic:

> We can see and measure such loss and retreat of ice— and capture it through photography, film, and remote sensing— perhaps more easily than we can detect and visualize the effects of climate change in other parts of the world, such as assessing the increases in water stress and excessive heat in other environments (2019: 160).

In some ways the Arctic islands in this study exemplify the direct consequences of a warming climate. They reflect multiple environmental, climatic and political changes that have begun to unfold prominently in the Arctic in recent years thus laying bare complex connections between local, regional and global spheres. There are numerous other examples from Greenland, Northern Canada and Alaska that demonstrate the unfolding effects of a warming climate in these Arctic regions. Two of these studies are discussed in my second publication *Shifting coasts: Developing New Coastal Concepts* (Tynan, in press).

Many of the environmental changes that are being reported in high Arctic regions are located along coastal areas. In the Svalbard archipelago, of which the islands of Bjørnøya and Hopen are a part, it is along these coasts that people have chosen

to inhabit over centuries. To begin to appreciate the importance of coasts in this archipelago a record of heritage sites mapped in Fig.3.3 illustrate the close connection between land and sea in these areas. These sites were used, according to Polar heritage expert Susan Barr, because these were the most accessible parts of the islands (2004). Further inland, on the larger islands of the archipelago, one encounters mountains and glaciers. Jan Mayen, which is not a part of Svalbard shares the same pattern of heritage site locations that are dotted along its coasts. A current Norwegian research project called Cultcoast[6], examines cultural heritage sites, environments and landscapes along a selection of Arctic coastal areas. In this project, researchers are finding methods for monitoring and managing sites exposed to climate change and threats of development. They claim that 'Arctic areas act as a sensor and an early warning-system for the rest of the world' (Norsk Institutt for Kulturminneforskning, 2019). In an article relating to the research project the researchers emphasise that 'Arctic areas have become important hot spots for studying the effects of a changing climate, which is felt earlier there than elsewhere

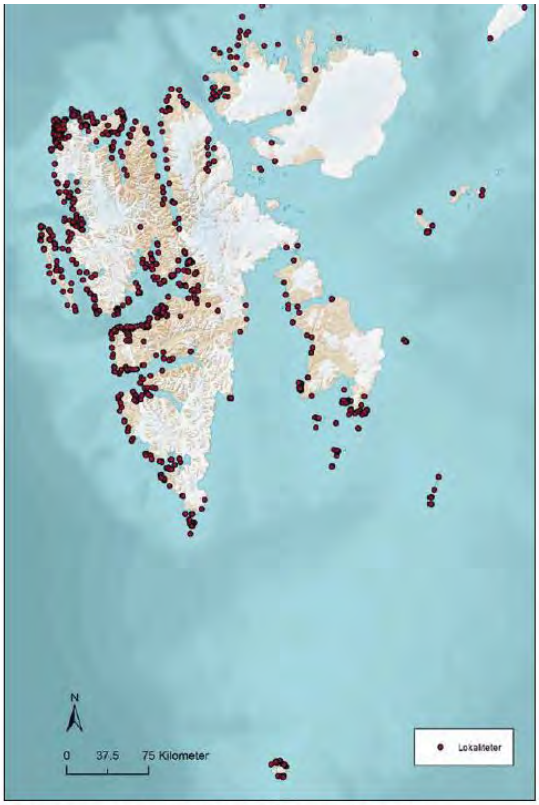


Fig.3.3. Map showing the locations of recorded heritage sites on Svalbard (including the islands of Bjørnøya and Hopen. These sites are predominantly located along coastal areas. Source: Sysselmesteren(Governor), Svalbard.

6 This research project (2019-2023) is run and organised by NIKU (Norsk Institutt for Kulturminneforskning), a Norwegian institute for cultural heritage research. https://www.niku.no/en/prosjekter/cultcoast/.

on Earth' (Nicu, 2020). The main threats to Arctic coastal heritage sites, according to these researchers include natural causes (erosion and burial) and pressure from Arctic tourism. Another cause for alarm, raised in an earlier research study, is the degradation of wood caused by increased fungal growth brought about by, what the researchers, claim the 'probable enhancing effects [of] climate change (Flyen et al., 2020).

In this thesis, I draw attention to some of the heritage sites that are located along the coasts of Jan Mayen, Bjørnøya and Hopen. There are two main reasons for including these sites in the study. Firstly, they are a means of telling stories about the coasts of these islands. As the following sections will explain, these sites were established for specific purposes relating primarily to the exploitation of natural resources and scientific endeavours. Secondly, these sites are materially very rich and varied. As this research is focussed on materials and time, these sites offer connections to the past whilst revealing how they have unfolded over time. The materials that can be found on these sites today are composed of natural materials such as rock and low growing vegetation, as well as mixes of alien materials to the island such as wood, glass, metals, ceramics etc. Over the course of time these have been conditioned by natural and anthropogenic forces and some materials have slowly started to blend into their locations. These sites, therefore, offer fascinating material agglomerations that deserve careful consideration on how they will evolve in a warming future.

3.2 ARCTIC ISLANDS: AN INTRODUCTION

In this section I will provide a brief description of the three islands of Jan Mayen, Bjørnøya and Hopen, that lie at the heart of this study. All of the islands are Norwegian and are located in the High Arctic regions of the Arctic. For each I will present the island's main geographical features, the more prominent flora and fauna, history and present-day use of the islands. The section will conclude with a brief summary on some of the common aspects and characteristics that the three islands share.

3.2.1 Jan Mayen

Jan Mayen (71°N, 8° 30' W) is the largest of the three islands in this study. The island is located in the North Atlantic Ocean and encompasses an area of 364km². It lies 550km to the north of Iceland and 500km to the east of Greenland. The island sits on the mid-Atlantic Ridge that separates the North American from the Eurasian Plate. This means that the island is exposed to tectonic activity resulting in frequent earthquakes and occasional volcanic activity from its prominent mountain called Beerenberg (Fig.3.4).

The first recorded eruption from Beerenberg was in 1732 and the most recent volcanic activity, although weak, was in 1985 (Birkenmajer, 2004)[7]. The island is composed primarily of volcanic rock and sand giving burnt tones of red, brown and grey material (Fig.3.5). Glaciers flank Beerenberg[8] and account for 30% of the island's area.

Jan Mayen may be roughly divided into three sections–nord Jan (North Jan Mayen), midt Jan (middle Jan Mayen) and sør Jan (south Jan Mayen). The

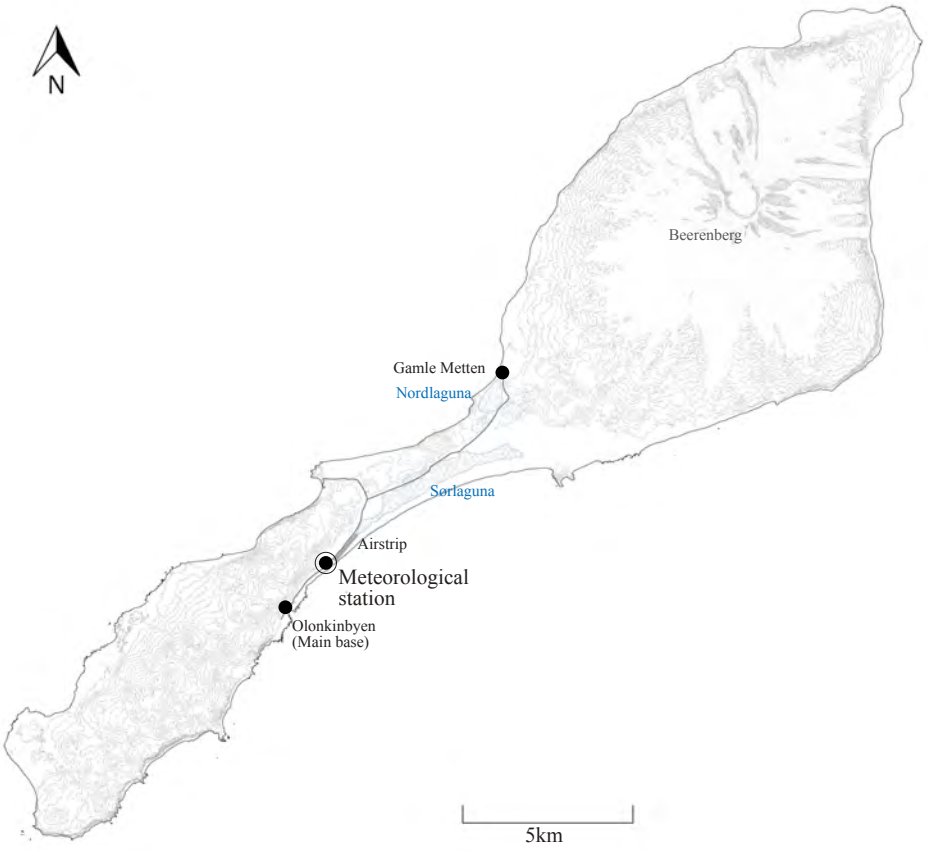


Fig.3.4. Map of Jan Mayen. American philanthropist, Bettie Fleischmann Holmes, who visited the island in 1906 described the shape of the island as 'a large spoon, with Beerenberg forming the bowl' (1907:112). Base map (contours, roads, island outline) sourced from geonorge.no. Map edited with placenames and scalebar added by author

7 The last significant eruption occurred in September 1970 when smoke and steam spewed 10,000m into the air. The eruption resulted in a 'new coastal platform at least 500m wide and 3.5km long' to the Northeast of the island (Gjelsvik, 1971).

8 Beerenberg (meaning Bear Mountain) is a 2,277m high dormant volcano occupying the Northeast part of Jan Mayen. Several glaciers surround the volcano.

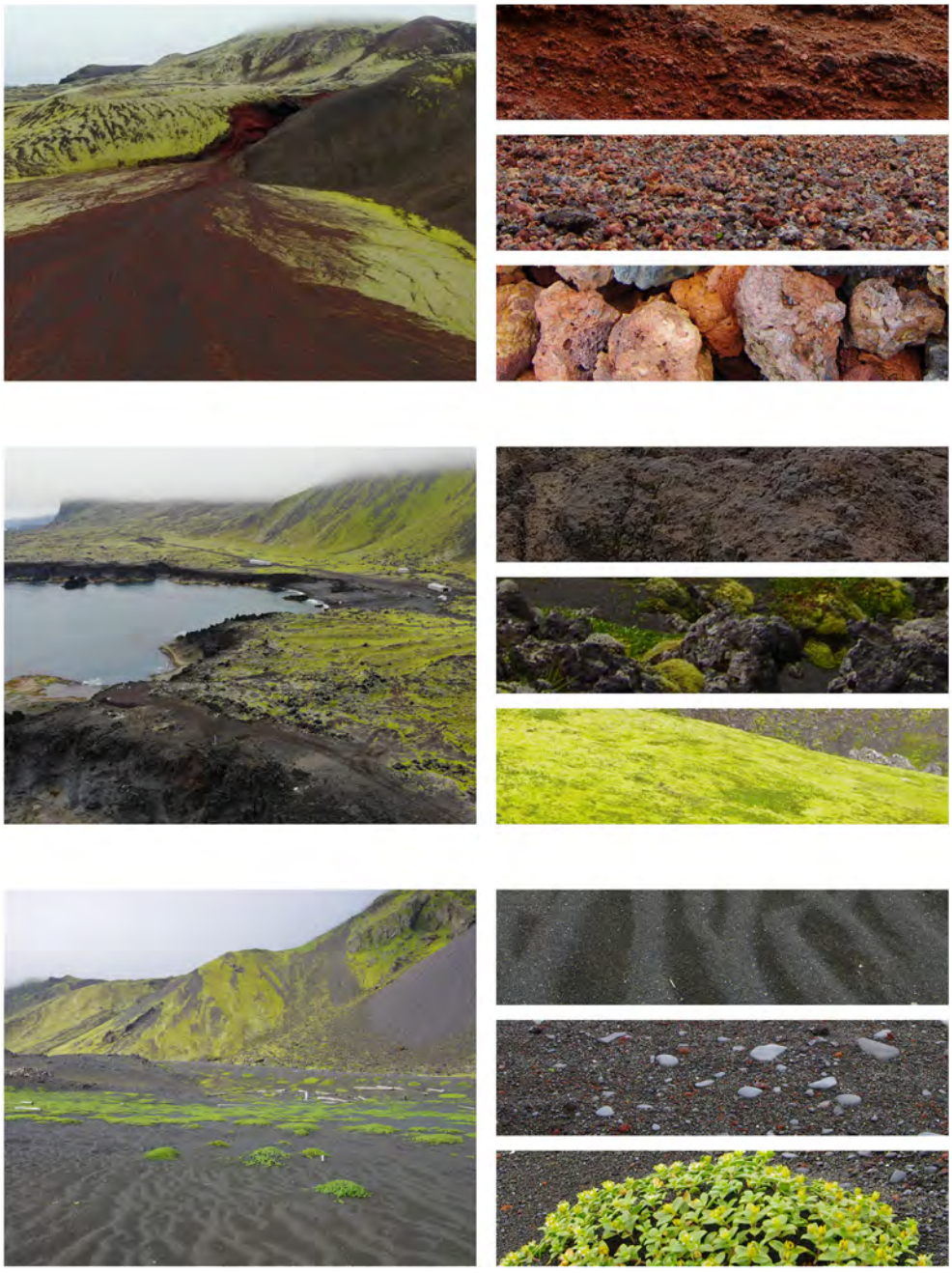


Fig.3.5. The multitude of colours from volcanic material across Jan Mayen. ‘The vivid green coloring of the mosses with which they are covered, contrasting with the varying shades of brown and terra-cotta of the strata of rock and lava, makes the rugged, steep cliffs of the shoreline exceedingly picturesque’ (Fleischmann Holmes,1907:112). Source: photograph by Eimear Tynan. Permission to reuse must be obtained from the rightsholder.

north part chiefly belongs to Beerenberg while the south part has a more gently undulating topography. The middle part, where my research is principally based, is a narrow, low-lying area connecting the north and south of the island. Two lagoons, one small one to the Northwest side (Nordlaguna) and a much larger one to the southeast (Sørlaguna), are prominent features in midt Jan. Sørlaguna dries out in the summer months leaving a large, flat expanse of dark brown volcanic sand. Human activity is mainly confined to midt Jan where the main settlement of Olinkinbyen is located. This will be elaborated upon later in this section.

There is no harbour on the island which makes landing by boat quite cumbersome.[9] Larger sea vessels anchor near the island and passengers are couriered to the island by smaller boats. The sea conditions around Jan Mayen are notoriously difficult. The bathymetry around the island varies significantly. A shallower seabed lies to the east, south and west of the island where the sea bed does not exceed 200m. However the seabed to the north plummets to depths of 2,000m in what is known as the Jan Mayen Fracture Zone.[10] There is a landing strip on the island, situated to the south of Sørlaguna. This is operated by the Norwegian Defence Force and is not used by commercial aircraft. The landing strip is composed of crushed volcanic stone.

Despite its Arctic position and lying to the East of Greenland, the climate of Jan Mayen is relatively mild. During the winter months average temperatures are around -5°C and summer temperatures 4.5°C. The relative humidity on the island is high with low cloud and fog common to the island. Vegetation on the island consists of low growing plant species such as the dwarf-shrub *Salix herbacea*, grass and saxifraga species, mountain sorrel (*Oxyria digyna*) and starwort Mouse-ear (*Cerastium cerastoides*).[11] With regard to animals on the island, the Arctic fox which was once common on the island was driven to extinction by intensive hunting on the island over centuries. Polar bears that frequently visited the island, by travelling on drift ice from eastern Greenland, have not been observed on the island for years due to the lack of sea ice reaching the island. Fauna on the island is mostly characterised by bird life including the Northern Fulmar, kittiwakes, guillemots, puffins and Little auks.

In relation to the history of the island, it is believed that Jan Mayen was first

9 Permission is required prior to coming ashore. The policing district of Nordland, located on mainland Norway, has administrative responsibility over the island.
10 The Norwegian marine mapping agency Mareano has an interactive mapping service where one can explore Norwegian territorial waters: http://www.mareano.no/kart/mareano.html#maps/6127.
11 Further information on Jan Mayen's vegetation may be found in Lid (1964) and Kapfer et al. (2012).

referred to and perhaps discovered during the voyages of the Irish monk, St. Brendan, in the 6th century. Later, it is likely that the Vikings visited the island. There are suggestions that they called it Svalbard (meaning White Mountain) which would plausibly refer to the dominant Beerenberg to the north of the island.[12] However, no traces from the Irish monks or the Vikings have been found on the island to date. Later, during the early 17th century the island rose to prominence with the arrival of English and Dutch whalers and explorers. Jan Mayen was bestowed its name from the Dutch whaler, Jan Jacobszoon May van Schellinkhout, in 1614.[13]

Whale hunting in and around Jan Mayen and Svalbard began in 1612. The motivation behind this was to support Europe's growing population and economies. Whales were hunted for oil which was used for oil lamps, soap manufacturing and the preparation of leather and textiles (Prestvold, 2016). Whaling was an activity that required a base on land (Fig.3.6). When the whales were hunted, from boats, at sea they were towed onto land. They blubber was boiled up and after the oil was cooled, was poured into barrels and exported from the islands (Arlov, 1994). There was a constant co-dependence between land and sea during the entire whaling

Fig.3.6. An engraving from 1744 by John Churchill showing whaling activity around Jan Mayen with Beerenberg volcano towering over whaling activities. It demonstrates firstly the coordinated nature of whale hunting that required huge resources (manpower and technology), and secondly it depended on a nearby base to land and process the whales underlining the importance of and reliance on Arctic coasts during the period. Source: Forbes and Clarke Collections.

12 Although Svalbard is nowadays associated with another island group to the east of Jan Mayen, historians believe that it was likely that Vikings were referring to Jan Mayen (Barr, 1987).
13 Jan Jacobsz May of Schellinkhout was captain of the ship the *Gouden Cath* as part of an exploratory expedition for the Dutch Noordsche Compagnie (Hacquebord, 2004).

operation. On Jan Mayen it is believed that, at its peak, up to 1,000 men were stationed on the island during the summer months.

As successive fleets of whalers and Arctic explorers visited the island it underwent many name changes particularly during the early 17th century. The names included Trinity Island[14], Isabella[15], Sir Thomas Smith Island[16], Mauritius[17] and Margafter. Cartographic archives from this time attest to these changing names. The Dutch had predominant presence on the island during the early half of the 17th century. Conditions on the island were very tough as hunting did not always provide reliable and regular sources of food and scurvy presented serious problems. During the first Dutch overwintering in 1633-34, for example, all seven men died. It is believed that they died from scurvy and/or trichinosis[18] (Barr, 2015).

When whaling activity came to an end in the middle of the 17th century there were less visitors to the island.[19] Activity on the island remained quiet until the 19th century. During the first International Polar Year[20], 1882-1883, an Austro-Hungarian group of fourteen scientists stayed on the island for thirteen months (Fig.3.7). Their preparations for the trip were thorough considering they had to take everything with them including materials to build comfortable lodgings as well as food to last at least one year. The buildings that they constructed had curved roofs allowing the wind and snow to sweep over them.

Some of the tasks undertaken during the trip included weather observations, recording the aurora borealis (Fig.3.9) and magnetic readings although this proved problematic on this volcanic island. The team also mapped the island to a scale of 1:100,000 and this remained the most detailed and accurate map until 1958 when the Norwegian Polar Institute published its first map of the island.

14 Trinity Island was named by whalers from Hull. This expedition is thought to be have been undertaken by Thomas Marmaduke in 1611 or 1612 (Hacquebord, 2004; Wordie, 1922).
15 Englishman, John Clarke, called the island *Isabella*, in 1614. The main purpose of the expedition was for whaling (Barr, 2015).
16 Another Englishman, Robert Fotherby, believing the island was a new discovery, called it Sir Thomas Smith's Island in 1615.
17 A Dutch whaling expedition in 1615, lead by Kerckhoff, named the island Mauritius or St. Maurice, in honour of Prince Maurice of Nassau (King and Jennings, 1939).
18 A deficiency of vitamin C causes the disease scurvy. Later in the 17th century, on Jan Mayen, there are references to hunters eating Scurvy Grass (*Cochlearia officinalis*) to help fend off the disease. Trichinosis is a parasitic disease caused by eating uncooked polar bear meat. Many polar bears carry the *trichinella* worm. It is known that the men who died on Jan Mayen ate several polar bears and a dog (Barr, 2015).
19 Whaling activity on and around Jan Mayen lasted from 1614 to 1646 (Barr, 2015).
20 An International Polar Year (IPY) is when international groups of researchers, mainly scientists, conduct research in polar regions. To date there have been four IPY: 1882-83 involving 11 nations; 1932-33 involving 40 nations; 1957-1958 involving 67 nations; and 2007-08 involving 63 nations.

Fig.3.7. A photograph of the Austro-Hungarian camp on Jan Mayen. Photo date 1880-1883. Source and copyright: Norwegian Polar Institute. Permission to reuse must be obtained from the rightsholder.

The early 20th century brought numerous groups of Norwegian trappers to Jan Mayen.[21] Fox trappers established themselves across the island. There was a main base which took the form of a cabin or hut and this provided the largest living quarters. Then, there were satellite huts or secondary bases around the island which were usually situated one and two days walk away from the main base. After decades of trapping on Jan Mayen, fox populations (blue and white foxes) steadily declined because of continuous and unsustainable hunting practices. Eventually the populations were entirely wiped out due to over-exploitation.

A huge shift took place on the island in 1920 when a telegraph weather station was established on the island. This marked the beginning of continuous weather observations on the island that have continued to last until the present day (Fig.3.8). A number of weather stations were built on the island at different locations. The following table lists the different stations and the years for which they operated.

21 The first overwintering by Norwegian trappers took place 1906-07 on Jan Mayen. They used the mostly derelict buildings from the Austro-Hungarian IPY expedition. They had a successful season on the island. However, when the men were picked up from the island to return home the shipping vessel was shipwrecked off the coast of Iceland and 14 of the 15 men on board died (Barr, 2015).

Name of station	Years in operation
Eldste Metten	1921-1940
Jøssingdalen	1941-1946
'Atlantic City'	1943-1945
Gamle Metten	1946-1962
Metten	1962-Present

Table 3.2. A list of the different meteorological stations that were in operation on the Jan Mayen since 1921.

On the 8th May 1929 Jan Mayen was placed under the sovereignty of the Norwegian State by Royal Decree. Up to this point Jan Mayen was regarded as a no-man's-land. In 1959 a LORAN (LOng-RAnge Navigation) station was established to serve civilian and military aircraft and ships. Although this has since been decommissioned the Norwegian Defence Force continues to have a base on the island located at Olonkinbyen, 3km to the south of the weather station. The base is used to house the meteorological staff too. Today, the island has a temporary population of around 25 people with four of those employed to run the meteorological station. Various researchers, chiefly concerned with earth sciences, regularly visit the island to conduct work.

Fig.3.8. Aerial view of Jan Mayen's meteorological station. Beerenberg volcano is located in the background. The island's airstrip is located in front of the station. Source: drone photograph by Eimear Tynan, 08th August 2018. Permission to reuse must be obtained from the rightsholder.

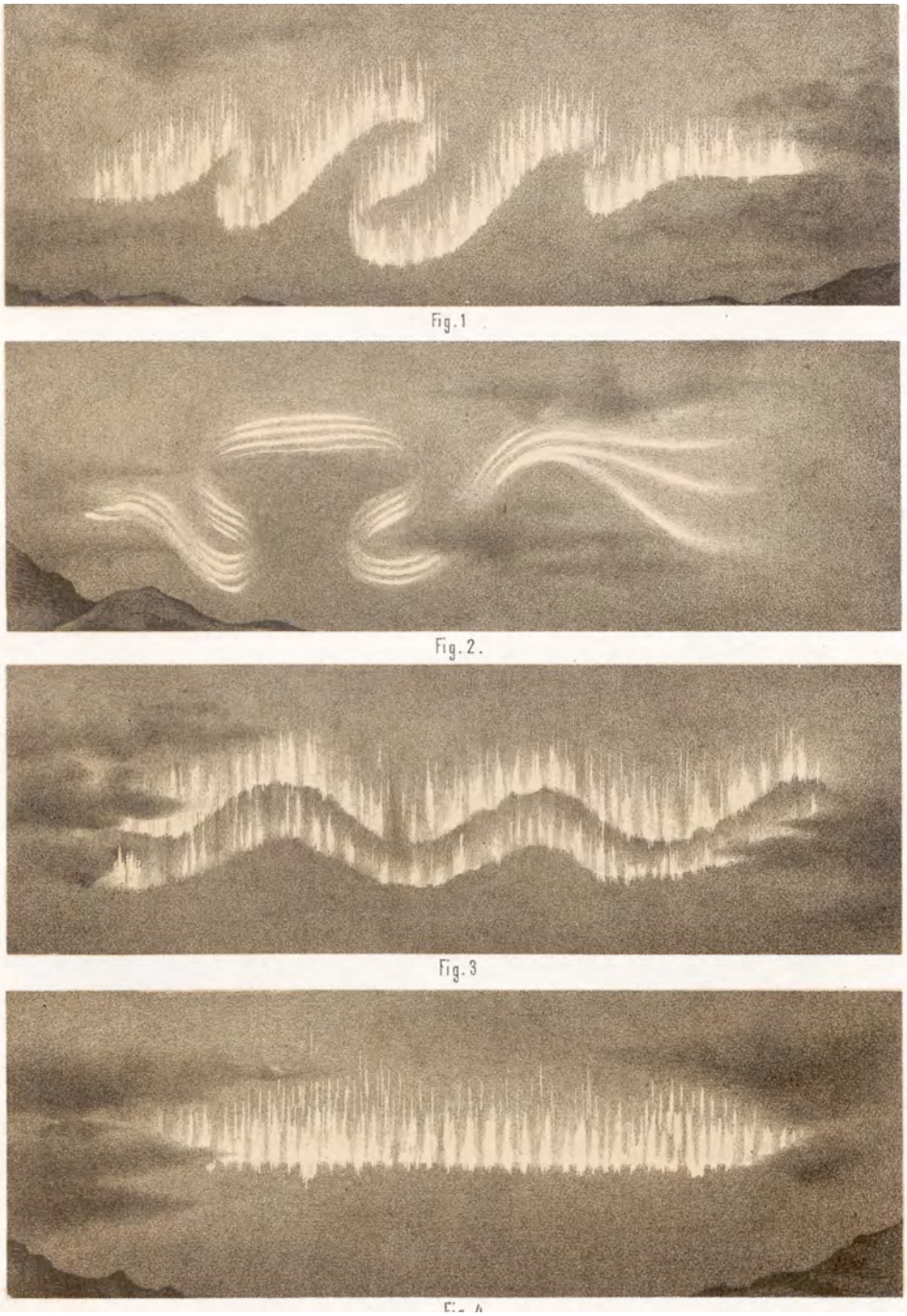


Fig.3.9. A small selection of sketches and illustrations of the aurora borealis observed during the International Polar Year 1882-1883 on Jan Mayen. The images on the right were part of a large series of sketches detailing the different types of Aurora (Wohlgemuth,1886).

3.2.2 Bjørnøya (trans. Bear Island)

The second island of this research is Bjørnøya (74° 26'N, 19° 02'E). The island is a part of the extensive Svalbard archipelago in the Norwegian Arctic and the closest island of the archipelago to mainland Norway. It is a small island in the Barents Sea with an area of 178km². Its shape is roughly triangular with the pointed end to the south (Fig.3.11). The northern part of the island is relatively flat and measures 15km at its widest points. The terrain is mostly rocky and pock-marked with numerous small lakes[22]. The island rises towards a small collection of mountains in the southeast of the islands with its highest peak, Miseryfjell, at 536m. The southern tip of the island, lying 20km from the north coast, is composed of jagged cliffs of up to 400m in height. These undisturbed cliffs provide a rich habitat for bird colonies.

Bjørnøya may be accessed by boat or helicopter.[23] A small pier lies adjacent to the meteorological station along the north coast of the island (Fig.3.10). This is only suitable for small boats. The Norwegian coastguard vessels, that provide transportation of people and goods to and from the island, must anchor offshore and deploy smaller boats to reach the island. There are numerous small beaches around the island that may be reached by smaller boats. The island can also be reached by helicopter. A helipad and fuel tank is located beside the meteorological station. Helicopters arriving to the island are used to transport some researchers carrying out fieldwork on the island and in other instances for emergencies particularly relating to accidents on shipping vessels in the Barents Sea area.

Fig.3.10. The coastguard vessel called 'sjøbjørn' (transl. sea bear) arriving at Bjørnøya's harbour. These smaller vessels are used to take people and goods to the island from the larger Coastguard Vessel that remains offshore in deeper waters. Source: photograph by Eimear Tynan, 10th March 2019. Permission to reuse must be obtained from the rightsholder.

22 According to the Norwegian Polar Institute's online place name portal, there are over 700 lakes on Bjørnøya which amounts to over 10% of the total area of the island.
23 Permission is required to visit the island. It may be granted from the Norwegian Meteorological Institute and the Governor of Svalbard.

Fig.3.11. A map of Bjørnøya. Base map (countours, roads, island outline) sourced from geonorge.no. Map edited with added textures, line weights, placenames and scalebar by author.

Bjørnøya has a more diverse wildlife than Jan Mayen. Bird colonies flock in huge numbers to the cliffs located along the south of the island's coast. Bird species include the common guillemot, Brünnich's guillemot, black-legged kittiwake, northern fulmar and glaucous gull (Overrein et al., 2015a). The island became a nature reserve in 2002 to protect wildlife on the island. The Arctic fox is also present on the island but in very low numbers. Polar bears rarely visit the island these days due to the lack, or unsuitable quality, of sea ice to transport them to the island from the more northerly regions of the Arctic.[24] However, their presence was once an integral part of the identity of the island. In 2002, Bjørnøya became a nature reserve.

Bjørnøya has, historically, been a convenient stopping point for travellers journeying into the depths of the Arctic with its location roughly half-way between mainland Norway and Svalbard. Bjørnøya's name was first given by Dutch explorers Willem Barentz[25]and Jacob van Heemskerck in 1596.[26] Here is a rather gruesome description of how they named the island:

> The 12 of June in the morning, wee saw a white beare, which wee rowed after with our boate, thinking to cast a roape about her necke; but when we were neere her, shee was so great that we durst not doe it, but rowed backe again to our shippe to fetch more men and our armes, and so made to her againe with muskets, hargubushes, halbertes,and hatchets, John Cornellysons men comming also with their boate to helpe vs. And so beeing well furnished of men and weapons, wee rowed with both our boates vnto the beare, and fought with her while foure glasses were runne out, for our weapons could doe her litle hurt; and amongst the rest of the blowes that wee gaue her, one of our men stroke her into the backe with an axe, which stucke fast in her backe, and yet she swomme away with it; but wee rowed after her, and at last wee cut her head in sunder with an axe, wherewith she dyed; and then we brought her into John Cornelysons shippe, where wee fleaed her, and found her skinne to bee twelue foote long: which done, wee eate some of her flesh; but

24 Up until 2006 solid sea ice would build up around the island of Bjørnøya. After this time sea ice only reached the island in 2009, 2011, and 2013. During my visit to the island in March 2019 sea ice built up around the north of the island bringing with it a polar bear.
25 Willem Barentz (1550-1597) was also a cartographer and navigator.
26 Willem Barentz made three expeditions to the Arctic (1594, 1595, 1596) in search of a northeast passage in the hope of linking the Netherlands to china. On the final expedition Barentz named Spitzbergen (jagged mountain) and Bjørnøya. A passage to China was not achieved but these expeditions extended knowledge of the geography and conditions of the farthest-most areas of the Arctic at that time.

> wee brookt it not well. This island wee called the Beare Island (De Veer, 1876: 75-76).[27]

Bjørnøya, like Jan Mayen, inherited different names that reflected a succession of expedition leaders, expedition sponsors and the nations that attempted to claim the island as their own.[28] Fig.3.12 illustrates activity concerning hunting on land and sea around Bjørnøya in the 16th Century. In 1603, an English expedition led by Stephen Bennett named the island Cherie Island after Sir Francis Cherie, their merchant sponsor. During their short stay on the island they killed over one hundred walruses and returned the following year for more. Between 1603-1612 it is believed that eleven hunting expeditions visited the island resulting in the

Fig.3.12. An engraving showing much activity on and around the island of Bjørnøya in the 16th Century. Bjørnøya lies in the centre of the illustration. This scene demonstrates the huge interest in hunting (whales and polar bears) and a determination to conquer the North. In contrast, the region to the south (at the top left of the image labelled as land under 80 degrees) is shown as tamed and almost pastoral. The illustration also makes evident the status of islands and coasts as a base, refuge and new territory to claim. Early representations of the Arctic like this reasserted an image of the Arctic as being wild, untamed, uncivilized and a region that was open to exploitation and claim. The book *Arctic Discourses* (Ryall et al., 2010) provides a useful resource explaining some of the historical perceptions (imaginings and realities) of the Arctic. Source: Gerrit De Veer, 1598.

27 Gerrit de Veer was a Dutch officer who accompanied Willem Barentsz' on his second and third voyages of 1595 and 1596 to the Arctic.

28 Other place names were inspired by human and non-human activity on the islands, such as *Russehamna* (trans. Russian Bay) on the south east coast of Bjørnøya where Russians once had a trapping hut there. Alkeholmen (transl. Auk islet) and Måkeholmen (trans. Gull islet) reflect associations with bird species on islets along the south coast of Bjørnøya.

slaughter of approximately 3,000 walrus (Prestvold, 2015). Activity on the island increased substantially in the nineteenth century and brought walrus populations in this region of the Arctic to the edge of extinction (Gjertz and Wiig, 1994; Hacquebord, 2001). Traces from this era are still evident on the island today such as at Kvalrossfjære (transl. Walrus strand/beach) where walrus bones are still scattered across the shore (Fig.3.13). There was an increase in Norwegian visitors to the island during this period with some choosing to overwinter on the island mainly for fox-hunting purposes. There is an overlap of hunters and scientists visiting the island during the nineteenth and early twentieth century.[29]

The first scientific expedition took place in 1827 when the Norwegian geologist Balthazarn Mathias Keilhau travelled with a group of hunters to the island (Lønø, 1972; Hagenæs-Kjelldahl, 2006). During his short stay on Bjørnøya, Keilhau made diverse observations. He noted the presence of coal on the island[30], the presence of varied fossils and plant observations, the earth's magnetism, and estimated heights of the terrain (Drivenes and Jølle, 2004). In the twentieth century, hunting waned but scientific expeditions to the island continued.

Fig.3.13. Kvalrossfjære, Bjørnøya: the remains from the 18th and 19th century walrus hunting still evident along the shore today. Source: photograph by Eimear Tynan, 28th August 2016. Permission to reuse must be obtained from the rightsholder.

29 Norwegian hunting began in 1822-23 mainly for walrus. However, as this declined over the decades, fox hunting and whale hunting prevailed. A whaling station was established at Kvalrossbukta, Bjønøya but was only in operation from 1905 to 1908 (Barr and Strøm, 2004; Hagenæs-Kjelldahl, 2006).

30 Keilhau's notes refer to the presence of coal but this was not a discovery. Coal was known to be on Bjørnøya since the 1600s. In 1609, Englishman Jonas Poole (1566-1612) first made reference to coal on the island (Drivenes and Jølle, 2004; Hagenæs-Kjelldahl, 2006). In an earlier expedition to the island, in 1605, he discovered galena '…I found a Myne of Lead Ure, and digged up about thirtie pounds weight of it, which I brought into England' (from Purchas, 1625).

The establishment of a mining town, called Tunheim, to the northeast of the island was a significant enterprise that left a mark greater than any other activity on the island. Although lasting from only 1918-1925, the village comprised of 25 buildings (Fig.3.14). At its peak, 200 people lived and worked here and this was reduced to between 60-80 people during the winter months. Coinciding with the mining enterprise was the establishment of a meteorological station in 1918.[31]

Fig.3.14. A historical photograph of the coal mining village of Tunheim. The photograph was taken ca.1920-1930 Source: Svalbard Museum. This photograph has been cropped by the author.

On 9th February 1920 the Svalbard Treaty was signed in Versailles awarding Norway administration over Svalbard and Bjørnøya. In 1941 Tunheim and the weather station were destroyed by the British army to prevent German occupation of Bjørnøya.[32] After the war, in 1947, a new meteorological station was established on the north coast of the island, in the same area as it stands today.

The only ongoing activity that takes place on Bjørnøya today is weather observations at the meteorological station. Staff working at the station also make good use of six cabins that are located on different parts of the island. The cabins

31 The weather station was operated by the Geophysics Institute Tromsø and the Norwegian Meteorological Institute took it over in 1932.
32 The Germans, however, successfully established two weather stations on the island. An automatic station called *Kröte* and another station, *Taage*, occupied by two people (Dege, 2004).

are used for leisure while staff members go hiking or snow-mobiling. The cabins are equipped with beds, cooking equipment and stoves. I stayed at Tunheim and Teltvika cabins during my visit to the island (Fig.3.15). Visitors who come to Bjørnøya are predominantly researchers. Ornithological research takes place on the island almost every summer and is carried out by the Norwegian Polar Institute.

Fig.3.15. Aerial view of the cabin at Teltvika, Bjørnøya. The cabin is used by staff from the meteorological station and the occassional visitor to the island. Source: drone photograph by Eimear Tynan, 28th August 2018. Permission to reuse must be obtained from the rightsholder.

3.2.3 Hopen

Hopen is the northernmost island in this study situated at 76°33′N 25°7′E. It is located to the south east of the main group of islands in the Svalbard archipelago. The island is long and thin measuring 33km in length and just 2km at its widest point. It encompasses an area of just 46km^2. It is composed of a series of mountain plateaux intersected by passes (Fig.3.16). The highest mountain, Iversenfjellet, reaches a height of 370m (Fig. Fig.3.17). The meteorological station is located in the southern part of the island at a narrow pinch point.

Fig.3.16. A map of Hopen. Base map (countours and island outline) sourced from geonorge.no. Map edited with placenames and scalebar added by author

Fig.3.17. An aerial view of Hopen. Photograph courtesy of Ted Torfoss from the Norwegian Meteorological Institute. Photograph has been cropped by author. Permission to reuse must be obtained from the rightsholder.

The island may be reached by boat or helicopter.[33] Due to the absence of a harbour arriving by boat means that larger vessels must anchor out at sea and ferry passengers and goods in smaller boats (Fig.3.18). There are strong sea currents around the island and a lack of naturally sheltered harbours makes access more challenging. In the winter and spring months the island is locked in by ice and the only way of reaching the island is by helicopter. A helicopter pad and fuelling station are located beside the meteorological station.

With regard to wildlife, birds are most abundant on the island. Large areas of the coast are composed of cliffs making them ideal breeding sites for bird colonies. The most common birds on the island are black-legged kittiwakes, Brünnich's

33 Permission is required to visit Hopen. It must be granted from both the Norwegian Meteorological Institute and the Governor of Svalbard

guillemots and kittiwakes. Similar to Bjørnøya, there are very few Arctic foxes on the island. Hopen is perhaps most renowned in the Arctic for being an important site for polar bear migration and denning. According to the Norwegian Polar Institute, between the years 1983-2001 the island received 150 to 300 polar bear visits (Overrein et al., 2015b). However, the bears depend on sea ice to reach the island annually. The severe reduction in sea-ice, in recent years, has had an impact on the number of polar bears on the island. In recent years the number of bears visiting the island has varied substantially because of fluctuating ice conditions. Hopen became a designated nature reserve in 2003.

Fig.3.18. Accessing Hopen by boat. A tractor is used to ferry goods to and from the meteorological station. Source: photograph by Eimear Tynan, 19thAugust 2018. Permission to reuse must be obtained from the rightsholder.

Despite its remote location Hopen has a rich history. The first confirmed mention of Hopen dates to 1597 when a Dutch expedition sailed to the south of Svalbard and encountered this long, narrow island. They named it *Visch Eylandt* due to the large quantity of fish observed to the south of the island. Not long after this, in 1613, a whaling expedition lead by English explorer Thomas Marmaduke named the island Hope Island after his ship the "Hopewell" (Conway, 1906).[34] The island retained this name translating from English to Dutch and finally Norwegian to today's name *Hopen*.[35] Walrus hunting was the prevailing activity on and around the island from the seventeenth to the twentieth century. Many archaeological sites dotted along the coast are testament to these activities.

The first report of an over-wintering expedition took place in 1823-1824. There is scant information about this trip only that it was done in connection to a trip to Bjørnøya and Spitsbergen. Aside from walrus hunting, fox and bear hunting was also carried out on the island with a notable expedition in 1908-1909 and again

34 Hopen celebrated its 400 year anniversary in 2013.
35 On some historical maps Hopen was renamed. An English map (1868 by cartographer John Murray) labelled it Sea Horse island (meaning walrus)–an example of how the local resources influenced place naming at the time.

in 1923-24. Similar to the organisation on Jan Mayen for fox hunting purposes, a main hut was established with satellite huts built on other parts of the island for the hunters to use. Scientific research overlapped with these hunting endeavours dating back to the late nineteenth century. There are several accounts of expeditions failing to reach the island due to inclement conditions such as fog, drift ice, sea swells and strong sea currents. [36] Scientific expeditions that successfully landed on the island studied the island's geology, hydrology, topography (cartographic surveys), flora and fauna, and fisheries around the island's coast (Søreide, 1994). Under the Svalbard Treaty, Hopen, along with Bjørnøya and the remaining islands of the Svalbard archipelago came under Norwegian administration in 1920.

Hopen, like Bjørnøya and Jan Mayen, was of German interest during the Second World War for the location of a weather observation base. In fact, two stations were established on the island (Fig.3.19). The first, called 'Svartisen' was built in 1943-44 and located where today's meteorological station stands. Four men were based there. The second station, called 'Helhus' was in operation from 1944-45 (Dege, 2004). After the war ended, the meteorological station was operated by the Norwegian Marines from 1945 to 1947.

Fig.3.19. A weather balloon launch during the Second World War. Source: Svalbard Museum. Photograph by Permission to reuse must be obtained from the rightsholder.

In 1947 Hopen a thorough cartographic survey was carried out on the island by Thor Askheim and Hans Henies (Fig.3.20).Although the island had been mapped over the centuries this was the most accurate survey undertaken at that time.

36 In 1898, for example, the Swedish explorer and geologist Alfred Gabriel Nathorst could not land on the island due to difficult sea conditions. Later that year, however, a trip sponsored by Prince Albert of Monaco, collected fossils for Nathorst to study (Iversen, 1926). In 1920, Norwegian geologist Adolf Hoel could not land on the island because of fog and high sea swells.

Fig.3.20. A cartographic survey of Hopen. Thor Askheim and astronomer Hans Henies during their expedition to Hopen in 1947 to map and position the island. Source: Norwegian Polar Institute. Copyright of Thor Askheim. Permission to reuse must be obtained from the rightsholder.

On 1st July 1947 the Meteorological Institute took over operations and this is how it has remained up to today (Fig.3.21). There are four people based at the station for six month periods. One of the main scientific research that takes place on the island is in connection to polar bear research. Other research that takes place on the islands includes ornithology and aurora borealis observations.

Fig.3.21. Aerial view of Hopen's meteorological station. Source: drone photograph by Eimear Tynan, 19th August 2018. Permission to reuse must be obtained from the rightsholder.

3.2.4 Jan Mayen, Bjørnøya and Hopen: Conclusion

The description of each of the islands in this section reveals that there are several aspects that they all share. The islands are physically very diverse but there are many commonalities with regard to their historical and cultural fabric which I outlined in the introductory chapter and the literature review (section 2.2.1 on *islandsness*) of this exegesis. As a recap I wish to lay out five of the more

prominent threads that are common to Jan Mayen, Bjørnøya and Hopen.

Firstly, there is a meteorological station located on each of the islands. These were established at different times and in the case of Jan Mayen and Bjørnøya, the stations moved location from one part of the island to another. These stations, however, provide more services that just those connected to weather observations. There is a helicopter and fuel depot on Bjørnøya and Hopen, and an air base on Jan Mayen. The helicopter bases, in particular, are regarded as vital for search and rescue operations in the Barents Sea or a temporary stop for emergencies that may occur on shipping vessels in the area. Staff at Bjørnøya meteorological station are also responsible for announcing weather reports twice daily by radio. The reports, announced in Norwegian and English, are provided by the Norwegian Meteorological Institute who is responsible for weather forecasting. This is particularly useful to shipping vessels in this part of the Barents Sea area.

Secondly, there are no indigenous human populations or permanent populations on the islands. Instead, the islands have always been exposed to intermittent waves of human occupancy. Since the 17th century whalers, walrus and fox hunters, scientists, miners, and soldiers have visited these island shores, each leaving their mark. The only residents living on the islands are staff working at the weather stations and on Jan Mayen there are staff working for the Norwegian Defence Forces. People working on the islands are there for 6 months at a time and exchange twice a year. Apart from meteorologists working at the weather stations there are other workers including cooks, IT specialists and technicians who have skills to repair the buildings and machinery.

Thirdly, all three of the islands share histories of scientific research and this has continued to this day. There are no permanent researchers based on the islands but they come and go during different seasons and mostly during the summer months. Early scientific studies on the islands were mostly concerned with cartography and geology. Today, research is carried out on the islands which mostly relate to earth sciences. It is important to note that research not only takes place on land but in marine areas offshore too. This will be elaborated on in the next section of this chapter.

Fourthly, the islands have been designated as nature reserves which include a 12 nautical mile area around each island too. This protects terrestrial and marine ecosystems, heritage sites and special restriction zones at certain times of the year where birds are nesting. Vehicular movement on the islands is very strict and must adhere to approved tracks and routes. There is however, more flexibility when

snow scooters are used as they generally leave no trace.

Finally, the extraction and exploitation of local resources has featured on and around all of the islands. Whale, walrus and fox hunting proved detrimental to the local populations of the islands. Walrus populations in particular were driven to extinction around these islands. The dynamic relation between land and sea is an integral part of activities connected to these resources. They have left marks along the coasts that persist to this day. In the following section I will elaborate further on how local resources are again under threat around these islands with regard to petrochemical activities.

3.3 ARCTIC ISLANDS: EBBS AND FLOWS

The description of the three islands in the preceding sections brings to light their vibrant histories. Many activities that arrived over the centuries in different waves such as the hunting of whales, walrus and fox were common to all of the islands. It is clear that the resources around and on the islands were key drivers of activity and human presence there. Another important point was the strong relation between sea and land particularly with regard to whale and walrus hunting as well as the import and export of materials to the islands. The establishment of meteorological stations brought a certain sense of stability to the islands with regard to their consistent presence and one that does not depend on extraction or exploitation of the local resources. However, with drastic environmental changes unfolding across the Arctic especially concerning the reduction of sea ice, the Arctic is increasingly open for different types of resource extraction together with a range of associated activities. In this section I will firstly outline some of the concerning activities developing on and around the islands at this moment in time. Secondly, I will describe how different materials, associated with different activities, influence the compositions of these island coasts.

3.3.1 Island resources: a return to the sea

Jan Mayen, Bjørnøya and Hopen are "protected" with nature reserve status. This extends to a 12 nautical mile (22.2km) area around each of the islands which means that both the land and sea around the islands are protected. However, the Norwegian government's interests in extending its oil and gas extraction in the Barents Sea give cause for concern for two reasons. Firstly, the opening up of oil and gas licences in the Barents Sea is steadily moving northward towards the island of Bjørnøya as shown in Fig.3.22.[37] In 2020 the Norwegian government announced

37 This is discussed further in my fourth publication *Temporal Perspectives on Arctic Peripheries* (under review).

its 25th License Round that included 136 proposed oil exploration blocks half of which were north of the 73°N parallel. If extraction eventually takes place in these areas the consequences will be significant and potentially destructive. Not only will marine life be disrupted in the area with drilling exercises and increased marine traffic but birdlife will be impacted upon too. In a worst-case scenario of an accident occurring, Bjørnøya could experience extensive environmental damage.[38] Apart from these concerns, the island itself could potentially be used as a helicopter base or a place for storage facilities to support the nearby oil/gas activity.

Fix.3.22 Map of oil and gas licences in Norway's marine territory. Source: Norwegian Petroleum Directorate. The light grey blocks in the grid indicate all production licenses and the dark grey indicates recently announced licenses. Labels indicating the islands of Jan Mayen, Bjørnøya and Hopen were added by author.

38 This very much depends on sea currents, wind direction and time of year. During the winter period when it is dark and conditions can be severe with wind, snow and ice, rescue and clean-up operations can be significantly hampered.

The second concern relating to the seas around these islands is the ongoing geological mapping of the ocean floor of Norway's marine territory for potential sub-sea mining.[39] Norway's extensive continental shelf[40] contains deep-sea deposits of copper, zinc, cobalt, gold, and silver. Some of these metals and minerals could facilitate production of battery technology, wind turbines and mobile telephones. The interest in resource mapping extends into Arctic areas and since 2011 the area to the northeast of Jan Mayen, along the northern part of the Mid-Atlantic Ridge, has been actively mapped.[41]

In 2008 researchers from the University of Bergen (Norway) identified a large hydrothermal field, rich in mineral deposits situated between Jan Mayen and Bjørnøya. It is called *Loki's Castle*[42] and is located 2,300m beneath the ocean's surface. Parallel to mapping the minerals in this area the researchers discovered microbes, which they named Lokiarchaeota, that appear to be specific to this habitat. The finding of *Loki's Castle* demonstrates that knowledge of very deep sea bed areas (Fig.3.23) in this part of the North Atlantic is far from complete. Researchers are slowly revealing how complex these marine habitats can be with regard to thermal vents, minerals, flora and fauna.

It is evident that interest in marine areas around Jan Mayen and Bjørnøya are heating up in more ways than one. Fredrik Søreide from the Norwegian University of Science and Technology believes that 'It is likely that the mining industry will move offshore eventually, the same way that the petroleum industry did' (The Norwegian University of Science and Technology, 2013). Questions then, inevitably, arise on the future of Jan Mayen, Bjørnøya, and to a lesser extent Hopen[43] (due to its very northerly location), if the Norwegian Petroleum Directorate continues to expand its interest in resource extraction. The protection status of the islands will mean very little if oil spills occur or ocean ecosystems are disrupted. It is also possible that the islands will become more intensively used as infrastructural bases to support researchers and extractive industries (Fig.3.24).

39 In 2019, a law permitting mineral activities (Havbunnsmineralloven) on the Norwegian Continental Shelf (NCS), was passed.
40 According to the Norwegian Petroleum Directorate (2021): 'The Norwegian continental shelf covers an area of more than two million square kilometres (2 039 951 km^2). This is almost six times the land area of mainland Norway, Svalbard and Jan Mayen'.
41 In 2011 and 2012 the Norwegian Petroleum Directive commissioned two seismic surveys over the southeast Barents Sea and the area south of Jan Mayen.
42 The field was named *Loki*, the Norse God of disguise and mischief because the field was difficult to find (The Norwegian University of Science and Technology, 2013)
43 A year before Hopen was designated a nature reserve in 2003, Norwegian Petroleum Group claimed licenses to bore on the southern tip of the island but these plans did not proceed due to the nature reserve status that followed (Senger et al. 2019).

This is merely speculative but it is possible that the islands will, like in the past, be important anchors to support sea-based resource extraction.

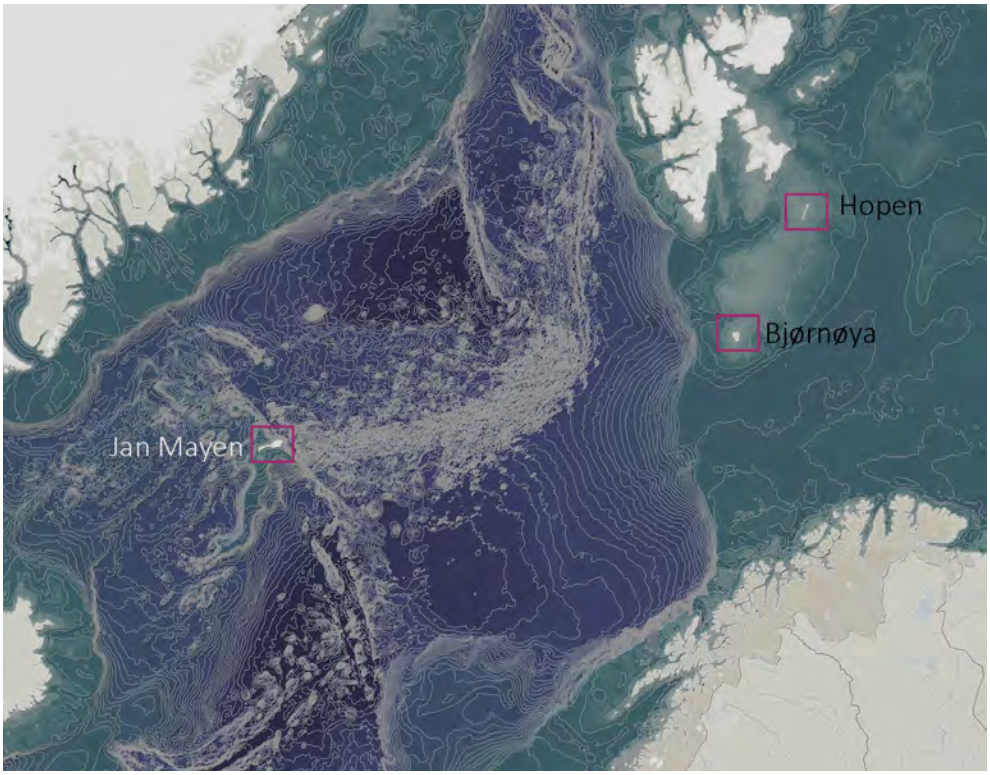


Fig.3.23. Map showing the dramatic bathymetry of North Atlantic and Barents Sea. The islands of Hopen, Bjørnøya and Jan Mayem are indicated by a pink box. Base map source: Mareano, 2013. Island names and boxes higlighting their location by author.

Fig.3.24. A speculative illustration of a petroleum plant on Jan Mayen. The image was published on Norway's national broadcast website (NRK) on 28 March 2011. Illustration by Bellona.

3.3.2 Arctic island coasts: Thresholds of material exchanges

The coasts of the islands in this study have revealed their vulnerabilities to environmental and anthropogenic changes. Along the coasts of Jan Mayen, Bjørnøya and Hopen there are sites strung out like beads that reveal different material compositions and conglomerations. Each of these beads are unique. They reflect site-specific conditions and processes of the coast and how they have interacted with different materials. I have paid much attention to historical sites in this study because they go some way to explaining how people have engaged and continue to engage with these coasts along with their associated activities.

One of the most explicit examples is the site of Tunheim and the adjacent harbour at Austervåg on Bjørnøya. This site features in my first publication *Arctic islands, Archival Exposures* (2020). The abandoned and destroyed coal-mining village of Tunheim connects to the Austervåg by a single railway track (Fig.3.25). The village is ghostlike with building rubble and shredded wooden planks piled up where buildings used to stand. At Tunheim there are domestic remains of glass

Fig.3.25. Aerial view of the what remains from the village of Tunheim. The former railway track links the village to the harbour at Austervåg. The footprint of the village is marked by a range of materials such as rusted metal, brick and wood. Patches of vegetation intersperse these materials. To the bottom right of the photograph is a particularly lush part of the site and the location of a former pig pen. The railways track remains as a very distinct line crossing this entire site with coal scattered on both sides of the track. Source: drone photograph by Eimear Tynan, 28th August 2018. Permission to reuse must be obtained from the rightsholder.

and ceramics and then there are metal fragments strewn throughout the site many of which were connected to the coal industry (Fig.3.26). The tones of colour are largely limited to grey, brown, orange and black. However, the site is interspersed with little colonies of plants that are huddled in sheltered locations. The scarcity of vegetation illustrates the harsh environment along this stretch of island coast. However, the presence of vegetation that has managed to establish is likely to stay and spread further. Climate reports forecast with certainty that Bjørnøya will become a lot warmer and precipitation will increase and fall as rain rather than snow. The ecologies of the islands are, as a result, expected to change too and sites like Tunheim will likely become greener. This prognosis requires a massive imaginary leap when one is standing on such a bare, exposed site on Bjørnøya today.

Fig.3.26. A range of materials at Tunheim.

Top left: Geological cores in a wooden frame; Top right: A mix of metal, brick and wood adjacent to an old building in the village; Bottom left: A deposit of red bricks scattered on the ground. The edges and corners of the bricks have softened over time; Right: A section of railway track with worn timber supports and rusted tracks highlighted by the black coal beneath.

Source: photograph by Eimear Tynan, 28th and 28th August 2018. Permission to reuse must be obtained from the rightsholder.

A second example that I wish to mention with regard to changing materials of Arctic coasts is along a stretch of coast on Jan Mayen. It is a long strand called Helenesanden that is approximately 1km in length and lies to the south of the island's air strip (Fig.3.27).

Fig.3.27. Aerial view over Helenesanden, Jan Mayen. Source: drone photograph by Eimear Tynan, 28th and 28th August 2018. Permission to reuse must be obtained from the rightsholder.

On approaching the strand it appears pristine with sharp clean contrasts between the black volcanic sand and the sudden bursts of white foam from the waves. However, I encountered a range of very interesting material collections as I walked along this strand. There were, what I would describe, as organic collections of sand, rock, driftwood[44] and vegetation. Then, there are natural and synthetic collections that featured a range of plastics such as bullet casings, pipes, fishing nets and buoys. Frayed plastic ropes were embedded in the sand as if they were growing there (Fig.3.28). According to staff working on the island there has been a marked increase in the amount of plastic debris washing up on Jan Mayen. Regular clean-ups are arranged to try to stem the large quantity. These are carried out by staff on the islands and the Norwegian Coastguard transports the waste to mainland Norway for processing.

44 Large quantities of driftwood from Siberia arrive onto the shores of Jan Mayen.

On all of the three islands in this study there are thousands of sea birds that nest and rest there. There are also rich fishing grounds around the islands. The growing presence of plastic in these environments makes birdlife and fish very vulnerable to plastic ingestion. A report that examined plastic debris on Svalbard found that discarded, lost, and abandoned fishing gear was most prevalent in many areas that were monitored (Arctic Monitoring and Assessment Programme, 2021b).

Fig.3.28. Some materials found along Helenesanden, Jan Mayen. Left: Seaweed clinging tightly to a rock; Right: Rope entangled in vegetation. Source: photograph by Eimear Tynan, 28th and 28th August 2018. Permission to reuse must be obtained from the rightsholder.

The two site examples that I have taken in this section briefly demonstrate the range of materials that are to be found on these Arctic islands. Materials that are found on historical sites are easily linked between former activity and the sites. However, random materials that wash ashore provide vague and usually unknown stories behind these materials. Instead, they are in some way approached differently as they assemble themselves onto the shore and attach to different materials that are more steadfast.

3.4 CONCLUSION

This chapter has sought to draw attention to a range of contexts associated with the Arctic islands in this research as well as providing descriptions of the islands themselves. There is a constant dialogue presented between the islands, the regions

to which they belong, and the larger global context. A theme running throughout this chapter is the present and forecasted consequences of climate change. This critically underpins how the Arctic may be defined in the future, how people will engage with it differently and how the materialities of island coasts are already changing. In order to appreciate the plurality of scales that are already playing out in high Arctic regions it has been necessary to read the islands in this study through their terrestrial, marine and atmospheric contexts. This helps to illustrate the complexities of change and the tightly woven relations that exist between land, sea and air.

CHAPTER 04 RESEARCH METHODS AND METHODOLOGIES

4.1 INTRODUCTION

Throughout this research, I have endeavoured to establish strong ties between research and design from my perspective as a landscape architect researching in the Arctic. I have used theories and philosophies from other disciplines to better inform how to practically work with my enquiries concerning materiality and time on the islands of Jan Mayen, Bjørnøya and Hopen. The methodological foundation to this research is 'research through design' which is an approach that promotes the application and practice of design methods as a mode of research enquiry. In this study, the methods chosen in this approach are driven by several research questions.

Embedded in this 'research through design' foundation I employ a range of qualitative methods and situate myself in different environments in order to expand temporal and material knowledge of selected Arctic-island coasts. The focus of this research is to explore different temporalities that are specifically inherent to Arctic coastal materials. Consequently, I have chosen to apply different methods that have the capacity to engage differently with materials thus revealing a range of temporalities. The methods that I describe in this chapter are commonly used in landscape architecture.

This chapter is divided into four sections. The first section describes the theoretical perspectives on how and why I have chosen specific ways of working with Arctic coastal sites. This involves an explanation of my 'research through design' approach and the qualitative aspects of this research which demands mixed methods and situated modes of practice. The second section explains the methodologies used in this study which critically appraises methodologies in landscape architecture research and practice. The third section describes the techniques and tools used in this multi-method research approach. Finally, the fourth section provides a conclusion to this chapter with brief reflections on methods used in this research and an elaboration on how time was practised throughout this research process.

4.1.1 Research *through* designing

There are several ways to integrate research and design in landscape architecture. Nijhuis and de Vries (2020) list four of these that are commonly adopted in

landscape architecture research.[1] These are 1) Research *for* design; 2) Research *on* design; 3) Research *through* design, and 4) Research *about* design. Landscape architect Martin Prominski points out that research *about* and *for* design operates from a distance whilst research through design 'is the type of research in which the act of designing is the essential component of the research' (2017:205). It is this category, research *through* design (RTD for the remainder of this section), that I identify most closely in my research approach.

However, I wish to extend the word 'design' to design*ing*' to put emphasis on the active and practical component of this type of research. Celia Lury, who has written extensively on interdisciplinary methodologies explains that words ending with –*ing* are 'active present tense forms that function as nouns' (Lury et al. 2018:3). The importance of this, for my research, is that by 'activating the present' as Lury calls it, there are two effects. Firstly, design moves from being a noun or a product of design to being a verb or a process of design (Lenzholzer et al., 2013). Secondly, time is recognised (active present tense) and given agency through the research process.

RTD stems from the work of Christopher Frayling who 'emphasised the importance of embodied knowledge generated in the creative process' (Schultz and van Etteger, 2017:191). It is an approach that engages with design whereby research and action generate new knowledge. For designers, RTD is possibly the most intriguing and interesting way to research, but it has also been regarded as the most difficult. The main difficulty has been in its recognition to qualify as "research" in academic environments. Deming and Swaffield (2011) for example maintain that 'design as an investigative strategy remains poorly understood and inconsistently applied, even if frequently invoked' (2011:205). In response to this, Lenzholzer et al. point out that 'as long as it [the research] is conducted according to academic standards, (it) can yield reliable and valuable design-relevant knowledge' (2017:61). Martin Prominski also addresses Deming and Swaffield's concerns of transferability and difficulties in evaluation. He takes a number of examples that he deems successful in demonstrating this RTD thus illustrating their validity and relevance for the progression of landscape architecture research (2016).

Prominski proceeds to highlight that rather than strictly categorise and separate research approaches into what he calls the trinity of research –research *about*

1 These categories have been written about by other authors too. Lenzholzer et al. (2013) for example, discuss three categories in which landscape research and design may be grouped. These are: research *on* design, research *for* design and research *through* design/ing. These are also taken up by van den Brink and Bruns (2014) and later by Lenzholzer, Duchhart and Brink (2017).

design, research *on* design and research *through* design–we should look towards all three having a role in a research project:

> In summary, all common research should include a research question and a reflection of the scientific context (in the language of design research: *research about design*), use appropriate methods (for example *research through design*), and advance and transfer knowledge (this could be understood as *research for design*) (Prominski, 2016:29)

Prominski certainly provides food for thought in his summary. In this study, I started out with a RTD approach. I have indeed reflected on the way in which time is expressed and practiced in landscape architecture in the second chapter of this exegesis. In this sense, there is an element of research *about* design integrated in to this study. The question on whether this research can be considered one that is *for* design is considered in the fifth chapter after I have put my theory and methods into practice.

Although research *about* and *for* design have been considered, RTD remains the most prominent of the 'trinity of research' for the following reasons. First, RTD allows methods that are already familiar to the designer to be used for research purposes. Backhaus et al. elaborate on this point stating that RTD 'elevates the design process from being the central working tool of a practitioner to becoming a research approach, one that employs several methods of continuous analysis and reflection'(2017:288). Although I share the general sentiment of this statement it must be added that the design process in research is not always the same in professional practice. I take my own example in this research whereby my design and research process are guided specifically by several research questions. In landscape architecture practice, the design process is guided by a design brief that is developed between client(s) and the designer i.e. a third party has a significant role to play in the outcome of the design process.

Secondly, there are no precedent studies from landscape architecture that I use in this research that help in answering my research questions. Although I use methods that are commonly and typically used in landscape architecture, their uses are very specific to Arctic coasts which will be described in more detail in the third section of this chapter. RTD is an approach that has an openness towards experimentation and process rather than outcome and therefore is fitting for this study. Finally, this study includes my subjective responses and reflections during in-situ research on the islands.[2] RTD allows for such inputs to be built into the research process unlike

2 These subjective responses to the coastal sites are included in the publications relating to this research in Tynan (2020 and 2021)

research *about* design for example. This, supported by non-representational theory, opens up an interaction and direct dialogue between the site and researcher. It helps in formally communicating other dimensions of knowledge building about a site where the researcher shares observations, thoughts and reflections. These elements of site knowledge are not often shared in landscape architecture research or practice.

4.1.2 Qualitative inquiry

Research *through* designing, explained in the previous section, provides an overall approach to the practice-based enquiry of this study. Within this approach I adopt a series of different methods that are qualitative. Qualitative methods, according to Britten and Fisher provide 'insights into processes as opposed to outcomes' (1993:271).[3] This resonates with landscape architect Rod Barnett's observation that 'designers are becoming more interested in means rather than ends'. He proposes a nonlinear model of landscape design 'which introduces uncertainty and indeterminacy into a design methodology' (2000: 31) that places emphasis on process and discovery rather than product and justification. This approach aligns well with what this research aims to achieve whereby the research is not bounded by restrictive or expected outcomes but more elastic and unending in its quest to open up the temporal qualities of materials I encounter along Arctic island coasts. According to Norman Denzin and Yvonna Lincoln:

> Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations including fieldnotes, interviews, conversations, photographs, recordings, and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world (2017:43).

This description aligns with the ambitions of this research where personal impressions and perspectives of Arctic coastal sites are shared through a series of different practices such as photography, fieldnotes and sound recording. Qualitative research also facilitates incorporating the more-than-human dimensions of Arctic environments in this study. Coastal materials are not approached as measurable objects. Instead, they are considered as dynamic components to coastal environments.

In the first chapter of this exegesis I introduced Non-representation Theory (NRT)

3 Although this source is aimed at medical general practitioners and social scientists, it is equally applicable to qualitative research in landscape architecture. This source has been previously used by Rekittke (2015) in his introduction to qualitative aspects of fieldwork research.

and briefly described how some geographers use this approach to underpin the processual and fluid qualities of landscape. In consideration of the qualitative aspects of NRT Tim Edensor et al. explain that:

> non-representational ideas focus on the emergent, fluid qualities of life, on the affective, sensory and emotional qualities that are rarely articulated – indeed may not be amenable to representation but are nevertheless integral to the ways in which space is experienced (2020:7).

Edensor et al. draw attention to the qualities and experience of place as I too have encountered along Arctic-island coasts. The challenges of representation are always present but in helping to overcome this I have applied a range of qualitative methods in an attempt to capture the specificities of these coasts but I acknowledge and concur with the above quotation that there are many qualities of a place that simply exceed representation.

4.1.3 Qualitative research: Arctic contexts and positions

In Norwegian High Arctic regions, there is a steady output of scientific research undertaken by international groups of researchers through remote and situated fieldwork. The research outputs, chiefly concerning earth sciences, are predominantly quantitative in nature.[4] This doctoral research examines change that is unfolding along Arctic-island coasts by taking a qualitative approach. Here, attention is given to situated accounts of these coasts by employing a range of different methods. Before I proceed to describing the qualitative positions of this research, I wish to outline a range of other qualitative studies that have been conducted more generally in Arctic regions.

A Norwegian research project called *Future North* was established between 2013 and 2017 by a group of researchers from the Oslo School of Architecture and Design (AHO).[5] According to the researchers, the project 'is founded in a conception of landscape as a shared material human experience, one that supplements the traditional conception of landscape as primarily an aesthetic category' (Hemmersam and Kampevold Larsen, 2018). The research project examines change across Arctic and sub-Arctic landscapes and operates on a number of scales ranging from subjective perspectives to regional scales. At the

4 A register of research conducted across the Svalbard archipelago may be found at a database called Research in Svalbard (RiS): https://www.researchinsvalbard.no/, here one can see the predominance of quantitative, scientific research undertaken in this region of the Arctic. On the website, accessed in November 2021, 4,097 research projects are listed and 13,209 publications. Under the research projects that are tagged 'design' less than one hundred appear and of these the majority relate to engineering and structures.

5 Information about the *Future North* research project may be found at this website: https://oculs.no/projects/future-north/about/. The research group also published a book on the project (Kampevold Larsen and Hemmersam, 2018).

University of Virginia, a more design-oriented research group called *Arctic Design group* have conducted work in Arctic and sub-Arctic regions, mainly in Alaska. The group works closely with students and uses design approaches to confront specific issues pertaining to Arctic environments. These two research examples share an approach that places emphasis on in-situ modes of enquiry. Furthermore, there is an openness in the framing of these research projects where discovery trumps expectation.

There are two positions that I wish to present in helping to establish and give direction to the qualitative approach of this research. The first relates to materiality. I return briefly to research outputs from scientific research in Svalbard where a common mode for communicating data is through numerical modes of representation. Air pollutants are measured in their parts per million, sea ice is measured in square kilometres, glaciers measured by weight (metric tonnes), area (square kilometres) and/or height (metres) etc. Through this form of communication and representation, information concerning the materiality of the Arctic tends to disappear behind thick swamps of numerical data. In this manner the tangible sense of how changing conditions influence the forms, textures, sounds and colours of materials is overlooked. In a sense, the vibrancy and agency of the more-than-human is hushed, but not necessarily silenced, whilst the experiential dimensions of data collection seldom form a part of a scientific paper.[6]

In an interview with landscape architect and architect Anuradha Mathur and Dilip Da Cunha, a question about working with data arises in relation to their teaching work. Mathur takes an example of a study undertaken in a desert region in India where there was no database to help the students. This did not concern her 'because it [the landscape] is not about topography. The landscape is all about material changes—sand, salty sand, sandy sand… They [the students] have to invent ways to construct the site. The conventions don't work…' (Bremner, 2019).

From my perspective, as a landscape architect and researcher working in the High Arctic, Mathur's observation that data does not necessarily provide the answers to the goals of a project rang true. My early expectations and desire to work with databases concerning maps and weather data did not prove to be helpful additions. There were digital maps available with scales and legends that failed to represent the coasts that I was researching. This is exemplified in my third publication *What time is this coast?* (Tynan, 2021) when I visited Bjørnøya in its winter attire. The printed map that I held in my hands, full of brown and blue hues, had hardly any resemblance to the island I was standing on. In addition to

6 There is a notable increase in scientists showing how they work in varying conditions in the Arctic through social media such as on Instagram, Twitter, and websites dedicated to specific research projects. These brief references to practicing research in the Arctic, however, rarely develop into academic qualitative research outputs.

cartographic disappointments, there were reams of climate data available that felt quite meaningless when I was battling the elements along these coasts. However, such climate data gives a much broader regional and global context with regard to understanding accelerated climate change.

The second point that I wish to raise with regard to qualitative research in this study concerns time. As I have previously mentioned research conducted in this region of the Arctic predominantly concerns the earth sciences. The temporal spectrums on which these quantitative studies operate are both linear and cyclical. With regard to linear time this could apply to observations of environmental change taking place over hours, days, months, years and decades. An example of cyclical time, meanwhile, includes the use of a timer where perhaps wind speed is measured hourly at a meteorological station. 'Clock time' is the universal language of data collection that is communicable across scientific disciplines including landscape architecture when one considers that almost every battery-operated instrument records the time when the data is recorded.

My research does not seek to pit qualitative time of landscape architecture against quantitative time of Arctic scientific research because from a landscape architecture perspective this would be foolish. The discipline has always mediated between the quantitative and qualitative aspects of a site. In addition, I would risk contradicting myself with the application of different methods that incorporate 'clock' time. Social theorist Barbara Adam also warns that 'assumptions are rarely questioned or held up for scrutiny, and the models [of time] seem invariably to be built on dichotomies that construct the time of other cultures in contradistinction to our own' (1994:516). However, in this study I invest in exploring qualitative expressions of time of coastal materials in the Arctic that exceed scientific measurement. I wish to look for relations between coastal materials, conditions, states, processes and my subjective interpretations and reflections.

4.1.4 Practice-based and situated enquiry

Situated and practice-based enquiry is a qualitative mode of working and researching that takes place in different locations in this study. This section will outline the role of situated enquiry and how it informs practice-based research. The following quotations demonstrate two interpretations that underpin some key points about situated enquiry.

First landscape planner and researcher Diedrich Bruns et al. claim that:

> Two things are specific to a designer's knowledge about a particular location… First, practitioner knowledge is defined as 'embodied', that is it is the knowing of what to do under particular circumstances. Second, the knowledge is situational, that is it is

> difficult to transfer to other places and situations, and also time (2017:11).

Architect and cultural geographer Anna Ryan observes that:

> ways of being in the world are equated with ways of knowing this same world. As I see it, all knowledge is situated knowledge: by virtue of our embodiment, the self is immersed within a fully three-dimensional world, thus all knowledge and understanding is grounded within this 'fact' (Ryan, 2016:54).

These descriptions place emphasis on *being* in a location, through immersion and embodiment. The knowledge that emerges, according to Bruns, is site-specific whereas Ryan expands this to a worldly sense of knowledge and understanding. Both authors illustrate how knowledge is generated through the mediated response of the subject and their location. In this research I account for my own subjective and situated accounts of the Arctic island coasts that I study. Parallel to this I demonstrate how different tools that I use also help in revealing different qualities of the materials I observe as well as exposing other temporalities of time that are difficult for my bodily senses to perceive.

Situated enquiry and knowledge-building is not only about the *where* but also the *when*. Time is infused in the ways in which we practice and learn about an environment. Visiting a site at different times can influence how researchers work with these sites and make decisions on how to practice. As well as this, the researcher also brings different thoughts and feelings to a site that may influence how practices are carried out. In a recent publication *Working with Time in Qualitative Research* the authors explore how time plays an integral role in research design and practice. They draw attention to 'the ways that our research choices are choices made in time' (Facer et al. 2022:9). They encourage researchers to work creatively with time whilst also being attentive to how different aspects of time play a role in how researchers practice.

My experience of working and teaching in Arctic environments at different times of the year has meant that the way in which I practice needs to adapt to different conditions. For example, working in freezing conditions when hours of daylight are very short curtails the longevity of some activities such as walking long distances or photographing the landscape. Such considerations came to the fore during this research and are elaborated upon in section 4.3 that details the methods that were chosen for this research as well as their temporal contributions to the study.

4.1.5 Mixed situated Methods

The previous sections emphasised the qualitative foundations to this research as

well as underlining the situated nature that is embedded throughout this study. These have influenced how the methods have been chosen as well as how they will be used and analysed. Fieldwork and the movement between different locations is a subject that has been written about by geographer Doreen Massey. She explains (2011) that fieldwork encompasses 'the cabinet' and 'the field' where the former is associated within a study or laboratory and the latter with outdoor explorations. She also claims that "the field" indicates immersion and "the cabinet" distance but that both of these "geographies of knowledge" are very much connected. This was taken up in my first publication *Arctic islands: Archival Exposures* (Tynan, 2020) where I explained different methods undertaken in different locations and how this incorporated different modes of researching. Transference from one 'geography of knowledge' to another brought with it different methods appropriate to different locations.

I explored a range of methods in different locations and situations on and about three Arctic islands. I have arranged these methods into a sequence of four phases which I have categorised in the table below in Table.4.1.

The first phase involves archival research that examines historical photographs and historical meteorological observations.[7] This phase was done in indoor environments as a mode of desk-top research.

The second phase involves in-situ fieldwork and it is here that a wide range of methods are applied, most of which are commonly used in landscape architecture.

The third phase brings attention to in-between spaces and in-between times. In this phase I bring my travels on the sea into my research as well as travelling by foot between coastal sites on the islands.

The final phase is where much of the processing of my research continues and develops. This is undertaken in a studio/office environment. Collectively, these phases highlight relations between locations and methods all of which offer different modes of knowledge making related to the three islands. It must be noted that the way in which I worked did not follow such a sequence of working. There was, instead, continual thinking, doing and connecting between the methods that I used. However, having worked through this research process and reflected upon it, I believe the set of methods that I have used is best communicated as a sequenced set of phases and perhaps this also gives clarity for others to follow.

7 In this research I have consulted historical maps of the Arctic and the islands of Jan Mayen, Bjørnøya and Hopen. I have also consulted historical weather data from the meteorological stations on each of the islands to confirm that these islands are experiencing similar climatic changes to other Arctic regions. The historical maps and weather data have supported the descriptions of the islands in Chapter 03 of this thesis.

Phase	Location	Method
01 Archival Research	Indoor: Desktop	Historical photographs
	Indoor: Desktop	Weather observations from the three islands
02 In-situ fieldwork	In-situ island locations	Photography: Hand-held
	"	Repeat photography
	"	Photography: Time-lapse
	"	Drone photography
	"	Field notes
		In-situ audio recordings
		In-situ soundwalks
		Observing meteorologist
03 In-between	On the sea | between coasts	Photography: Hand-held
	In-site: between island sites	Walking
04 Studio processing	Indoor: Studio	Model-making
	Indoor: Studio	Map making
	Indoor: Office	Article writing

Table 4.1. A list of methods and locations during four phases of the research process.

4.1.6 Establishing temporal relations between methods

In this section I would like to outline some of the temporal relations between locations and methods used in this research. It helps in promoting the time-centred nature of this research but more importantly, it raises awareness of the temporalities that are woven into landscape research practice. The diagram in Fig. 4.1 illustrates the four phases of my research practice, outlined in the table in Table 4.1. Under each phase and location, the methods are listed. The phases transition from archives to in-situ (outdoor) research and onto the studio phase where work is processed and finalized. There are two in-between phases positioned before and after in-situ fieldwork to highlight the journeying that was involved going to and from the islands. The methods are connected horizontally with arrows to illustrate how methods from different phases weave through this research process. Each of the arrows has a colour that corresponds to the amount of time it typically took to connect various methods together.

The arrows of time in this diagram denote linear time to maintain simplicity with the main purpose of showing how time is at the fore of this research practice. Each phase and each method used in this research have additional expressions

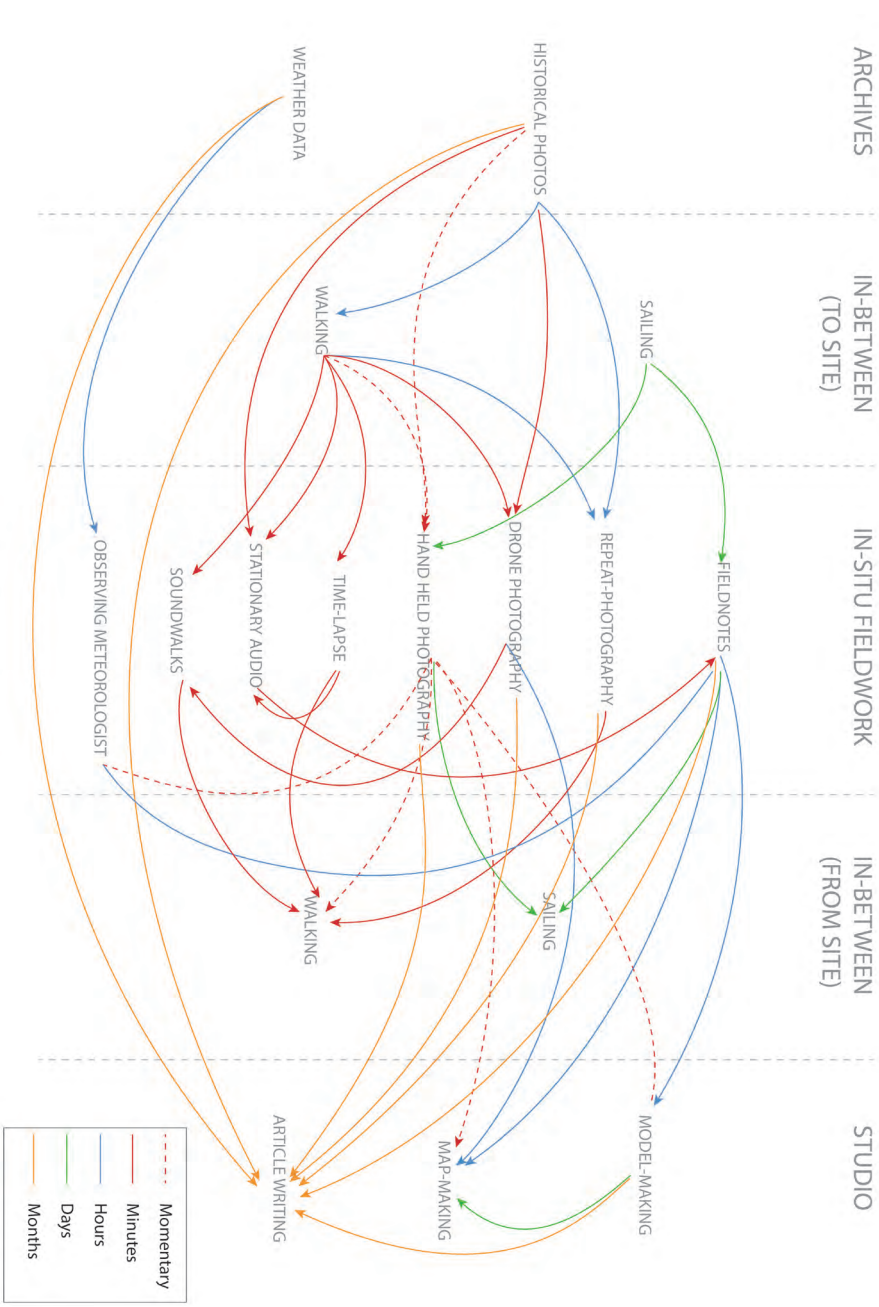


Fig. 4.1. Diagram illustrating the role of time between methods and locations in this research. Source: diagram by Eimear Tynan

of time that have been described in the second chapter of this exegesis. It is, however, through the publications, connected to this thesis, where the thickness and complexity of time between island, coast, subject, material, condition, state and method are demonstrated.

4.1.7 Research questions revisited

The practice-based aspects of my research addresses two of the research questions that have been described in the introductory chapter. These questions are about *how* concepts of time can be developed more specifically for the discipline of landscape architecture and *how* they can be applied.

These questions are addressed through exploration, experimentation and reflection. I consider this 'practice' phase of the research explorative and experimental for two reasons. First, my framework of time concepts and considerations were not fully developed prior to doing situated, fieldwork studies. I used a range of methods to explore how they captured different temporalities of materials but this was done in a more general sense rather than specifically assessing specific concepts of time. Second, it was through travelling and working on these islands that I came to realise how relevant in-between spaces are with regard to time and research. In this sense, the explorative nature of travelling to these islands further sharpened my attunement to time. The answers to the research questions listed above came about gradually as the processing of my material parallel to the development of my theoretical temporal frameworks evolved.

4.2 RESEARCH METHODOLOGIES

This section illustrates the multifaceted ways of working in practice and research in landscape architecture. Both practice and research depend on working with other disciplines but in different ways and for different purposes. The first section will highlight how landscape practice currently operates in working with other disciplines and will follow in the second section with perspectives on landscape architecture research. The final section will conclude with an outline of the position this research takes with regard to influences from other disciplines in a project that is located on Arctic islands.

4.2.1 Methodologies and landscape practice

In order to develop a research project in landscape architecture or to practice as a landscape architect, one engages with other disciplines to negotiate issues that typically concern local geologies, hydrologies, ecologies, cultures, social networks, infrastructures etc. In landscape architecture, the spatial scale of a project varies significantly from a small public town square to a large opencast mine that may be of a regional scale. The temporal scale, meanwhile, varies significantly as I have described in the literature review in Chapter 02. I have also elaborated on time in landscape architecture in my third publication *What time is this coast?* (2021).

According to Linda Groat and David Wang 'architecture—as well as most design and professional fields—entails such broad multidisciplinary qualities that any one epistemological framework would be inadequate to the task of addressing all the potential research questions within the fields'(2013:27). To juggle the complexities of a landscape requires dialogue with and input from other disciplines. Collectively, this forms a framework to work within where one discipline informs the other to resolve current or future problems concerning a landscape.

Landscape architecture practice actively engages with teams of professionals that typically consist of architects, surveyors, planners, engineers and ecologists. This emphasises a certain openness that is required by the discipline. Ian Thompson elaborates on this by explaining that:

> Landscape architecture may have a fluid core but it does not have a fixed essence. It has borders with other disciplines, including engineering, art, architecture, urban planning, and urban design, but these are not fixed boundaries and they are permeable (2014:22–23).

However the inter-disciplinarity of landscape architecture has started to shift –requiring other specialist disciplines such as working in different ways with local communities or developing coastal adaptation measures that need terrestrial and marine specialists. Over ten years ago Deming and Swaffield advised on a 'broader base of thinking in the field and to deepen the way we think' in meeting the 'profound challenges of the twenty-first century' (2011:1). The disciplines that landscape architecture practitioners are likely to work with in the future have been briefly stated by landscape architect Anita Berrizbeitia which was presented in the Chapter 1. Berrizbeitia outlines increased relations with other professions and groups, namely, 'teams of technical experts, NGOs, community activists, public-private conservancies data scientists, AI/robotics, biotechnology, other biological agents' (2018:27).

This expansion of collaboration may be seen, as an example, through the work of US practitioners SCAPE studio. This landscape architecture practice has undertaken many projects concerning water systems, in the form of wetlands, rivers and coasts.[8] Many of the designs are attuned to adaptive measures that can mitigate present-day and future floods and rising sea level predictions. The adaptive measures involve a range of infrastructures that encourage specific plant and animal species to establish in watery environments. However, this is not undertaken solely by the landscape architects, there are a range of other disciplines

8 A notable project undertaken by SCAPE studio is 'Living Breakwaters: Design and Implementation' which is currently under construction.

involved such as specialist engineers (such as fabricators and construction managers), marine ecologists and policy makers.

This section briefly discussed the current status of landscape architecture with regard to the need to work more widely with other disciplines. It has also underlined how time is being considered more explicitly now in response to climatic and environmental change. These are important points to raise for this study because, although it is a research project, it enacts a number of methods that are common to landscape architecture practice. What I wish to accomplish in the practice phase of this research is how methods can help inform how time is playing out along Arctic coasts. For practitioners, this could mean having a more informed way of working with a site and being more sensitive to the temporalities that are inherent to materials of a site.

4.2.2 Methodologies and landscape research

Trends in landscape practice resonate with those in landscape architecture research whereby practitioners, educators and researchers are increasingly working with a wider range of disciplines with the aim to better address the needs of environments under threat of significant change. Landscape architecture research remains broad and flexible oscillating between science and art, theory and practice, retrospective studies and prospective speculations, whilst extending its tentacles to themes concerning politics, economics, society and ecology amongst others. Van der Brink et al. claim that ‘until recently there was little in the way of academic research taking place which could be considered as strictly belonging to landscape architecture’(2017:1). In this research, although it is firmly positioned in landscape architecture, it draws upon theories and philosophies from a range of other disciplines. This has been necessary in consideration of the topic of materiality and time, as well as its Arctic coastal location.

On the subject of time, landscape architecture research is increasingly examining how the discipline engages and acts within the Anthropocene. This has been elaborated on in the second chapter of this exegesis. However, I wish to underpin in this section how researchers in landscape architecture draw upon ideas and theories from other disciplines in helping to articulate discussions on environmental, social and climatic change and crises. One example of this is from landscape architect Dirk Sijmons who borrows from Australian philosopher and science writer Clive Hamilton in providing four distinct perspectives on the Anthropocene. The aim is to help designers navigate the new ways in which we need to respond in the Anthropocene. Sijmons believes that this model ‘will serve as a motherboard for environmental debates over coming decades’ (2021:126).

A second example is from landscape architect Martin Prominski (2019) who turns towards the philosophies of Philippe Descola (anthropologist) and Bruno Latour

(sociologist). The motivation to examine aspects of these philosophies is to work towards non-dualistic ways of thinking in western landscape architecture research and practice. This is in response to the Anthropocene which has caused reflection and critique on the nature/culture divide, upheld in western notions of landscape for centuries. In examining complex entanglements of the human and non-human, Prominski integrates time and by doing so gives direction for practitioners and researchers to work towards re-animation and time-based aesthetics.

The examples from Sijmons and Prominski[9] show how these researchers have reached out to other disciplines such as philosophers, anthropologists and sociologists in an effort to position the discipline in the era of the Anthropocene as well as give new directions and perspectives on how to practice. In both cases, these authors have borrowed sound and established theories and have shown how they can be applied in different landscape architecture contexts. There is a balance that needs to be struck, therefore, where 'landscape architecture needs to develop research methods that are discipline specific and academically accepted' (Lensholzer, 2013:120). In this research I have taken a similar approach whereby I have taken theories and philosophies from outside the discipline of landscape architecture and tested how these can be applied in an Arctic context as well as considering their application in other contexts.

4.2.3 Design as research

The points raised in the previous section demonstrated how some researchers are borrowing theories and philosophies from other disciplines to better equip the discipline with unprecedented climatic and environmental changes. This section will delve a little deeper into the role of design in landscape architecture research, with particular emphasis on design practice that feeds into the approach of this research.

Jörg Rekittke emphasises the role of design in landscape architecture research. In the following quotation he outlines the possible ways in which design may be considered as different forms of research:

> There is no denying that design work may be understood as a form of research. Research can be defined as: 1) a careful or diligent search, 2) a studious inquiry or examination (especially an investigation or experimentation aimed at the discovery and interpretation of facts, revisions of accepted theories or laws in the light of new facts, or practical applications of such new or revised theories or laws), and 3) the collecting of information about a

9 There are other examples such as Milligan (2022) who borrows theories of time from sociologiest Barbara Adam and applies these theoretically into landscape examples.

particular subject (2015:56).

Rekittke proceeds to outline the challenges for landscape architect researchers who often have to balance precariously between quantitative and qualitative methodologies that are borrowed from other disciplines such as plant science or anthropology in order to be, as Lenzholzer earlier stated, 'academically accepted'.

A recent example which I regard as successfully blending research and design through inter-disciplinary enquiry is the research project headed by architect Lindsey Bremner from Westminster University called *Monsoon Assemblages* which ran from 2016 to 2021. The aim of the project was to offer a 'new interdisciplinary approach to the design of cities, treating the monsoon as an organising principle of urban life, not an external threat, and assess the potential impact of this approach for contemporary urban life, architecture, the environmental humanities, urban planning and urban policy'. The project draws on the environmental humanities (anthropology, environmental studies, political ecology, cultural geography and philosophy), the natural sciences (meteorology, climatology and climate science) and spatial design (architecture, landscape architecture, planning and urban design).[10] A project such as this recognises the need to work broadly with a range of disciplines to address the complexities of current and future urban design.

For my research, what is of most interest in the *Monsoon Assemblages* project is the practical design elements that were integrated into the research and theorized from and through different disciplines. The design approaches were largely experimental but opened up ways in which to process the monsoonal conditioning of climatic, social and environmental change. The reiteration of change and movement in this research had the effect of activating time in the study of different marine, terrestrial and aerial environments.

In this research, as previously outlined, there are theoretical and practical dimensions that frame and inform my approach. The process is not linear, in that the theoretical components are constantly revisited and reflected upon during different phases of the research process and through the different publications that have been produced throughout this research. While the practical element of this research is largely experimental it is framed theoretically at the start and re-framed again at the end in order to offer a landscape architecture-specific approach to this research output.

10 The website for *Monsoon Assemblages* may be found here which contains a description of the project and links to publications connected to the research project: http://www.monass.org/project/executive-summary/

4.3 DESIGN TECHNIQUES AND TOOLS

As previously mentioned in section 4.1.5 the methods used in this research are divided into four phases:

Phase 01: Archival research which examined historical photographs and meteorological data relating to the three islands.

Phase 02: In-situ research on the islands where four modes of photography were applied (hand-held photography, repeat-photography, time-lapse photography and drone photography; field-note taking; two modes of audio recordings (stationary and sound walks); and finally observing a meteorologist working at Bjørnøya's meteorology station.

Phase 03: In-between spaces which firstly incorporates travelling on the sea with the Norwegian coastguard. Here I used hand-held photography again. The second in-between space involved walking on the islands to and from coastal sites.

Phase 04: This is where collected data is processed which resulted in the application of three methods: model-making, map making, and writing for journal publications and one book chapter publication.

4.3.1 Phase 01: Archival Research

In this phase nine photographic archives and three meteorological archives were consulted. They will be described in detail in the following sections. These archives were consulted for three main reasons. Firstly, they provided a background to the history of the islands and helped to ascertain different types of activities, events etc. pertinent to the islands. Secondly, the archives offered a good overview of how people engaged differently with the Arctic islands of Jan Mayen, Bjørnøya and Hopen over time. Due to the absence of permanent residents on the islands there is almost a tidal aspect to their histories where waves of small groups of people made their marks on the landscape. Thirdly, the archives offered insights on how island coasts have physically changed over time. This included, for example, how different uses had an impact on the materiality of coasts through the building of different structures. Meanwhile, meteorological observations that date back approximately one hundred years shed light on what type of weather conditions prevailed along these coasts. These archives allow for a picture to emerge on how diverse users, activities, and conditions have shaped the coasts of these islands over time. To fully appreciate what is encountered on these islands today, a retrospective study gives insights of the changes that have impacted and influenced these island coasts whilst providing context and foundation to the present.

4.3.2 Historical photographs

Historical photographs that were included in this research provided a very useful visual introduction to the islands prior to my fieldwork visits. I was already quite familiar with the island of Bjørnøya prior to this doctoral research having visited it twice. However, I had not made any earlier visits to Jan Mayen or Hopen and so the photographs helped to build some familiarity. I utilized a selection of these photographs for a technique called repeat-photography which will be described later in this chapter.

Photographic archives background

In total, nine Norwegian photographic archives were accessed and examined. These were from 1) Svalbard Museum; 2) Norwegian Polar Institute; 3) Norwegian National Library; 4) Tromsø Museum; 5) Norwegian Meteorological Institute; 6) Nord-Troms Museum 7) Norwegian Aviation Museum; 8) Museum Nord; and 9) Norwegian Rail Museum. The selection was narrowed to the first six archives listed. The main criteria for the selection of the archives were based upon the quality of photographs and ones that clearly illustrated human engagement with the coast. My interest was focussed on engagement that was evident between people and coast.

All but one of these archives were available digitally and easy to access online. However, the Norwegian Meteorological Institute's archive is not public and only available to staff members. I personally visited the Meteorological Institute's archives in Tromsø and Oslo which was arranged by appointment. The archive held in Tromsø, where I first visited, have analogue collections stored in several photo albums amounting to eight albums which were available during my visit in 2018. Most of these photographs, however, have been digitised and I accessed these in the main meteorological station at Blindern in Oslo through a staff member's computer.

The photographs from the archives date back to the 1880s and up to the present. I adopted the conventional definition of 'historic' of using photographs that are 50 years old or over (Margolis and Rowe, 2011) for this research. The research did not undertake a material approach to the archives. By this I mean I did not research, for example, the size or type of paper the photographs were originally printed on. Nor did I consider the printing processes used, the type of camera used or the camera settings used to take the photographs. Instead, it was the content of the photographs that I prioritized relating to activity shown within the photographs.

The number of photographs of the islands, in these archives, amount to a few thousand with several of these photographs repeated in some of the archives. A significant problem with these archives, particularly concerning Bjørnøya and Hopen, was that they were very loosely labelled or tagged as 'Svalbard' which

meant they were grouped under a category that contained tens of thousands of historical photographs. After gleaning these archives I selected 56 historical photographs showing Jan Mayen's coast, 90 showing Bjørnøya's coast and 31 showing Hopen's coast. The quantities that I chose reflected the numbers that were in the archives. Hopen, for example, had the least number of historical photographs in these archives.

Through the selection process of the historical photographs I formulated a number of questions to guide my enquiry specifically towards the coasts of these islands. These included:

- Were people engaging with these coasts and if so, how did people engage with these coasts?
- What were people using the coasts for?
- Were there any significant material impacts on the coast as a result of activity?

These questions helped to narrow the quantity of photographs I was consulting and also pointed me in the direction of what parts of the coasts were more intensively used by people.

Temporal dimensions of consulting photographic archives

In using these historical photographs, I was engaging with a specific range of time of approximately a 70-year period. According to Penny Tinkler 'to use photos in social and historical research requires an appreciation of three temporal dimensions: the temporalities that are conjured by a photo; the life of a photo; the timings of research' (2013:12). In the first dimension, Tinkler states that 'although photos depict what was once in the present… they are always representations *of* the past that were produced in the past' (2013:12). The photographic archives that I examined made me reflect on the age of my grandfather who was born in Dublin in 1899. His age and life became a barometer to compare the lives of the people I was viewing in the photographs. Although an unexpected reaction to the photographs, I found it useful to make a personal connection to the photographs.

The second temporality that Tinkler refers to, the life of a photo, provides a context to the photograph. This takes into account the different processes that a photo undergoes through its lifetime including the way people engage with the photograph over time. A photograph may start with the intention of recording a personal memory but may over time become research data. This may involve a photograph taken from a personal photo album and reproduced in an academic journal whereby the tangibility, texture, format, quality and meaning are transformed. In other words, researchers should be mindful that the identity, meaning and value of a photograph may change over time.

The third and final temporality of historical photographs that Tinkler refers to is 'the timings of research'. Historical photographs 'can be a bridge between different stages and times in the research process, typically the collection/ generation and analysis of data' (2013:13). For my research, consultation with several photographic archives was needed to piece together different events and activities that occurred on the island. This ultimately helped to trace changes that unfolded on the islands over time. In addition, the archives were accessed before and after fieldwork which helped me to select and eliminate photographs pertinent to this research. To gain a better grasp of the contexts of these photographs I also consulted a range of literature pertaining to the histories of the islands many of which are referred to in the third chapter.

Emerging themes from the photographic archives

Although the three islands of Jan Mayen, Bjørnøya and Hopen have their unique histories, some common themes emerged from the photographic archives. The themes may broadly be divided in three – hunting (fox, whaling, walrus[11] and polar bear), science (namely geology, zoology, biology and meteorology) and the Second World War. The historical photographs start to appear from the late 19th century where there was a transition from the islands being used predominantly for hunting towards the start of scientific interests. Between the late 19th century and the Second World War there were many scientific expeditions to the islands that included geological, biological, cartographic etc. research. The Second World War affected all three of the islands and meteorological observations were disrupted or halted during this period. Although the war played out differently on each of the islands, the photographs illustrate scenes of defence (Jan Mayen), destruction (Bjørnøya) and occupation (Hopen). After the war there is a predominance of images pertaining to meteorology. This includes the construction and establishment of buildings and structures as well as every-day activities undertaken by the meteorologists. These themes relate closely to the coasts of the islands in that people had to negotiate these coastal environments differently to overcome difficult conditions and had to be innovative in order to live there.

A final conclusion from these photographic archives relates to the coastal conditions of the islands. Several photographs that I encountered showed the presence of sea ice during summer months. Summer sea-ice is no longer present around any of these islands. This illustrates how the Arctic is indeed warming up. In relation to this point I also came across many photographs of polar bears

11 The most intensive period of whaling and walrus hunting took place prior to the invention of photography in these Arctic regions. However, I have mentioned these here because the remains of these activities are still evident along parts of the coast of Jan Mayen and Bjørnøya. However, a short-lived whaling station was established on Bjørnøya 1905-1908 and I found a photograph in the Norwegian Polar Institute photographic archive that shows buildings relating to the activity there which are now long gone. Whaling along the Norwegian coast was banned in 1905 although it still prevailed in and around Bjørnøya for a longer period (Hagenæs-Kjelldahl, 2006)

including several showing meteorologists playing with polar bear cubs. Again, this is something that is resigned to the past with regard to the islands of Jan Mayen and Bjørnøya.[12] This is due to the reduction in sea ice reaching these islands which transport the bears.

4.3.3 Archival meteorological observations

Meteorological records background

Meteorological records for the three islands go back approximately one hundred years with a short disruption of records during the Second World War which is elaborated upon in the third chapter of this exegesis. These observations have been collated and digitised by the Norwegian Meteorological Institute and the information is freely and publicly accessible through their online resource called seklima[13] (Norwegian Meteorological Institute). The website allows users to choose different weather parameters from any Norwegian meteorological station. There is a choice to download data in Norwegian or English languages. Up to five parameters may be chosen at one time. There are options to download the data in a number of formats ranging from numerical data to visual charts.

The meteorological records from the three islands were accessed for a number of reasons. Firstly, climate trends can be established to show how weather conditions have changed over time. The weather data collected from the stations feed into climate reports[14] providing climate predictions for Arctic regions and more precisely, how these islands are likely to change in the future. Secondly, the data produced from these observations feed into a much larger picture on expected climate trends for the future. A very unique aspect of all three islands is the presence of meteorological stations situated on or very close to the sea edge. Weather records date back between 78 years and 114 years. The records for each station have been gathered since the following years per station:

Jan Mayen: In operation since 01.08.1908
Bjørnøya: In operation since 01.01.1910
Hopen: In operation since 01.11.1944

All three islands have recorded an increase in temperature in recent decades. There is also an increase in precipitation on all three islands but this varies significantly with Jan Mayen showing an insignificant trend unlike the other two islands where precipitation increases are regarded as significant (Hudson et al.,

12 Polar bears occasionally visit the island of Bjørnøya but these visits have been limited to individual bears. In addition, present-day conditions on the islands are unsuitable for their survival.
13 Website: https://seklima.met.no/ [accessed 21 July 2021].
14 Some climate reports that used weather data from the meteorological stations on Jan Mayen, Bjørnøya and Hopen include: Førland et al. 2009; Renner et al., 2018; Hudson et al. 2019; Hanssen-Bauer et al. 2019.

2019). The consequences of warmer temperatures and increased precipitation mean that ecologies will change on the islands. An increase in humidity also means acceleration in the rotting of wood thus affecting the deterioration of heritage structures.

The significance of adding weather and climate information lie in the study's focus on the materialities of the islands. The coasts are constantly acted upon by different weather conditions which directly impact its material compositions. Future climate predictions are also vitally important in the speculation of future materials, states and conditions of these coasts. A huge impact of a warming climate is the gradual reduction in the presence of snow and ice which completely transforms how we knew and know these islands. These aspects of my research is expressed in my first publication *Arctic islands: Archival Exposures* (Tynan, 2020); third publication *What time is this Coast?* (Tynan, 2021), and fourth publication *Temporal Perspectives on Arctic Peripheries* (under review).

The photographic and meteorological archives allow for a picture to emerge on how different users, activities, and conditions have influenced the coasts of these islands over approximately a one-hundred-year period. The timing and longevity of the archival records is important to mention. To gain insights into older histories of the islands I consulted a range of literature and historical maps. However, to fully appreciate what is encountered on these islands today, this retrospective study has guided an understanding of the changes that have impacted and influenced these island coasts whilst providing context and foundation to the present.

4.3.4 Phase 02: In-situ Fieldwork: Preparation

The second phase of this research proceeds from the indoor environments of the archives to outdoor and in-situ coastal enquiries. The tools I use and the techniques I adopt are typically used in the early phase of a design process when a landscape architect familiarises themselves with a site. Designers approach this early stage of the design process differently as I have described in chapter 2. Fieldwork in this research involved much preparation before I put my feet on the islands. I made two excursions during this doctoral study. The first took place in August/ September 2018 when I visited all three islands. The second visit took place in March 2019 when I made a short visit to Bjørnøya. All of these trips required close communication and coordination with other parties.

The first task was to gain permission for my travels. I contacted the Meteorological Institute in Tromsø to seek permission to visit the islands and to stay at the meteorological stations too. I then contact the Governor of Svalbard (Sysselmesteren) to seek permission to undertake research fieldwork. Bjørnøya and Hopen are part of the Svalbard archipelago and must therefore follow the rules and regulations set out by the Governor of Svalbard. Travel to the islands require the

following:

- Notification of SAR (Search and Rescue) Insurance.
- The carrying of a distress beacon, during the fieldwork period, which must be registered with the Governor of Svalbard. This, I hired from the Norwegian Polar Institute in Tromsø.
- A firearm to protect against polar bear attacks. This must also be registered with the Governor of Svalbard. I carried a rifle with me during my stay on Bjørnøya and borrowed the rifle and ammunition from the meteorological station there. A rifle was not necessary on Hopen because I was working close to the meteorological station. However, I carried a signal flare while I was there.
- A signal pistol or bear deterrent for protection against polar bear attacks. I carried a signal flare which I borrowed from the meteorological stations.
- Familiarity with tourist regulations and area restrictions of the Svalbard archipelago.
- Submission of a registration card with details of travel plans to the Governor of Svalbard before and after fieldwork was complete.

Travelling to Jan Mayen requires different requirements under the administration of Nordland, a county on mainland Norway. A visitor to the island requires special permission if the stay exceeds 24 hours. On arrival to Jan Mayen I was given a visa to stay for 72 hours. It was not necessary to carry a firearm or signal pistol on the island.

The second task was to arrange travel to and from the islands. The only feasible and affordable means for me to get to the islands was to seek permission to travel with the Norwegian Coastguard (Kystvakten).[15] On board the vessels safety is paramount and instructions are given in the event of emergencies. There is also the requirement to join in emergency exercises/drills which, for a visitor, involves putting on a life-jacket and helmet and meeting in an assigned part of the ship. I was also instructed on how to wear a survival suit. Survival suits were required for disembarking on Hopen in 2018 and on Bjørnøya in 2019. For a visitor travelling with the coastguard there is no communication with the outside world i.e. no

15 Travelling with the Norwegian Coastguard required flexibility with travel schedules. Although the dates for the Norwegian Coastguard to collect me were fixed, the travel time to and from the islands varied substantially because of the duties that must be undertaken on board the vessels. An example of this was the trip to Jan Mayen in 2018 which took three days by sea. However, I was informed that returning to Norway would take six days because of additional duties that had to be done en route. Fortunately I returned by air with the Norwegian Defence Force which took three hours. Another example included my trip to Bjørnøya in 2019. Due to the presence of sea ice the coastguard collected me from the island one day ahead of schedule because sea-ice conditions were expected to worsen. If I did not leave at that time I would have had to stay on the island for an three additional weeks until another coastguard vessel was available.

internet access or phone network.

In August 2018, for my travels to Bjørnøya and Hopen, I flew to Longyearbyen in Svalbard from Oslo and from there, travelled to the islands with the Norwegian coastguard. When my fieldwork on these two islands was complete a coastguard vessel collected me from Bjørnøya and took me to Tromsø in Northern Norway. From there, I returned to Oslo by air. My trip to Jan Mayen involved meeting another coastguard vessel in Nordland county in Norway. I had intended returning with the same vessel but instead, there was the opportunity to return to Oslo with the Norwegian Defence Force which I accepted. Fig. 4.2 illustrates the different routes taken for fieldwork in August 2018 and the different durations of time to travel to each island.

In preparation for carrying out fieldwork on the island, I brought the following equipment/gear:

- Physical maps of each island provided by the Norwegian Polar Institute
- Compass
- Garmin GPS Map 64s
- Pentax K-5 digital camera with 18-135mm lens
- Tripod - Joby Gorilapod Pro to hold digital camera and sound recorder
- Samsung galaxy phone which I used for photography
- DJI Mavic mini drone and landing pad
- Zoom H6 Handy Sound recorder with interchangeable microphones
- Bose headphones
- Notebook and pens
- Powerbank to recharge phone
- Extra batteries for all equipment requiring batteries
- Macbook
- All equipment and clothes fitted in a 70l rucksack and I also brought a 15l backpack for short, local trips on the islands.

The following sections will describe the methods for in-situ fieldwork undertaken on the islands which used the equipment, listed above, in different ways and for different purposes. Each of the sections that follow will include a theoretical introduction to the method followed by a description on how I applied it specifically for this research.

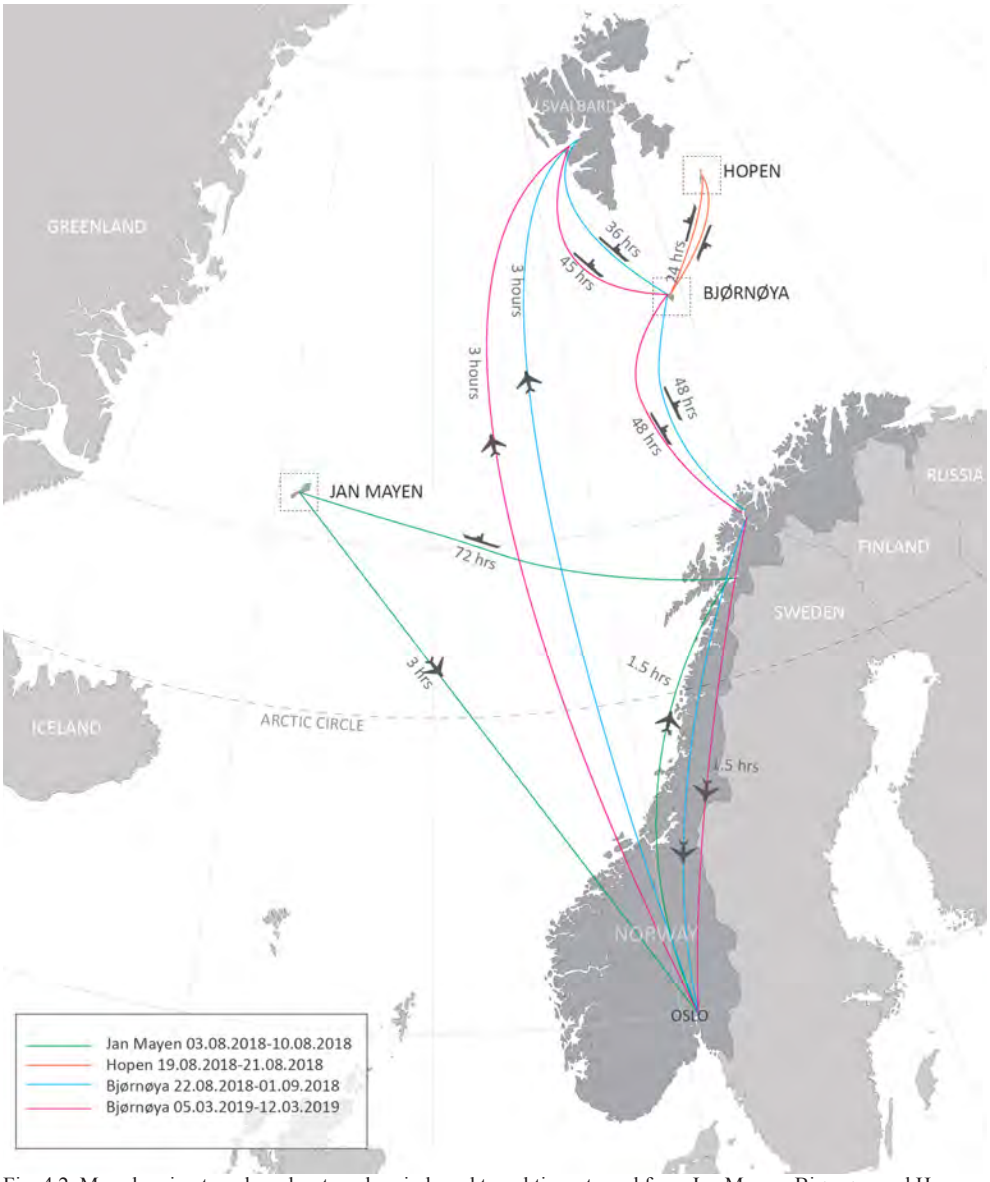


Fig. 4.2. Map showing travel modes, travel periods and travel times to and from Jan Mayen, Bjørnøya and Hopen in 2018 and 2019. Source: map by author.

4.3.5 Photography

Photography proved to be a crucial part of fieldwork carried out on the islands. There were a number of ways in which this method was used and these will be discussed in the following four sections. Preceding this, however, I wish to provide a brief background to how two landscape architects have used and theorized photography. I feel this is a necessary step before I describe my approach to

photographing particularly because so little has been written about photography from within the discipline despite it being a prevalent method used in practice, education and research.

Two noteworthy publications by landscape architects have propelled the importance and multiple values of photography for the discipline. In *The Eye Is a Door: Landscape, Photography, and the Art of Discovery* Anne Whiston Spirn (2014) shares a personal yet academic account of the thinking and criticality involved in taking and processing photographs. She uses photography to resolve her curiosity of landscapes from all around:

> I wanted to understand what makes a place particular, how it comes to be and how it changes, in order to imbue designed landscapes with a strong spirit of place and to capture this quality in photographs. (2014: section heading 730)

She assesses the different practices involved in photography where the designer must decide which is most appropriate. For example, a tripod is cumbersome yet 'encourages deliberation', while a camera held in the hand allows freedom and to 'think more fluently'. The photographer's position prior to taking a photograph holds great importance for Whiston Spirn. It is not only a question of where to stand but also when to stand. Her strategy is that 'First my eye must focus on parts, on significant details that are explicit clues to a larger, implicit whole' (section heading 861). This leads her to note 'how emotional distance shifts from detached to intimate as the photographer moves up close to a subject, how looking down at a subject may diminish it, looking up aggrandizes it' (section heading 942).

There are several points and considerations that Whiston Spirn raises that are pertinent for my research. She switches smoothly between technical and artistic references to articulate the practice of photography that are purposeful and meaningful to her. Her ambition in drawing out the specificity of a landscape reveals attentiveness most particularly to the changing light conditions of a space. This resonated with many thoughts I had while photographing the Arctic island's coasts and working with predominantly grey, dull skies but with very dynamic seas. Whiston Spirn reminds us that:

> Every region has its own light with particular qualities of solar angle, brightness, clarity, and color, caused by the interplay of latitude and longitude, altitude, climate, the color and reflectivity of the surfaces of rock, soil, plants, water, buildings. The sun's angle, a factor of time of day, of season, and of latitude, affects how much atmosphere (dust and moisture) the light passes through. Humidity and dust change light's quality — its color, clarity, and brilliance — from place to place (section heading 1096-1099).

References to time and material qualities of the air, ground and sea are embedded in this description. Time is also referred to by Anne Godfrey (2020) who draws attention to the different longevities of time involved in the practice of photography:

> There is time preparing for the trip, there is time finding the points of view, there is time setting up the large-format camera, there is time metering light, adjusting the lens and choosing a filter. The shutter is released and then there is innumerable time working in the darkroom to make a print…This is an act of creation, a process and a commitment to *making* (2020:45).

Godfrey helps to capture the fluid manoeuvres in making a photograph. These are small but meaningful steps that I was not even conscious of prior to embarking on this research despite practicing photography for years. The two authors, Whiston Spirn and Godfrey, draw attention to a lot of the same considerations that I had during this research such as mediating between distance and close-up scales, appreciating the light conditions that are inherent to a moment in a particular place, and how time very much infiltrates this method in different ways.

The methods of photography which I have used may be divided into four distinct categories–handheld photography, repeat photography, time-lapse photography, and drone photography. Each of these photography methods have been used for specific purposes and each have engaged with time and materiality differently.

4.3.6 Handheld photography

Photography, using a hand-held digital camera, was a very important part of my research both during fieldwork practice and in the studio. The camera I used was a Pentax K-5, a digital single-lens reflex camera. The lens was 18-135mm which offered flexible use for different landscape scales. This camera had been used in the Arctic on many previous fieldtrips and proved robust in inclement and freezing weather conditions. I also brought a small tripod for both the camera and sound recorder. In addition to the digital camera, I used my phone camera (Samsung Galaxy). I expected this to be a backup camera but the quality of the photographs for the details of the materials I photographed, such as wood, ice, vegetation etc. were very good and so, I used this camera to the same extent as the digital Pentax camera.

Photographing the coast

Once ashore, I made a schedule of which areas of the island to visit. On Bjørnøya, I made two excursions to different parts of the island (Teltvika to the west and Tunheim to the east) and the weather forecast dictated when to visit these areas so that conditions were optimal for fieldwork and especially for photography. My

Fig.4.3. Patterns along Helenesanden, Jan Mayen. Source: photograph by Eimear Tynan, 5th August 2018. Permission to reuse must be obtained from the rightsholder.

approach to photography could be reduced to two phases.

The first phase involved travel to the site. On Jan Mayen this was done mainly by jeep and walking. On Bjørnøya and Hopen this involved walking only. Apart from travelling by jeep my mode of travel, being on foot, was slow that involved many stops to take photographs. These photographs were generally wide-angled shots to give comprehensive readings of the coast and helped to build up an understanding of the diverse materials that I traversed upon. However, there were often materials or patterns that caught my attention and spurred me to take detailed photographs (Fig.4.3).

The process of walking through and photographing these coastal environments involved looking up, down and across the sea. Due to the shifting weather conditions the horizon was constantly opening up, blurring, disappearing and opening again. The wind moving across the sea rippled towards or bypassed the island. Sometimes cliffs would shelter me from onshore wind and other times I was confronted with strong sea winds head-on. For all my site visits, I was always accompanied by sea-birds. Their behaviour differed enormously. The Great Skuas

on Bjørnøya, for example, did their utmost to steer me away from their territory.[16] On Hopen, hundreds of seabirds remained distracted feeding the chicks on the cliff faces and did not interfere with my ramblings. On Jan Mayen, the puffins occasionally rested on the cliffs before making wobbly jumps towards the sea.

The second phase was on the coastal sites themselves. I generally walked along the more solid land part of the site before I approached the intertidal zone to get an overall sense of the topography and materials. The intertidal zone[17] was, for me, the most intriguing part of the site to visit. Activity in this area is vibrant with constant interactions of rock, sand, water, air and living organisms (Fig.4.4).

My visits to the island meant that I traversed across many different intertidal areas to demonstrate the ways sea meets land and how people (including me as a landscape architect) engage with such areas. On Jan Mayen, at Gamle Metten, there were very diverse materials to make sense of. There was a crumbling cliff area with materials scattered amongst the fallen clay and rock debris. These materials are not indigenous to the island such as timber and steel. These loose agglomerations were not only material but temporal too and it is the unforgiving processes of the sea and air that have exposed the multitude of time of these coasts. Capturing the detail of this site was relatively easy with few physical obstacles. At Austervåg (Tunheim) on Bjørnøya, however, I was photographing a site that extended across a steep cliff edge. There was much to photograph on the top of the cliff. There were stark material reminders from the mining community that was once here as I described in chapter 3. Some of the site was too dangerous to access by foot and I photographed as much as possible even if it was frustratingly from a distance. To overcome this distance I used my drone to photograph areas that were inaccessible.

This phase of photographing the sites was the most intimate phase where I was able to get close to the materials and get a good sense of the local context to which they belonged. Capturing the materiality of the island coasts required constant movement between spatial scales. Through this movement relations began to emerge between material and context and between me and the materials.

16 It is forbidden to access certain areas of Bjørnøya during the breeding period for birds. According to the Norwegian Polar Institute ‘The breeding population of skuas across Svalbard is estimated to be between 500 and 1000 pairs, with approximately half breeding on Bjørnøya. The colony on Bjørnøya is the largest in the Barents Sea region’. https://www.npolar.no/en/species/great-skua/ [accessed 14 August 2021]
17 The area of the coast subject to tides.

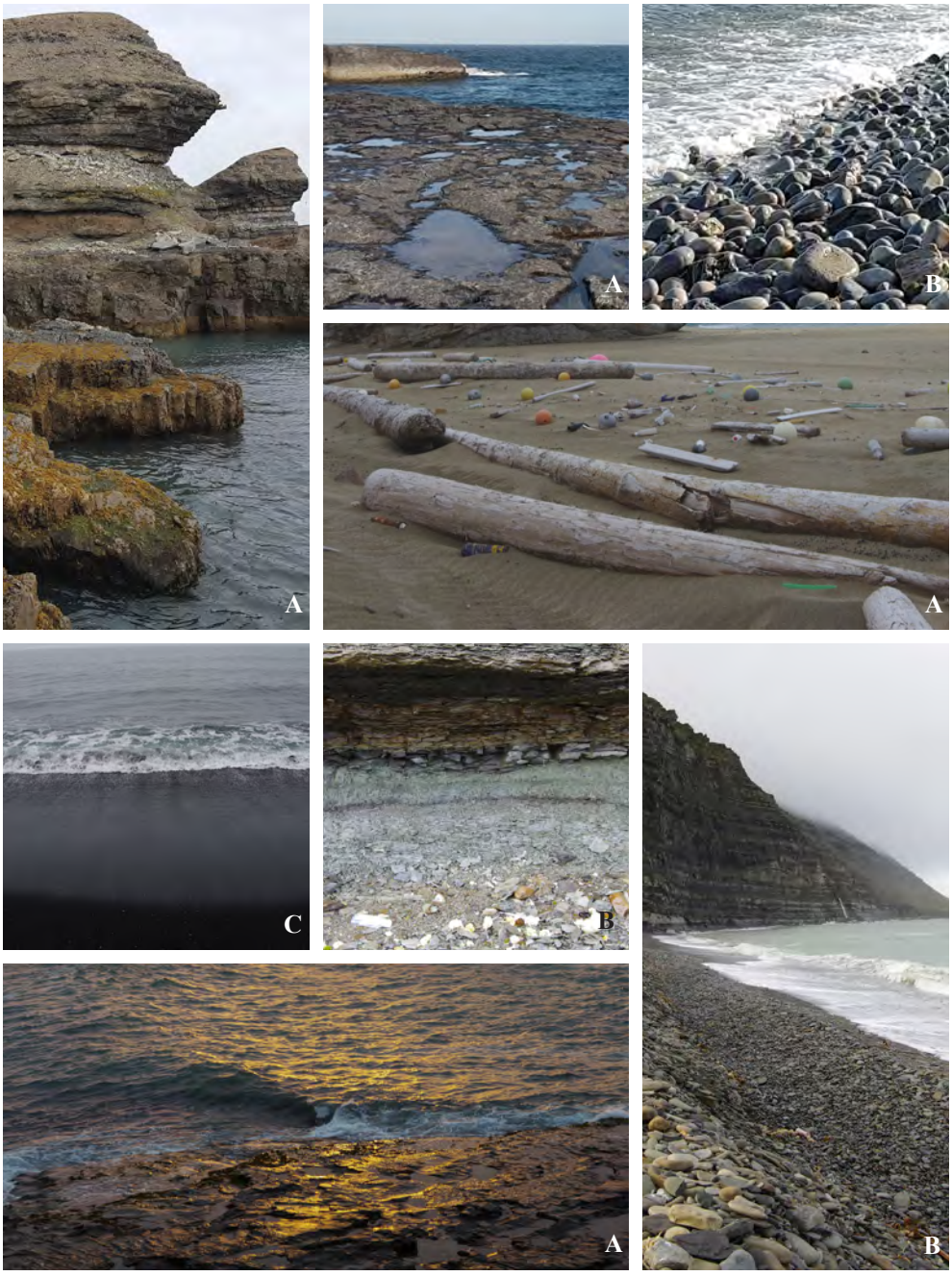


Fig.4.4. Examples of ways in which the sea meets these island coasts. Bjørnøya (A), Hopen (B) and Jan Mayen (C). Source: photograph by Eimear Tynan, 5th August 2018. Permission to reuse must be obtained from the rightsholder.

4.3.7 Repeat Photography

Repeat photography, also called rephotography, is a visual research method (Metcalfe, 2016) where a historical photograph is compared with a recent or present-day photograph taken from the same location.[18] Repeat photography was implemented in my research primarily as a means to link the historical photographs from the archives to the present and to evaluate the material changes that have occurred on selected coastal sites. Geologist and photographer Mark Klett emphasises how this technique can capture change:

> Common to many disciplines, there has been a need to visualize change, and the overall connection has been to gain a unique perspective on time related to place that is independent of discipline and challenges the observation of any single moment (Klett, 2011:115).

There are many merits to the application of this technique. It is a lo-tech method that does not usually require a high level of photographic skills.[19] Further, repeat photography is a method with visual results that may be understood universally. Geographer Christian Kull adds that 'When compared with the analysis of air photos and satellite images, the technique [of repeat photography] is found to provide useful high-resolution data and a deeper historical reach' (2005:253). Through the comparison of old and contemporary photographs spatial, temporal and material change may be observed. However, Klett warns that when photographs are compared, they 'may illustrate change and the passage of time, but neither image can explain the events that led to that change' (2011:114).

Approaches to Repeat Photography

Repeat photography is used for both qualitative and quantitative purposes. In the natural sciences, for example, much attention is paid to the precise location and position from where the original photograph was taken. When used quantitatively, repeat photography helps to ascertain change in habitats[20], vegetation, hydrology, glaciers[21], geomorphology, land use[22] etc. The interval between a historical photograph and a rephotograph can vary significantly from hours to months to decades.

18 According to Webb et al. (2010) the first scientific use of repeat photography was by a Bavarian mathematician named Sebastian Finsterwalder in 1888. He conducted photogrammetric surveys of glaciers in the Tyrolian Alps over a number of years to compare changes.
19 This claim, however, is challenged if the research demands technical precision for more accurate comparisons with original photographs. Mark Klett, for example, puts great emphasis on the technical considerations in his rephotographing work (2011).
20 For example a coastal study undertaken by Reimers et al., 2015.
21 For example, photographer Christian Åslund, uses this method to document retreating glaciers in Svalbard.
22 For example land use change in a study conducted by Kull, 2005.

Qualitative approaches, meanwhile, are often adopted in the arts and social sciences where the precise location and photographic format are not critical to the process. Instead, finding relationships between the two photographs and its context is desired. Klett explains that this may be achieved by 'embedding a smaller second view into a larger original photograph' or 'placing a newly made photograph side-by-side or overlapped with an original photograph to form a continuous scene where the features of one image flow seamlessly into the next' (2011:126).

Practicing Repeat Photography

My approach to repeat photography was qualitative which involved the following steps based on those outlined by Klett (2011):

1. Photograph selection:
As previously mentioned in the section on historical photographs from the archives, I selected photographs that displayed the coasts of the islands and preferably ones with evidence of human activity. Prior to my visit to the islands during the summer of 2018 I printed out approximately 15 historical photographs for each of the islands and placed them in plastic sleeves to protect them from wet weather conditions. When I arrived on each of the islands, I asked members of staff at the stations if they could assist me in finding the locations from where the photographs were taken. On reflection this was a very nice way to interact with people that I had not met before and their response was one of helpfulness and enthusiasm. I decided after talking to the experts on the islands that I would prioritize some locations over others.

On Jan Mayen I chose two sites at two former weather stations on the island. Hopen was most restrictive but also the easiest because I had to stay in the vicinity of the weather station for (polar bear) safety reasons. At Bjørnøya there were two sites that became the focus of my repeat photography assignment – a site at the station itself and another at Austervåg (Tunheim), located to the north east of the island.

2. Visiting the location of the original photographs

Jan Mayen

During my fieldwork on Jan Mayen, I accessed the sites by jeep and by foot.[23] I photographed the weather station of Gamle Metten which was in use from 1946-62. The site consists of many buildings which are largely intact. The infrastructure associated with the station, however, has been brutally affected by the tough weather conditions there. The location of the historical photograph is taken from

23 On the 6th August 2018 the station manager from the Norwegian Defence Forces drove and guided me to several historical sites on the west side of the island. On the 7th of August 2018 Hege Terum Kvitberg drove and guided me to several historical sites on the west and east side of the island.

the beach below the station which is perched on a hill. The second site on Jan Mayen was on the east coast at Eldste Metten, a weather station that was in use 1921-1940. The collection of station buildings has largely been obliterated from the site but the footprint of some of the buildings remain. This area of the island, I had been warned, contains a lot of small depressions which one can easily fall into particularly if they have been covered with a layer of sand. I had to, therefore, walk around this site with extreme care.

Bjørnøya

All sites on Bjørnøya were accessed by foot. Locating the sites from where the original photographs were taken was straightforward as I had visited these sites previously. I photographed the site at Austervåg first. It took approximately three hours to reach this location. I took the meandering coastal route which also extended the journey time. The site at Austervåg is connected to the former coal mine village of Tunheim by a rail track. The site itself was formally used as a silo and harbour for exporting coal from the island. Most of the structure is no longer

Fig.4.5. An example of repeat photography at Austervåg, Bjørnøya. Photograph on the left taken in circa 1920-1930 when coal was being exported from the island. Source: Svalbard Museum. Permission to reuse must be obtained from the rightsholder. The photograph on the right shows Austervåg during fieldwork in August, 2018.Source: photograph by Eimear Tynan, 28th August 2018. Permission to reuse must be obtained from the rightsholder.

there but the foundations and parts of the rail track are still evident (Fig.4.5). Although the location was easy to find I am quite certain the precise vantage point from where the original photograph was taken has since fallen into the sea. I was compelled to take the photo from as close to the cliff edge as possible. The second location was at the present-day meteorological station and again, proved easy to locate. This photograph showed a view towards the small harbour with a narrow, single rail leading down to the shore. Some of this rail has remained at this location.

Hopen

On the island of Hopen I was limited to one area of the island, that being at the

meteorological station. Fortunately I had several historical photographs from this area and over a two-day period I had ample time to conduct repeat photography at many areas of the site.

3. Vantage point

After finding the correct location for each of the selected photographs I needed to capture the new photograph that would correspond as close as possible to the original photograph. Due to the coastal location, the sea horizon was a very useful line to follow and provided the first guide to matching the new photograph with the original. Following on from this I paid attention to the outline of the geomorphology in the original photograph. This helped to make more precise

Fig.4.6. Working with historical photographs at Austervåg, Bjørnøya. Print-outs of the photographs were protected with plastic sleeves. The located of each photograph vantage point was recorded using GPS. Source: photograph by Eimear Tynan, 28th August 2018. Permission to reuse must be obtained from the rightsholder.

adjustments of the direction of the camera. Finally, I took note of prominent features in the original photograph and, if they were still evident today, I tried to align the camera view with these features as closely as possible. The following image, from Austervåg on Bjørnøya, illustrates the process that I used where different features were used to adjust the camera view as precisely as possible to match the original vantage point. The locations of the photographs were noted using a GPS (Global Positioning System) device (Fig.4.6).

4. Photograph contexts

The use of historical photographs drew me to different sites on the islands. The comparison of two photographs explicitly showed change to these coastal sites. It was easy to recognise what was missing between the two photographs but less easy to see what materials had remained and what had become of those materials. Examining the context to which the photographs belonged was, therefore, an important to my research.

Jan Mayen

On Jan Mayen, the site at Gamle Metten, one may gain a better sense of its meteorological past by the presence of an old anemometer, rain gauge and

Stevenson screen. The wooden buildings have been scoured and bleached to a light grey hue with windows and doors boarded up. An old, rusted rail track swings through the site and comes to an abrupt stop at the cliff edge where it was once met by a cable system that connected the station to the beach below. Moss and low-growing grass have started to encroach on the rail track and a large part of the wooden structures that once held the cable system has fallen onto the beach below. On the site of Eldste Metten there is no evidence to specifically show that a meteorological station was there. There are remains of buildings but it is difficult to read this site which is located on a lunar-like plain beside the sea. The scattering of wooden planks across the site stand out in the dark red sand and stone environment.

Bjørnøya

Austervåg on Bjørnøya had an abundance of different materials strewn across the site and down at sea level too. On top of the cliff, a rusted train wagon barely supported on rusted rain tracks was the most prominent feature. Nearby, where a former building stood lie a stone foundation with scattered glass fragments, geological cores, bricks concrete and wood. A wooden light post, erected on the clifftop still remains with a broken ceramic lighting fixture lying in smithereens on the ground below. There is scant vegetation on the site with moss being most dominant. The second site, at the present-day meteorological station, maintains its former rail track connecting the station to the small natural harbour. Although redundant it shows that this part of the harbour was once where most activity took place. Today, activity has shifted to the opposite side of the harbour where a concrete pier eases access to the island. The most significant material change around the harbour is the construction of the concrete pier.

Hopen

The first site on Hopen where the German meteorological station was based has since been replaced by the Norwegian meteorological station. The historical photograph was taken perhaps during spring when light conditions had returned after the Polar nights but the sea ice was still present. My photograph, conversely, was very much a thawed version where the sea was unfrozen and the land was strewn with rivulets. The precise location for this photograph was not possible because of the presence of newer buildings that would have obstructed the view. Nevertheless, the conditions and context of the photographs were telling. The second repeat photograph was taken behind the meteorological station where views to the sea were an important aspect to the original photograph. Like the previous site, there is the original frozen version compared with the contemporary unfrozen view.

5: Charging the photographic archive

In the previous step of the repeat-photography process the context of the site allowed for more interpretations to be made on the state and conditions of

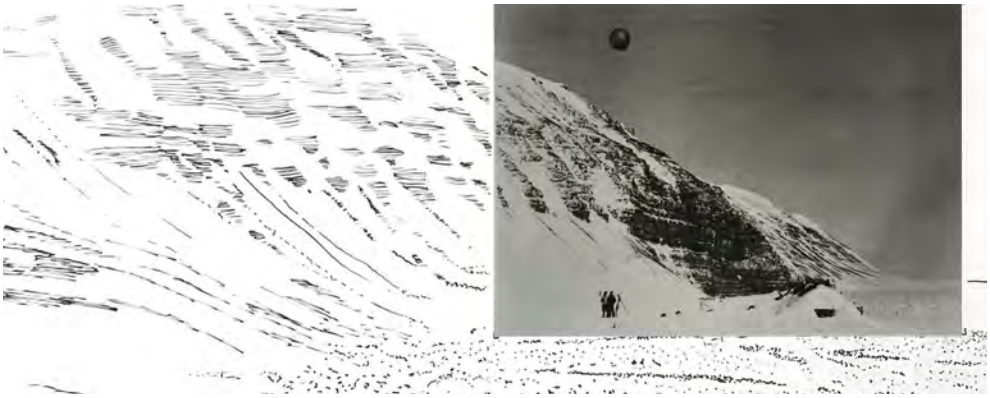


Fig.4.7. Using a historical photograph from Hopen and sketching around the view to record present-day conditions. Source: photograph and sketch by Eimear Tynan, 2018. Permission to reuse must be obtained from the rightsholder.

the materials of each site. In order to read the site in multiple ways and using techniques common to landscape architecture I also took notes and quick sketches for most of the sites (Fig. 4.7). If conditions were unfavourable, for example blustery or misty conditions, I declined to take sketches. Repeat photography was a method that featured in my first publication *Arctic islands, Archival exposures* (Tynan, 2020) where I combine historical photographs with sketching and fieldnotes.

I also took a short sound recording at each location at the time that I took the photograph. Although experimental, I wanted to capture what each location sounded like. This was done to provide an additional sensory dimension to the space with the intention of bringing a viewer of the photograph into the space. Adding sound is also an attempt to underpin what artist and anthropologist Trudi Smith calls 'ground truthing'. In adopting the repeat photography method she mentions that a 'key aspect of the practice of locating a historical vantage point is that it is an embodied process that requires presence in, and engagement with, the world' (2007:190). It puts the contemporary photographer in the same location as a previous photographer thus linking past and present. In my work, sound recording was an act of documenting and becoming aware of the environmental conditions around me and how the coastal space sounds at that moment but it also made me consider how the space would have sounded in the past and what it will sound like in the future.

Repeat Photography: spatial and temporal connections

I found several advantages to using repeat photography as a method to link the past to the present and indeed to speculate about the future of the selected coastal sites. There are three advantages which I feel are noteworthy for landscape architecture practice. First, locating the site from where a historical photograph was taken provides a destination for a site visit and opens the site up into further enquiry.

Second, this method can potentially be used as a base for layering with notes and sketches, and sound recording which is advantageous to designers who often like to work with several methods. Third, repeat photography allows for speculation on what causes change. There are of course advantages and disadvantages to this but depending on the purpose of research this method can be a creative exercise.

4.3.8 Time-lapse Photography

The use of time-lapse photography in this research was not initially planned prior to in-situ fieldwork but was implemented after I arrived on the island and became an important addition to my work. Time-lapse photography emerged as a method that could successfully capture the flow and movement of material phenomena over a specific time period. This method is featured in my fourth publication called *Temporal Perspectives on Arctic Peripheries* (currently under peer review). Time-lapse photography is 'where a series of photos are taken from the same place at regular, frequent intervals, and then spliced together' (Rose, 2016: 313). There are two factors that influenced the application of this method. Firstly, when I was staying on these islands I realised how quickly conditions changed over a short period of time. During my August visit to the islands in 2018, for example, fog regularly engulfed the islands and this not only impacted visibility but the light conditions too. In March 2019 when I visited Bjørnøya I noticed the gradual movement of sea-ice passing in front of the weather station and the most appropriate means of capturing this was, I felt, by using time-lapse photography.

The second factor that influenced my decision was more practical. I decided to use time-lapse photography as a way to extend the use of my digital camera when I was not using it for in situ fieldwork. Sometimes, when weather conditions were too poor to undertake outdoor research I set up my digital camera indoors at the weather station to record the changing conditions outdoors. During my visit to Bjørnøya in March 2019, the presence of a polar bear curtailed my time outdoors and I decided this was a good opportunity to pay more attention to time-lapse photography while I was restricted to more time indoors (Fig. 4.8).

The application of this method is wide-ranging. Landscape architect Ann Godfrey (2020), for example, discusses the use of time-lapse photography for documenting the construction process of a new landscape. A notable example of time-lapse use is by the urbanist William H. Whyte. In the 1950s and 1960s he used this method to observe and examine how people used public spaces. He subsequently carried out quantitative analyses based on the collection of the time-lapse photographs. Geographer Paul Simpson also used this method in an urban setting to observe the gathering and dispersal of people at a street performance. Simpson found that one of the merits of using time-lapse photography was that 'the images produced through this photography potentially facilitate the fine-grained analysis of everyday activities and especially how these activities play out and vary across different

Fig. 4.8. A selection of time-lapse photographs used to record weather conditions over a 4-hour period. Source: photograph by Eimear Tynan, 3rd March 2019. Permission to reuse must be obtained from the rightsholder.

interrelated timescales' (2012:431).

Time-lapse photography has been used for many purposes in the Arctic to document the movement of glaciers, record avalanches and to monitor coastal erosion.[24] In a project conducted on the glaciers of Skobreen and Paulabreen on Svalbard, researchers Lene Kristensen and Douglas Benn (2012) describe some of the challenging conditions experienced with timelapse photography. These included fog, rain droplets on the camera lens, snow, darkness (during the polar nights) and temporary battery failure. Despite these disruptive elements, the researchers concluded that a time-lapse movie, pieced together from the photographs, 'dramatically illustrates glacier dynamic processes in an accessible way… [and] provides a powerful resource for teaching and inspiring students, and for communicating the fascination of glacier science to a wider public' (2012:no pagination).

The above examples illustrate that time-lapse photography can be used for qualitative and quantitative purposes. I used this method qualitatively and for much shorter periods than the examples I have described.

Practicing time-lapse photography

I used time-lapse photography for two reasons. Firstly, it was used to record changing coastal conditions over durations of time lasting several hours. I did not regard this as an immersive technique but rather a distanced observation of phenomena occurring on the outside while I remained indoors. Secondly, I used time-lapse photography as a means to document how I was working along the coasts, for example, conducting audio recordings (Fig. 4.9). This technique also captured how the environment was constantly moving around me.

This method has the capacity to show change over a duration of time that differed from single-shot, handheld photography and repeat-photography. Out in the field it is not possible to observe and process all of the events unfolding around the researcher. This method helps in bridging this shortfall even though the camera is fixed to one viewpoint and cannot replace the 360-degree freedom that a human observer can afford. The timeframe that I used ranged from minutes to hours. I fixed my digital camera on a tripod and set up the desired interval of time that I wanted to record. This interval varied from minutes to hours.

With regard to the presentation of time-lapse photography it may be shown as a sequence of photographs or presented as a movie where the photographs are

24 Additional examples using time-lapse photography in the Arctic include studies of sea-ice (Dufour-Beauséjour et al. 2020), avalanches (Eckerstorfer et al. 2013); and monitoring coastal erosion along Alaska's Beaufort sea coast (Wobus et al. 2011).

Fig. 4.9. The use of time-lapse to record working on ice. This method also captured weather and tidal conditions while I was conducting sound recordings of sea-ice at Kvalrossfjære, Bjørnøya. Source: photograph by Eimear Tynan, 3rd March 2019. Permission to reuse must be obtained from the rightsholder.

collectively and sequentially reeled out as a video file. I used both processes which allowed different ways to view change and also allowed for flexibility in sharing this information publicly. Creating a short video file dramatically speeds up the recorded phenomena as they unfold in real time which produces 'the appearance of events unfolding at a faster pace than they actually occurred' (Simpson, 2012: 430). This creates a compressed notion of time. If one were to stand in one position and look in one direction for hours some changes that are observed are difficult to discern at such as slow pace. Viewing the photographs as a video allows for a more explicit and dramatic examination of coastal processes at play. Time-lapse photography establishes a fixed, long-standing point of view that can record the dynamic conditions of an environment for hours, days, months or years depending on the research purposes. On reflection of using this method I regret not using it more in my research. It would have been a useful technique for capturing the boat journeys to the islands and to give a more extensive account of the changing sea and sky conditions.

4.3.9 Drone Photography

Drone imagery has become an increasingly popular method in landscape architecture. In an article evaluating the use of drones in landscape architecture, landscape architect and urban designer, Karl Kullmann (2018) explains the

important focal and scalar shift from the use of satellite imagery to drone imagery:

> The enhanced imaging and mapping capabilities of next-generation drone technologies are highly applicable to the near-scale at which landscape is both experienced and designed. Given that existing satellite-derived mapping technologies and techniques poorly serve this scale, the drone's eye exhibits significant transformative potential in landscape architectural practice and theory (2018:919).[25]

Drones have proved to be very useful for a range of coastal studies. A Norwegian research project called Seabee Norway, for example, has been established to 'understand and manage' habitats, water quality and plastic distribution along Norway's coast. The goal is to inform and assist regional and national policy makers. According to project leader Kasper Hancke drones give details of the coast that remote sensing, using satellite imagery, does not. In addition, drones can repeatedly return to the same areas, using the same system, to capture coastal dynamics such as the recording of seasonal changes along the coast.[26]

Another example, from 2017, was a study undertaken by a group of international researchers to monitor coastal erosion in the Canadian Arctic using drones. The work was conducted on Qikiqtaruk or Herschel Island. A selected area of coast was mapped seven times over a 40 day period during the summer of 2017. During this period, the researchers calculated that this part of the island's coast retreated by 14.5m. Incidentally, the long-term average, between 1952 to 2017, was 2.2m. In using drones for this work Cunliffe et al. concluded that:

> lightweight drones and aerial photogrammetry can be cost-effective tools to capture short-term coastal erosion dynamics and related shoreline changes along discrete sections of permafrost coasts… By combining new methods of observation with long-term records, we can improve predictions of coastal erosion dynamics and subsequent consequences for the management of fragile Arctic coastal ecosystems and cultural sites (2017:1524).

Although the two examples that I have provided are firmly rooted in the natural sciences they highlight some of the more prominent potential uses of drones for coastal studies. Although I regard myself as an amateur drone user I concur with

25 Other landscape architects that have written about the use of drones in the discipline include Rekittke (2015); Milligan (2019); Godfrey (2020).
26 SeaBee Research Infrastructure, 2021. SeaBee: What We Do and How it Works. [online] Available at: https://www.youtube.com/watch?v=yVsf3IYDwaU&t=19s [Accessed 10 August 2021]. Additional information about the research project may be found at: https://seabee.no/about/ [Accessed 10 August 2021].

these researchers that drones provide details of the coast that satellites do not (currently) provide and they are useful in capturing the dynamic nature of coastal environments. In my research I have used a drone specifically for photography and video but many researchers and landscape architects also use drones for mapping purposes. I have described my use of drone photography in my second publication *Shifting coasts: Developing New Coastal Concepts* (in press), and my third publication *What time is this coast?* (2021).

Practicing drone photography

The drone model that I used during in situ fieldwork was DJI Mavic Air. It is a small, lightweight drone that can fly to up to heights of 500m with a battery time of approximately 20mins. It can fly in wind speeds of up to 30km/hr which was an important consideration for coastal environments that can often have blustery conditions. I also invested in a landing pad for the drone to minimise sand and grit interfering with its mechanics. Prior to travelling to Jan Mayen, Bjørnøya and Hopen I consulted the *Governor of Svalbard*'s website for guidelines on the use of drones which included maximum flight height of 120m and avoidance of any disturbance to wildlife.[27] On arrival to each of the islands I also sought permission to fly the drone and this was granted on each island.

I used the drone for different purposes. Firstly, it was useful to get different aerial contexts of the coasts at different height and different angles that could not be achieved by any other means. In addition the drone could capture the meeting point between land and sea more comprehensively than if I was using hand-held photography as illustrated in my second publication *Shifting coasts: Developing New Coastal Concepts* (in press). Secondly, it was practical and safe to fly the drone to areas that were dangerous to access which was experienced at Tunheim on

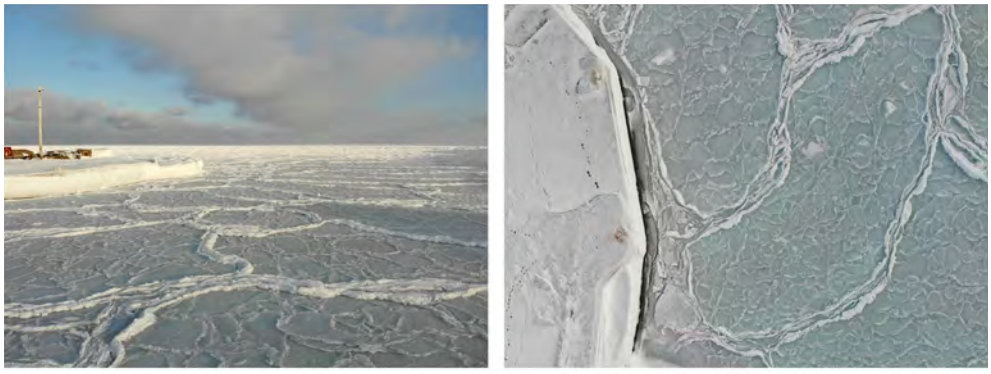


Fig.4.10. Drone photography over sea ice. Using a drone at different heights can provide a range of scales over the sea or land. Source: photograph by Eimear Tynan, March, 2019. Permission to reuse must be obtained from the rightsholder.

27 Since 01st January 2021 drone guidelines and regulations have changed in Svalbard (Norway): Governor of Svalbard, 2021. Drones on Svalbard. [online] Available at: https://www.sysselmesteren.no/en/drones-on-svalbard/ [Accessed 10 August 2021].

Bjørnøya. Finally, this method allowed for views to be taken *from* the sea allowing visual access to more materiality and particularly of the rocks and sediments along cliffs.

This method gave a level of detail that is not available through satellite imagery. Getting close to the materials of the coasts was successfully achieved with this method. An example of this was capturing the fine detail of sea ice around the north coast of Bjørnøya when I visited in March 2019. The drone could hover at varying heights to help me document up-close details of the ice as well as the larger patterns of ice from a higher altitude (Fig.4.10 on the previous page).

Fig.4.11. Two examples from Bjørnøya where I used a drone to follow my walking. For this drone feature to work there needs to be good contrast between the moving object and the surrounding environment. Source: video stills by Eimear Tynan, August, 2018. Permission to reuse must be obtained from the rightsholder.

In addition to photography I also took a number of videos using my drone. When the drone is hovering over the area where the sea meets land, a video can capture not only the tidal movements but the varying patterns that emerge on the beach during and after a wave. Video frames or screenshots can be taken from these videos to show sequential photographs that can capture such tidal change and movement. I also experimented with a video feature on this drone that can track and record my movements which offered another way to document how I was working and moving along the coast.

Finally, the drone has the capability to following moving objects. I used this feature to record some short walks on Bjørnøya (Fig. 4.11). This was experimental but it was useful in capturing a different perspective to what I was seeing as I walked.

4.3.10 Fieldnotes

Taking field notes was a very important method used during in situ research as it provided a first-hand and personal account of my impressions and thoughts of the islands. My fieldnotes feature in my first publication *Arctic Islands: Archival Exposures* (2020) and my third publication *What time is this coast?* (2021). Artist Laura Denning describes field notes as being:

> foundational yet also marginal. Field notes identify and anchor key trajectories within research, they sketch out a general direction and highlight potential areas where key findings might later be located. Field notes also have an integrity in their own right precisely because they are subject to memory and subconscious bias (2019:83)

During in situ fieldwork, fieldnotes did indeed feel marginal and were primarily used to record observations, experiences and reflections. However, through the processing of different materials over the course of the research the field notes became a much more integral part of my work. They helped to recover events that I had forgotten and they helped to communicate my subjective experiences, through my publications, to different audiences in different ways.

Fieldnotes were used in two different ways. Firstly, they were used to make short notes on the paper maps that I used while I explored the island coasts. They were more akin to scribblings than fully fledged notes. They resembled prompts to remind me to pay attention or to research different parts of the coast in more detail. Secondly, at the end of each day I recalled all the tasks that I undertook and the people I had talked to during the day through field notes. This inherited a more reflexive quality than the notes I scribbled while I was on site. I had the time to revisit methods I had used and to document the merits, downfalls or disappointments of these methods.

Unlike the other methods undertaken during in situ fieldwork, which was firmly focussed on the materialities of the coasts, writing my fieldnotes each evening on the islands inherited a different experience of time. I wasn't distracted by conditions around me or concerned about the next steps that needed to be done before the sun went down. Instead, writing notes was about reflection and my thoughts at that particular moment when I was writing. The places where I wrote up my notes varied from the small, quiet, dark cabins on Bjørnøya where I listened to fire logs hissing in the stove to the sterile, windowless cabins of the Coastguard vessels that had a constant humming of the engines in the background.

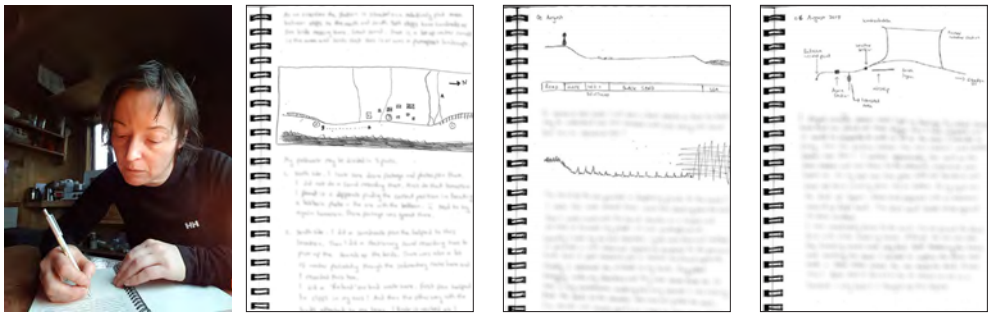


Fig.4.12. On the left: Taking fieldnotes at Teltvika cabin on Bjørnøya. Fig.4.13. On the right: Examples of fieldnotes taken during fieldwork on the islands. They they included notes and sketches. Source: photographs by Eimear Tynan, August, 2018. Permission to reuse must be obtained from the rightsholder.

Fieldnotes as a method to record observations or thoughts rarely feature in publications in landscape architecture even though there is encouragement, in education, to use this method. Having read through numerous historical accounts of visitors and explorers who ventured into the Arctic in the 19th and 20th century I see huge value in having personal accounts of impressions and reflections on place. They offer another perspective from a particular time and place that can complement other methods, most notably of the visual kind.

4.3.11 Audio Recordings: Stationary and soundwalks

As an experimental addition to in situ fieldwork I conducted audio recordings on the islands. In preparation, I undertook a weekend long course on field recording at the London Film School to gain basic knowledge on the type of recorder and microphones to use and how to conduct recordings using different equipment. The purpose of including audio recordings was to actively involve another sense, beyond the visual. Sound offers a different kind of immersion in space and enriches our perceptions and knowledge of what is around us. Michael Fowler, a musician whose work involves the study of sound in architecture and landscape architecture, points out that there is much potential in accessing and using sound at the early stages of the design process and it acts as a 'mediating language between listener and environment' (2012:113).

In the Arctic where the surfaces can dramatically and temporarily change from stone to snow or from liquid sea to ice, sound recordings are very effective in capturing these material changes. The changes conditioning the materials are brought about by processes beyond the site such as wind, temperature change and tides. These processes and conditions are not adequately captured through photography and therefore, sound recordings supplement new readings of this coastal site.

Fig.4.14. Equipment for audio recording. On the left is the audio recorder on a short tripod. Beside the recorder are a GPS device and headphones. The photograph on the right shows the tracks from a sound walk along Helenesanden, Jan Mayen. Source: photographs by Eimear Tynan, August, 2018. Permission to reuse must be obtained from the rightsholder.

Stationary audio recordings

I implemented two different sound recording techniques during my coastal encounters. The first type of audio recording was stationary where I placed a sound recorder, on a small tripod, by the sea. The second type of audio recording was mobile and I called these sound walks (Fig. 4.14).

Stationary audio recordings were done in conjunction with my repeat photography method where I did short audio recordings at the locations where the photographs were taken (refer to audio recording AR1). This was to provide an enlivened dimension of the coast as well as adding a more immersive experience for those viewing the photographs.

Fig.4.15 Repeat photography from Gamle Metten, Jan Mayen accompanied by an audio recording. The historical photograph on the left was taken in 1949. Source: Norwegian Polar Institue. Photograph on the right was taken during my trip to Jan Mayen in 2018. Source: photographs by Eimear Tynan, August, 2018. Permission to reuse must be obtained from the rightsholder. AR1: Stationary recording at Gamle Metten. The QR code above provides a link to the audio recording that I took during my visit to Gamle Metten. Alternatively the following website provides access to the recording: https://soundcloud.com/user-921067170/jan-mayen-file037?utm_source=clipboard&utm_medium=text&utm_campaign=social_sharing

When I visited Bjørnøya in March 2019 I also carried out a number of stationary sound recordings on the sea ice. This time, there was no relation to historical photographs unlike the previous use described in the paragraph above. I experimented with this method by using a different type of microphone called a contact or piezo microphone which is held directly against a material to record vibrations running through the material. I found this to be an excellent form of recording sea ice whereby the friction between small compact islands of ice, known as pancake ice, was heightened with the movement of the tides (refer to audio recording AR 2). The subtleties of the tides, which were barely perceptible to the naked eye due to the frozen state of the sea, were amplified through audio recordings. This recording, in particular, captured varying conditions of the sea and ice.

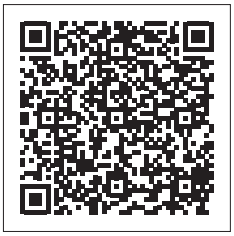
The photographs (from Fig.4.9) showing audio recording undertaken on sea ice along the coast of Bjørnøya in March 2019. AR 2: Stationary recording on sea ice, Bjørnøya. The QR code provides a link to the audio recording that I took during my visit to Gamle Metten. Alternatively the following website provides access to the recording: https://soundcloud.com/user-921067170/bjornoya-sea-ice-iwav?utm_source=clipboard&utm_medium=text&utm_campaign=social_sharing

I have written about this sea ice recording in my fourth article *Temporal Perspectives on Arctic Peripheries* (under review). However, due to the exclusion of alternative media in this publication the actual sound recording is not included. I tried to overcome this obstacle by offering a textual interpretation of the sounds with words added to the irregular movement of the sea ice. This is undoubtedly a compromise to audio recordings and does not do justice to the richness of the icy conditions and material complexities captured in the recording. However, an alternative interpretation does allow for a personal take on how sound can be expressed spatially on a page whilst drawing attention to particular sounds and beats.

Sound walks

The second way in which I incorporated sound, as a method, into my work was through mobile means where I recorded the sound of my walking from land to sea. These I called sound walks. These walks were not only experiential in character but capture the diverse sounds of materials underfoot (refer to audio recordings AR 3 and AR 4). The sea, wind and birds provided background acoustics at the start of the walks and as I progressed towards the sea, the sound of the waves crashing on the shore became most dominant. I have included one sound walk in my fourth article *Temporal Perspectives on Arctic Peripheries* (under review) and have used a textual interpretation similar to that described in the previous paragraph on stationary audio recordings.

AR 3: Sound walk, Hopen. This audio recording was taken adjacent to the meteorological station on Hopen. There were several small streams and rivulets draining into the sea. This recording is of a short walk along a small stream leading to the sea. There are very distinct sounds from the materials underfoot, starting with wet, gravelly sounds to the pebbles on the shore. The QR code provides a link to the audio recording. Alternatively the following website provides access to the recording: https://soundcloud.com/user-921067170/hopen-sound-walk-i?utm_source=clipboard&utm_medium=text&utm_campaign=social_sharing



AR 4: Sound walk, Jan Mayen. This audio recording was taken on Helenesanden, Jan Mayen. I walked perpendicular to the coast to show how the sound of the waves crashing on the shore gradually became louder as I approached it. The very fine volcanic sand was soft to walk on and as the waves retreat there is a faint hissing released. The QR code provides a link to the audio recording. Alternatively the following website provides access to the recording: https://soundcloud.com/user-921067170/jan-mayen-sound-walk-i?utm_source=clipboard&utm_medium=text&utm_campaign=social_sharing

The audio recordings that were used in this research offered another way of studying the materials of Arctic coasts and provided minute details of the materials whilst capturing background sounds from seabirds or the wind. There were many processes documented in this method. These processes included the impact of my walking on and through these materials, the wind shifting the snow across an icy surface or the tide pushing and squeezing the compact sea-ice. The recordings allowed for a fluidity of these materials to be evoked which visual forms of representation such as photography and mapping cannot achieve. Landscape architect David Buck claims:

> If landscape is an alchemy between place and time… then attempting to freeze these experiences into static instances in time in order to draw them, will inevitably exclude the temporal qualities of the experience (2017: 4).

I feel every method I have chosen in this research offers different temporal expressions. Audio recordings, a method that I had no experience with prior to this research, captured a liveliness to the coasts that was not quite as explicit in other methods. Where photography and mapping chiefly rely upon the visual, the audio recordings offer a very different and perhaps more wholesome perspective of a place. In comparing vision and sound the Finnish architect, Juhani Pallasmaa, explains ‘sight isolates, whereas sound incorporates; vision is directional, whereas sound is omni-directional’ (2005:49). However, listening and reflecting upon these recordings I realized there is something rather contradictory about them. On one hand, they offer minute and immersive details of a place and on the other hand, if one did not know where the sounds were recorded, they can sound placeless. It is necessary, I feel, to use audio recordings with other methods such as text, photographs or maps for a more complete reading of these coastal environments.

4.3.12 Observing the weather observers

When I was based at the Meteorological Station on Bjørnøya I took part in a work shift to become more acquainted with the different types of weather observations that were done there. This was an informal undertaking and came about due to bad weather that prevented me from taking an excursion on the island. On the 30th August, 2018 I joined Venke Ivarrud for a 6-hour work shift at the meteorological station. The work was located in two different areas of the station. One area is where weather balloons are set-up, launched and monitored. The other is the main base where all other data is monitored and recorded (Fig.4.16).

Fig.4.16. Venke Ivarrud working at the heart of Bjørnøya's meteorological station. Source: photograph by Eimear Tynan, 30th August, 2018. Permission to reuse must be obtained from the rightsholder.

At Bjørnøya meteorological station the following weather parameters are recorded: precipitation, air pressure, wind speed and wind direction, air humidity, temperature (air and sea), visibility, cloud observations,[28] sea ice (type and thickness), and other phenomena such as northern lights activity. At this weather station weather balloons are launched to measure temperature, humidity and pressure from the ground to heights of up to 39,000m. One of the first activities that I observed at the station was the launch of a weather balloon. A radiosonde, for upper air observations, is a small plastic box that is attached to the balloon and relays information about different weather parameters such as temperature,

28 Cloud observations involve different methods. An automatic instrument called a ceilometer is used to measure the height of cloud bases and overall cloud thickness. A meteorologist, meanwhile, observes cloud type and cloud cover.

Fig.4.17. Balloon launch from Bjørnøya's meteorological station. The top three photographs show the preparation of the weather balloon (with a radiosonde attached to record weather data) by Venke Ivarrud. The six lower photographs show the stages of the balloon launch in very windy conditions. This balloon reached a height of 32,000m. Source: photograph by Eimear Tynan, 30th August, 2018. Permission to reuse must be obtained from the rightsholder.

pressure, humidity, wind speed and wind direction. Preparation involves inflating the balloons with hydrogen followed by a careful launch outdoors which can be challenging in very windy conditions (Fig.4.17). Two balloons are launched daily and four in the winter time when weather conditions can be more severe thus warranting extra weather data.

After taking precipitation measurements Venke proceeded to explain the process of cloud observation. This part of the work shift I found particularly interesting. It requires astute observation skills that must ascertain how much of the sky is covered by cloud as well as the identification of different cloud types all the while everything that is being observed is constantly moving and morphing. My preconceptions of weather observations being a controlled, objective and scientific endeavour began to shift. Instead, there are parts of this job that require embodied, situated accounts of the weather.

I observed Venke preparing for her outdoor cloud observations by putting on her boots, rain jacket and hat before assigning the weight of her body against the heavy door of the weather station to exit into blustery weather conditions. The immersion and adaptation to the weather outside the station gave insights into the realities of working at the station. I was curious to know how cloud observations were done during polar nights when darkness prevails for months at a time. Venke explained that while observations are certainly more limited a cloud observer must allow for some time for the eyes to adapt to the darkness prior to cloud observation. The World Meteorological Organization adds to this advising that 'Night vision works best when using peripheral vision; moving your head from side to side will reveal more detail than a fixed gaze.'[29]

In the process of cloud observation clouds are identified and recorded through a coding system. Cloud observation consists of two main parts. Firstly cloud cover is assessed and is measured in oktas. The observer takes a 360° look at the sky and mentally divides it into eight parts each of which is called an okta. On the okta scale, 0 oktas represents the complete absence of cloud while 8 oktas represents full cloud cover with no breaks.[30] The second part of cloud observation consists of the identification of clouds. The appearance of clouds is 'described in terms of the dimensions, shape, structure, texture, luminance and colour'.[31] Clouds are classified by their height level – cloud low (C_L), cloud medium (C_M) mid-level and cloud high (C_H), and the various cloud types that are associated within these levels. The

29 https://cloudatlas.wmo.int/en/identifying-clouds.html [accessed 30 July 2021]
30 The okta scale is explained on the website: https://polarpedia.eu/en/okta-scale/
31 World Meteorological Organization, 1975. *International Cloud Atlas - Manual on the Observation of Clouds and Other Meteors*. Geneva: Secretariat of the World Meteorological Organization: 9. The International Cloud Atlas is used by staff at Bjørnøya Meteorological Station. Hamblyn (2008) is also used at the station for cloud identification and classification.

Linnaean system of classification is used to classify the type of cloud [32] consisting of genera, species and varieties. Cloud height level and cloud type are reduced to a code number. An example of this is: C_L2 where C_L represents low cloud level and 2 represents cumulus cloud of moderate or strong vertical extent.

Reflections on working at the meteorological station

The 6-hour work shift at the meteorological station proved to be a very significant turning point in my research for a number of reasons. I became aware of the different skills and techniques that were required to record quickly shifting weather phenomena. Meteorologists actively engage with time and their environment. Even though technology plays a role in almost every type of weather recording, human engagement is vital through cloud identification, visibility, launching weather balloons, checking weather instruments and inputting data into computer systems.

I became very aware that meteorologists are constantly engaging with varying scales of time and space. There is attention to what is observed directly outside the weather station for example if the ground is wet or dry, and there is a more horizontal reading through ascertaining visibility from the station. Then, there is the vertical reading through the observation of clouds hundreds and thousands of metres overhead. In other words, there is a process of constantly looking up, down and around. This particular point directly influenced how I developed a framework on how to approach tempo-material readings of coasts described in the fifth chapter of this exegesis where I propose vertical and horizontal readings that traverse the atmosphere, biosphere, hydrosphere and lithosphere.

The experience of working with an expert made me reflect on how landscape architects observe. Meteorologists have a very prescribed and repetitive method for observing different weather phenomena and it is a skill that is taught. In landscape architecture, I questioned whether the skill of observation is taught or acquired and how, for the purposes of this research, it relates to time. In meteorology time is infused in the materials observed but this time is strictly communicated as clock time (hourly, weekly, monthly, annual recordings) as is evident in any weather data chart. This uniformity allows us to gain insights on conditions at the station, to see climate trends that have developed and predict future climate scenarios.

This section concludes the second phase of my research methods. The following

32 The Swedish botanist Carl Linnaeus introduced what is known as the binomial nomenclature classification system where genera and species are used. Referring to the history of cloud classification, historian of science, Lorraine Daston (2016) describes the difficulties involved in adopting a botanical classification system for cloud classification: ‘cloud descriptions must be even more brutally reductive: they must also frame the phenomenon in both time and space, before it mutates into something else entirely. Species evolve over epochs and eons; clouds evolve over minutes and seconds.’ Richard Hamblyn (2001) provides a detailed account of the history of cloud classification through the work of Luke Howard.

section draws attention to the in-between phases of my fieldwork which firstly incorporates travelling by boat to the islands and secondly, walking between coastal sites on the islands.

4.3.13 Phase 03: Between coasts: On the sea

The time it took to travel between different locations became a significant part of this research because it involved different ways of processing knowledge about island coasts. This integral part of fieldwork is usually overlooked in research but in the case of this research it warranted attention. Prior to arrival onto the islands, a lot of time was spent at sea with a minimum of 24 hour journeys to each island. The main method I used to record these journeys was through photography. However, what made this method a little different compared to the way I photographed in previous sections, was that I was constantly moving as the boats sailed to and from the islands (Fig. 4.18).

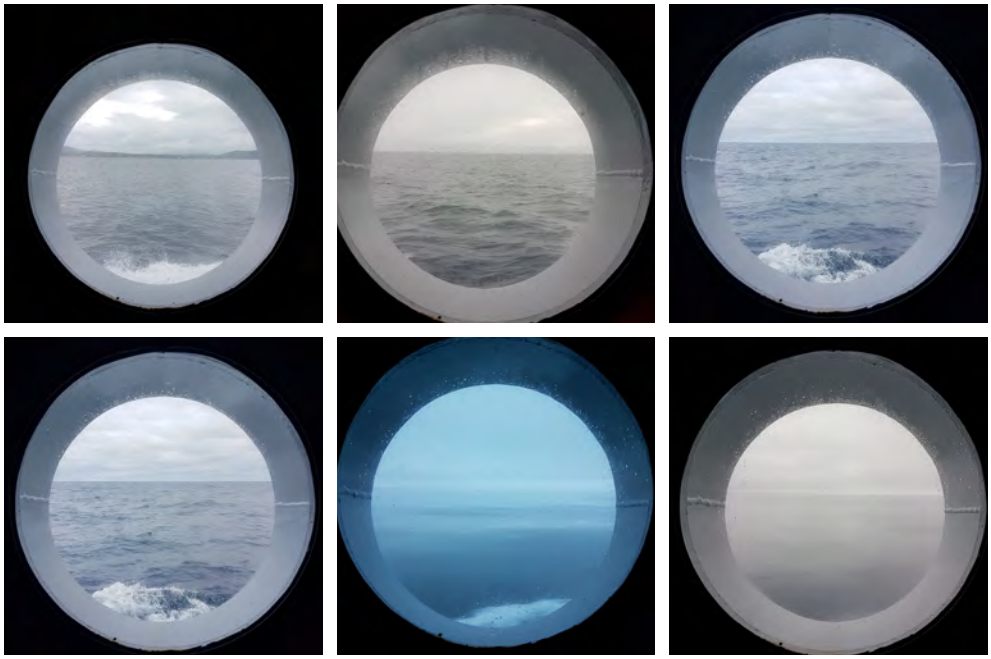


Fig. 4.18. A selection of photographs capturing different sea and sky conditions on the 3-day journey to Jan Mayen. Source: photograph by Eimear Tynan, 30th August, 2018. Permission to reuse must be obtained from the rightsholder.

On a boat, there is full exposure to the weather and the sea. Each fine movement of the sea is felt. Artist and film-maker Peter Hutton, who documented journeys on the sea, shared this reflection (cited in Adams Sitney, 2008):

> One of the great revelations of traveling by sea is how slow it is compared to airplane or even train travel… One of the exhilarating

> and terrifying aspects of traveling by sea is the vulnerability you feel and the fact that you're not isolated from nature, but are rather in the heart of nature itself… Being on the ship forced me to slow down, and allowed me to take time to look.[33]

Hutton's work looks outwards but at the same time captures the experiences of the observer as they move with the slow, movement of a ship. In landscape architecture there is usually more emphasis on how we approach and arrive to a site. I also found that departure from these Arctic islands was significantly different to the arrival. Arriving to the islands I was full of expectation and curiosity (Fig.4.19).

Fig.4.19. The first glimpse of Hopen (on the left) and Jan Mayen (on the right). The first impressions of each island were always a special part of the journey and as the coastguard vessel approached the islands. Source: photograph by Eimear Tynan, August, 2018. Permission to reuse must be obtained from the rightsholder.

Travelling by boat was a slow and gradual process that moved through the shifting conditions of the open seas. Photographs taken on these journeys were wide-angled to allow for the wide context of sea and sky to breathe. If weather conditions were good and being on the ship's deck was safe, I took photographs in the open air, but otherwise from the bridge of the ship.

Departing from these islands, conversely, could be compared to leaving a new acquaintance. I left with a sense of familiarity and a little sadness. As I looked at the island's topographical details one last time, I paid particular attention to photographing the areas I had visited. Seeing these areas from the sea, rather than the land, captured a context and scale that I had not experienced on land (Fig.20)

The experience of travelling by sea to the islands became a part of my third publication *What Time is this Coast*? (2021), and my fourth publication *Temporal Perspectives on Arctic Peripheries* (under review). In both publications I have used photographs from my journey to Bjørnøya in March 2019 when sea ice was

33 Hutton's documentary *At Sea* was both inspirational and influential in my work in helping to articulate journeys by sea and highlighting the importance of observing conditions that surround the traveller. This documentary is available at: RIAN, 2012. *At Sea, Peter Hutton, 2007*. [online] Available at: https://www.youtube.com/watch?v=rM4V7lAy74M [Accessed 12 August 2021].

present. The conditions of the sea changed dramatically during this journey and the light conditions were equally as changeable. Approaching the island through the sea ice set the context for the entire excursion on the island where I worked closely with frozen coastal materials. This trip to Bjørnøya brought with it a reminder that these freezing conditions that transformed the materiality of the coast are occurring less and less as a result of a rapidly warming Arctic. There was, as a result, a condensed experience of time with this short visit to research a frozen island coast. There was also reflection on the longer, drawn-out scales of time involving a changing climate that will directly influence the future materiality of this island.

Fig. 4.20. Departing from Hopen and Bjørnøya. On the left, Hopen, in August 2018, and on the right, Bjørnøya in March 2019 with the Norwegian Coastguard vessel. Source: photograph by Eimear Tynan. Permission to reuse must be obtained from the rightsholder.

4.3.14 Walking

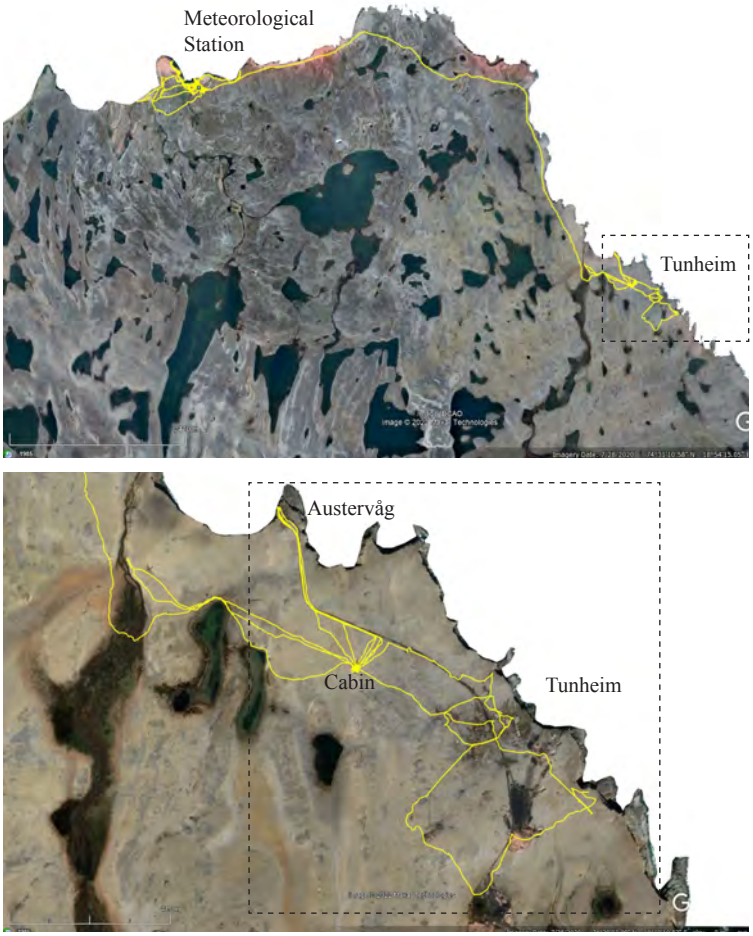
The second in-between method that was also an integral part of my research on these islands was walking. 'Despite all technical progress, in landscape architecture and urban design the direct contact to ground and detail will remain indispensable' (Ninsalama and Rekittke, 2016:159). It is not surprising that the practice of walking features in modes of research relating to landscape such as geography,[34] anthropology,[35] urbanism and landscape architecture. In landscape architecture a number of texts have emerged that feature walking as an integral part of in-situ fieldwork.

Landscape architect Katherine Jenkins, for example, stresses the benefits of walking iteratively in her teaching course called *Field Exercises* whereby the designer 'can repeat a route in varied atmospheric conditions and, in so doing, observe changes in the landscape over days, weeks, or months' (2018:8). Jörg Rekittke takes a military style approach to walking with his students where the 'mission' of *foot soldiers* 'is to provide information that cannot be gathered by any aviator' (2015:62). He proceeds to stress that, through this mode of fieldwork,

34 Geographers who have written about the practice of walking include: Edensor (2008, 2017); Lund and Wilson (2010); Ryan (2016); and Wylie (2005).
35 Anthropologists who have written about the practice of walking include Ingold and Vergunst (2008); Lee and Ingold (2006).

detail and contact with the terrain provide indispensable knowledge for the landscape architect. A more categorical approach is taken up by Filipa Matos Wunderlich (2008), [36] Henrik Schultz (2014) and Ben Jacks (2004). These authors depict distinct sequences of change that are experienced by a walker as they traverse the landscape which is broken down into varying 'modes' and 'practices'.

My experience of walking on the islands was not so much regarded as sequential but inherited two distinct spatial patterns. There were two components to walking on the islands. The first was walking to and from the selected coastal sites. On Bjørnøya, for example, this entailed walking for many hours along the coastal fringe where impressions of the island developed and where my thoughts were given time to wander too. This walking to and from a site may be regarded as linear but meandering. Landscape architect Andrew Toland extends this linearity to a temporal dimension stating that 'walking is nothing if not a continuous tube of time



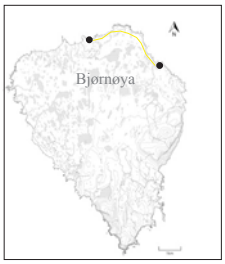


Fig. 4.21. Recorded walks between the meteorological station and Tunheim, Bjørnøya. In the upper image one can see the concentration of routes around the Meteorological station and again at Tunheim.

The lower image zooms into the Tunheim area. Once again there are concentrated routes at Austervåg and the cabin demonstrating areas that were mostly used/visited.

Source: Google Earth Pro and GPS routes recorded by Eimear Tynan. Permission to reuse must be obtained from the rightsholder.

36 Filipa Matos Wunderlich's article (2008) is firmly rooted in an urban context which directly influences her categorisation of three modes of walking: the purposive, the discursive and the conceptual.

organising sensorial organisation from place to place in a continuous, unbroken line' (2013:297).

The second aspect to walking on these islands was at the coastal sites themselves. The sites were never perceived as bounded in any way. Walking around and through the sites went hand-in-hand with deciding where to set-down my tools and apply a multitude of techniques. This second aspect of walking felt centrifugal whereby walking in a more concentrated manner in one area brought radiating modes of working and thinking beyond the site (Fig.4.21 on the previous page).

Immersive dimensions of walking

Walking has the potential to be an immersive practice for landscape architects. I use the word *potential* because walking is more often than not used simply as a way to move around a site as efficiently as possible. By this I mean that walking is often a contained practice within the confines of site boundaries as well as bounded by time that must be calculable and accountable for a client's bill. Prior to this doctoral research, a former work colleague and I wrote about the embodied practice of walking based on an excursion to Bjørnøya with a small group of students.[37] In this text we write that:

> Walking brings about a focus on the body as it moves and navigates through a space. It is a perceptual process that links the body to the ground beneath. This dialogue between the body, the ground, and the surrounding space is a rhythmic response to the conditions encountered…Through walking there is a measurement of the body as it is contextualised in the wider landscape. (Tynan and Kampevold Larsen, 2017: 147).

This immersive mode of walking resonates with the practice of Günther Vogt who underpins the values of walking:

> We look outwards, with our minds open; we look inwards, thoughts wandering in time with the rhythm of a walking pace. The environment shapes our thoughts. Tuned into the landscape, we sense the presence of past and present life, letting our intuition and imagination lead us to the atmospheric haunts of former peoples, and to the recent habitats of creatures (Foxley, 2010: 31).

The island coasts that I visited looked so fixed on a map yet felt so unfixed under foot. The rich and diverse materiality of each of the islands ensured that

37 The studio course which I designed, organised and taught was centred on post-industrial sites in the Arctic and involved a study trip to Tunheim on Bjørnøya which was once a coal mining village.

a comfortable walking rhythm was never quite accomplished which heightened an awareness of corporeal awkwardness as well as the textures underfoot. There were also changing weather conditions that I had to contend with during these excursions. Geographer Susannah Clement claims that 'we are always with the weather, always feeling it, always being weathered by it, always *weathering*' (2021:54). This rang true in my experience of walking along exposed island coasts. I was exposed to a remarkable range of micro-climates as I meandered around the coasts where I might start the journey battling the winds and might end my journeys with the wind pushing me towards my final destination. The condition that made the strongest impression on each trip was the changing light. Being adjacent to the sea is likely to have exaggerated this perception with the reflective and absorbing qualities of the sea surface.

Walking as a method was an important part of my fourth publication *Temporal Perspectives on Arctic Peripheries* (under review) which I combined with my audio recordings. This text describes walking in a snowy and icy coastal environment which I had not written about previously. Both methods, walking and audio recording, worked well in drawing attention to the fine acoustic qualities of textures underfoot.[38] If I was to take this combination of methods further I would argue that they could be used as alternative ways to map a site where materials are prioritized over spatial accuracies.

4.3.15 Phase 04: Model making

The final phase of my research concerns the processing of material gathered in the previous phases (in situ and in-between fieldwork). This section that follows describes the three methods of model making, map making and article writing which were done in indoor environments. The decision to make models in this research was inspired by my trip to Bjørnøya in March 2019 when I encountered the frozen shores of Kvalrossfjære, located a short distance to the west of the meteorological station. The materials and processes that I observed on site were documented in my field notes and photographs. These included the wind shifting light, dry snow onto icy surfaces, the diverse frozen dripping patterns on the rocks at varying angles, the wind sculpting miniature snowy terraces on sloping terrain, and the presence of low-angled sunlight accentuating all of these frozen patterns. What I was observing was a diverse range of patterns that were partially created when low temperatures transformed the seawater from liquid to semi-liquid to solid matter. The processes of wind and sunlight transformed the materials further.

38 During my time on the islands I did not walk in dark conditions due to safety reasons. However, having lived in the Tromsø, Norway, for approximately five years walking during dark periods can be very rewarding. In his book *From Light to Dark* (2017) Tim Edensor discusses how different senses, such as sound and smell, are heightened in dark conditions.

I used the materials of plaster and wax for model making (Fig.4.22). These were chosen for their capacities to change from liquid to solid. I wanted to immerse myself in this process to observe how these materials could solidify in different ways. The model making processes that I explored formed a significant part of my third publication *What time is this coast?* (2021). The material experimentations were just one part of this model making exercise. I also wanted to explore different expressions of time relating to these materials as well as my own temporal experience in working with materials through model making.

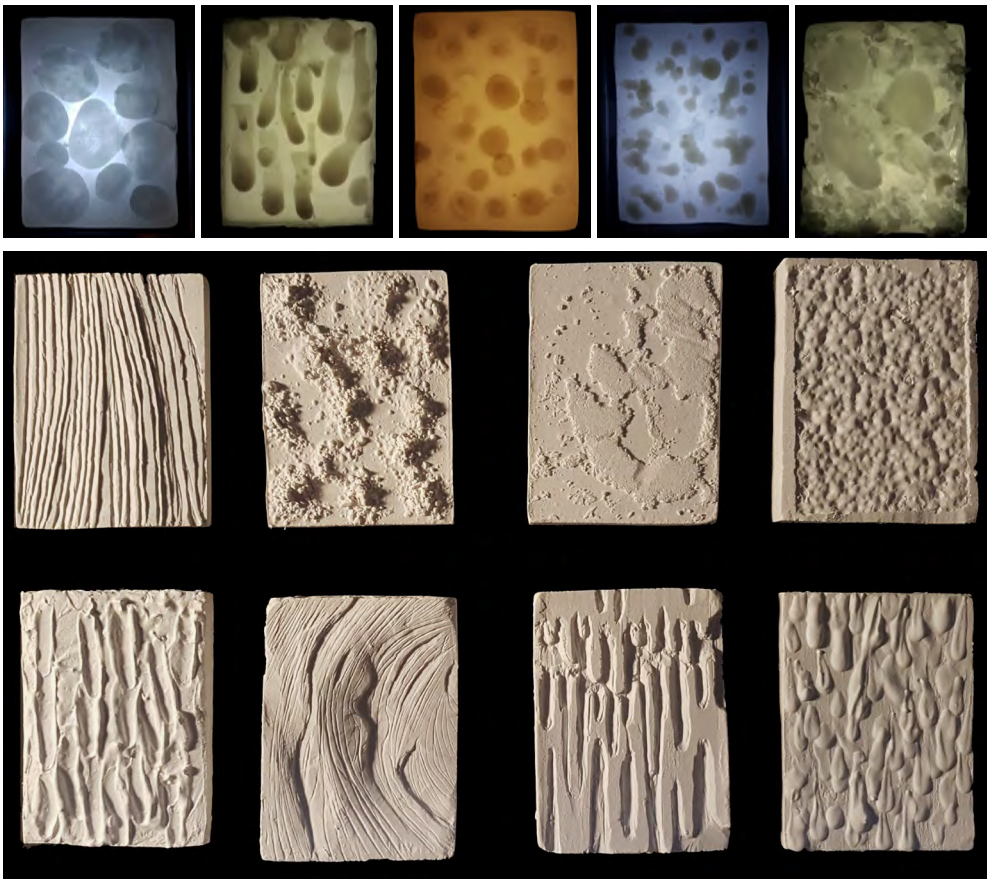


Fig. 4.22. Photographs of wax and plaster models. Top row of photographs show a sample of wax models with a light placed underneath. The bottom row of photographs show a sample of plaster models with a light source placed at an oblique angle to emphasise the textures. Source: photograph by Eimear Tynan, 2019 and 2020. Permission to reuse must be obtained from the rightsholder.

Through my close engagement with ice and snow I was reminded of an excerpt written by Jeffrey Jerome Cohen concerning stone. To overcome the disconnectedness that Cohen feels prevails in our engagement with nature or the nonhuman he proposes that:

> If nature, refracted through the geological, is understood as *interfactual* (knowledge arises within mediated spaces),

> *transcorporeal* (a phenomenon of bodily crossings and ontological hybridities), *transmaterial* (forces and things that may at times be utterly indifferent to Homo sapiens but not to other nonhumans, with whom a multitude of relationships are composed), our ethical connectedness to the nonhuman would become more tangible (Cohen, 2015:12).

This three-pronged solution that Cohen proposes resonates with my model making ambitions. Through the *interfactual* I wanted to create new knowledge about materials that I engaged with on site through model making. *Transcorporeal* reflected the capacity of the materials to changing states between liquid and solid. It also incorporates how I engaged with these materials. *Transmaterial* I interpret as expressing how the materials reacted to conditions. Temperature, for example, dictated their eventual formations. These materials were also transformed when light shone on them at different angles. The use of *inter*-, and *trans*- by Cohen also iterate the fluidity of all materials which I find very helpful in articulating the shifting states and conditions of materials on site and translating these qualities in a studio environment.

There were several positive outcomes to using model making as a method for this research. Firstly, materials that have the capacity to change state are highly appropriate for design work concerning studies in the Arctic where many materials transform throughout the year. Secondly, this immersive method helped to unfold and delve into alternative concepts of time. As Ellen Braae points out, 'It [time] relentlessly changes objects, places, and conditions from one state to another, for even these intermediate states are never static' (2017:55). Rather than refer to this frozen strand as simply the product of seasonal change, I considered the duration of the materials, processes and states of this coast. I illustrated, in my third publication, that multiple temporalities were playing out on site and in the model making process. Finally, the relations I made between methods undertaken on site and in the studio deepened my knowledge of Kvalrossfjære. Spending time to physically create a model deepened my understanding of materials, textures and processes. It is these ever-changing states that characterise Arctic environments where there are dramatic material changes experienced annually.

4.3.16 Map Making

The second method that I adopted in my studio setting was the creation of different maps which were used for different purposes. Maps feature in all of my publications primarily as a means to communicate to readers where my research was taking place. I have used a range of maps ranging from historical maps to ones that I produced myself. I made maps to bring additional information to sites that were not presented on other maps. Some of these maps also reflected how I perceived and experienced these coasts.
Prior to visiting the islands I consulted maps and aerial imagery provided by the Norwegian Polar Institute[39] as a means to become more familiar with the topography along the coasts. The printed maps that I used during my fieldwork had varying scales. The Bjørnøya map was printed to a scale of 1:50,000 while maps of Jan Mayen and Hopen were printed to a scale of 1:100,000. These maps were primarily used for orientation purposes and for scribbling notes on. They were, however, inadequate for the specific sites I visited because of the lack of detail at these scales. To counter this inadequacy I brought a print-out of an aerial photograph of the selected sites downloaded from the Norwegian Polar Institute's website which had more detail to help with fieldwork.

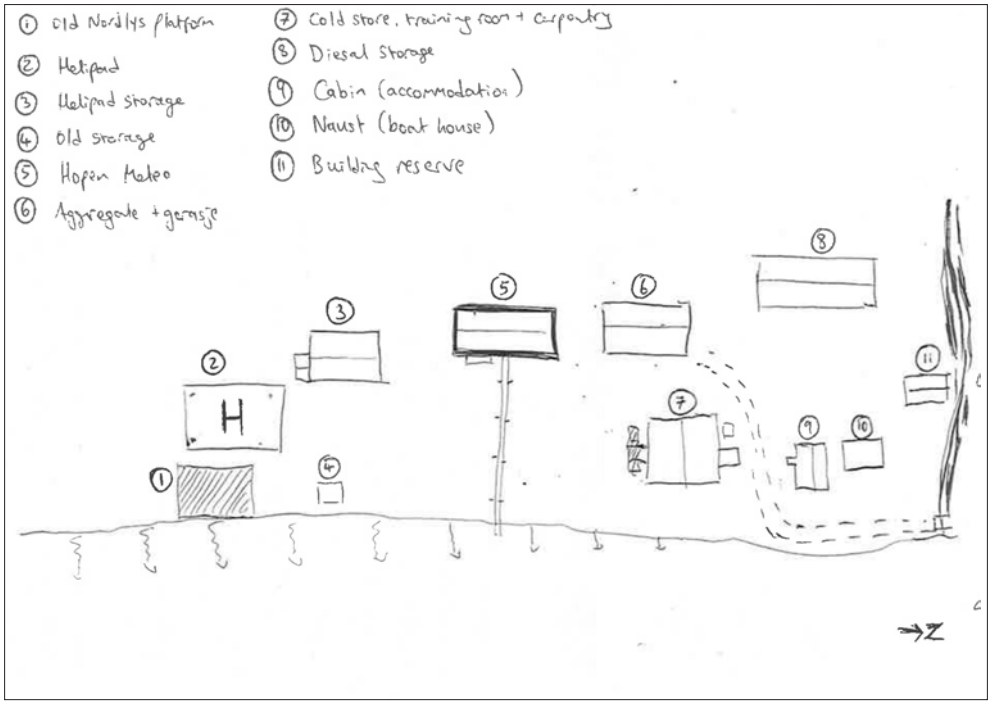
These maps and aerial photographs worked well for fieldwork undertaken in August 2018 when the land and sea were unfrozen and topographical features were clearly identifiable. However, many features that were present in a 'summer' version of the maps simply disappeared in the reality of an Arctic winter/spring period. The green, blue and brown hues faded to muted tones of white, grey, blue and black. My awareness and observation skills needed to be heightened during the early spring visit to distinguish differences between map and coastal realities.

Personal Maps

The maps and aerial imagery provided by the Norwegian Polar Institute provided a helpful base to work from. However, due to the inadequacies of scale and the omission of more detailed topographical features I created my own maps. There were two stages to making these maps. During in situ fieldwork I sketched maps of the site. These simple maps were primarily for spatial purposes – locating different features that were pertinent to coastal sites and to document different forms of fieldwork that I did at different areas of the site (Fig.4.23).

The second stage was done post-fieldwork when I had more time to process all of the data I had gathered. I wanted more accuracy to the maps and I also felt it was important to add layers of textures to these maps to reflect the different materials

39 The Norwegian Polar Institute is responsible for the production of topographic and geological maps of Norwegian Polar regions. In addition, the institute's website has an online map viewer where satellites imagery of the islands may be viewed: https://www.npolar.no/en/maps/.



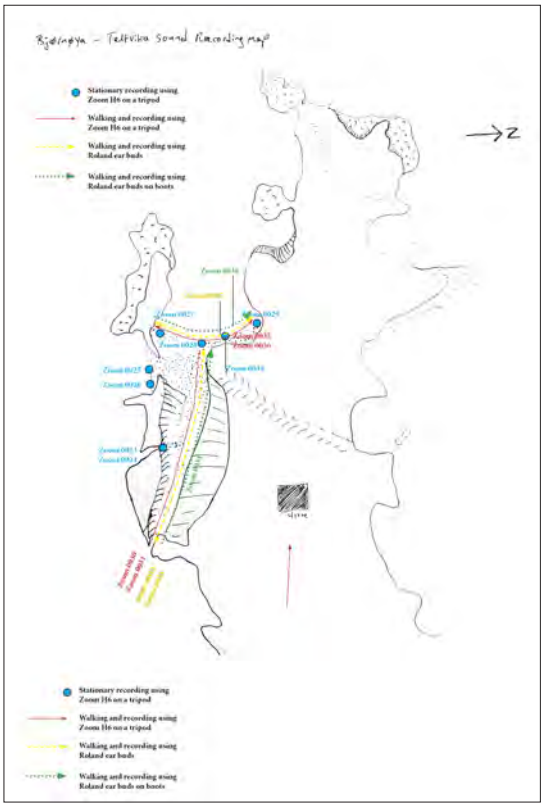


Fig. 4.23. Sketch maps from Hopen and Bjørnøya. The sketch map from Hopen (above) includes information on the different buildings associated with the meteorological station and the location of where different fieldwork methods were done. The sketch map below documents different audio recordings undertaken at Teltvika, Bjørnøya.

Map sketches by Eimear Tynan, 2019 and 2020. Permission to reuse must be obtained from the rightsholder.

and intricate morphologies that I had encountered. These maps have featured in the third chapter of this exegesis where I introduce each of the islands.

The coast I visited on Bjørnøya in March 2019 bore little resemblance to the maps I had become familiar with from my previous trip. The diverse range of materials, textures and colours were replaced with ice and snow that revealed their own textures and formations. This enticed me to create another map that reflected the coast I had observed and experienced. This map was included in my third publication *What time is this coast?* (2021). While I was in the process of making small models made of wax, I decided to experiment with using wax to make a three-dimensional map. I printed an aerial view of a section of coast I had worked with and overlay it with wax. To emphasise topography I added a fine layer of charcoal shavings to represent shade and texture. I proceeded to photograph this model where it was transformed to a two-dimensional format. Using computer software (Adobe Illustrator) I added notations to this plan and textures to the sea which I could not achieve with my limited wax-moulding skills. My approach was experimental but I felt it gave a more true representation of the coast I visited rather than the map I had held in my hands while I was on site.

The creation of personal maps provide a record of what I observed and experienced at the time of my fieldwork visit. They are not only site-specific in a spatial sense but may be understood as *material*-specific and *condition*-specific that relate strongly to a particular time. The spring visit to Bjørnøya was a sobering experience in my understanding of maps and how landscapes and oceans resist the confines of map-making. It compelled me to broaden my views of how to create maps that offer more true reflections of the realities of a coast.

4.3.17 Article writing

The final method that I used in my research was academic writing. This is not usually included as a method in a doctoral thesis. However, being a designer I found academic writing a very different but rewarding way of expressing my work and research. This method will be briefly examined in relation to the tempo-material enquiries of this research.

The publications produced in this research meant pulling together other methods from my research and processing them through to a formal two-dimensional format. The publications and methods described in each publication are summarised in the table below (Table 4.2). Each of the publications draw attention to Arctic islands, coastal materials and time in a number of different ways. Writing these publications took time and with the peer-review process (and a pandemic) this even stretched to years where I revisited and amended my work. The diagram previously illustrated in Fig. 4.1 shows the temporal relations between methods in this research. It shows how article writing has harvested and processed different

combinations of methods over months and years of this research.

The duration of writing an article for publication contains multiple little expressions of time. There is the fresh, swift and inspired first draft, there is the long reflections on how other methods will be woven into the article, there is the intermittent contact with journal editors and reviewers followed by meticulous revisions and alterations to the article, and finally there is waiting for the publication to come to fruition that ends in a little flush of pride.

Publication	Year	Methods featured
01. Arctic islands, Archival Exposures	2020	Archives: Historical photographs
		Hand-held photography
		Repeat photography
		Fieldnotes
		Map making
02. Shifting coasts: Developing new coastal concepts	In Press	Drone photography
		Fieldnotes
03. What time is this coast? Temporal encounters in the Arctic	2021	Hand-held photography
		Drone photography
		Fieldnotes
		Map making
		Model making
Temporal perspectives on Arctic peripheries	Under review	Time-lapse photography
		Audio recordings

Table 4.2 A summary of methods used in the four publications related to this research and the methods that featured in each.

4.4 Practicing time in landscape architecture research

In the main introduction to this thesis and in the introductory section to this chapter I referred to the notion of 'practicing time'. This relates directly to the methods I have employed in this research whereby I have undertaken a conscious and immersive approach to engaging with time. I would also like to recall and expand upon a framework I proposed that considers time of the method, time of the environment and time of the designer.

1) ***Time of the method***: considers the time of the tools and techniques that are used and applied and takes into account how these perform in different coastal conditions. Each of the methods described in this chapter have brought about new and different knowledge of the coasts through a material and time-centred approach. I will take two examples that demonstrate this point. Firstly is the use of repeat photography where I compared a historical photograph with one I took at the same location. The historical photograph shows how the selected coastal site appeared in the past whereas the contemporary photograph examines how the site has changed over a particular period of time. These photographs illustrate material compositions of these coasts from different times. Knowledge pertaining to predicted climate change allows me to also consider the different types of material changes that could happen in the future such as the arrival of new plant species and/or the accelerated decomposition of wooden structures at some of these sites.

A second example is the method of time lapse photography where a sequence of photographs were taken automatically and with precise and equal intervals of time. When I used this method I used it for several hours. This method recorded changes in the outside environment that was not discernible when I was standing and looking outdoors. An example of this was the flow of ice passing by the north of Bjørnøya's meteorological station. For slower environmental phenomena, like the build-up and movement of sea ice, this method was suited to the time of this particular environment.

2) ***Time of environment***: this takes into account the materials and the associated conditions, states and processes of the coastal site. This temporal category operates directly with the chosen method. Audio recordings, for example, which I used in very different conditions–August 2018 and again in March 2019–picked up on a range of different materials, processes and conditions. In many of the audio recordings that I conducted in the August period there were seabirds squawking all around me, waves pounding the shores and the wind adding different volumes of noise. These recordings show busy, overlapping compositions of sounds that give insights on the range of temporalities playing out in a particular environment.

3) ***Time of the designer/researcher***: encompasses the experiential, affective, reflective and intuitive responses of the designer to the coastal site. There were

subjective and experiential dimensions to all of the methods that I engaged with. However, it is the addition of fieldnotes that explicitly expressed my thoughts and impressions of the materials I encountered along these coasts. Added to this is the inclusion of in-between methods to this research. My journeys by boat enticed me to consider and theorize on *slow-looking* practices and walking between sites drew attention to how I was physically interacting with the materials around me.
These ***times*** that I have described encapsulate how I practiced time to the fullest of my ability on, off and around these Arctic islands. I sought to give attention to the more-than-human elements of these coastal environments, such as materials, conditions and processes, whilst bringing my own subjective, human impressions to this research.

CHAPTER 05: A TEMPO-MATERIAL FRAMEWORK

The second chapter of this exegesis discussed how time has recently gained more attention in landscape architecture particularly in the context of climate crises and the Anthropocene. It reflects a sense of urgency to act and coordinate responses to environmental change with a broader range of disciplines. Theoretically, landscape architecture is currently positioning itself in how to deal with current and forecasted changes as I discussed in the introductory chapter and the literature review in chapter 2. This exegesis has described a range of different environmental changes that are unfolding along Arctic island coasts. These changes permeate terrestrial, marine and atmospheric environments and play out locally, regionally and globally. To appreciate these changes along Arctic island coasts, I have emphasised the need to engage more extensively with time from a landscape architecture perspective by paying attention to the materials inherent to these coasts. The materials that range from natural to synthetic origins possess different expressions of time that operate on a range of temporal scales. Further, when one considers the changing conditions and processes interacting with these materials, these expressions of time are multiplied. This has the capacity to reveal complex relations emerging between materials and specific coastal conditions thus highlighting the dynamic character of Arctic coastal environments.

In this chapter, I develop a practical framework that has been informed by a selection of literature explored in the second and third chapters, along with the situated fieldwork I have conducted in this research which has been described in the fourth chapter. The proposed framework has a tempo-material focus with its basis on a situated coastal enquiry that draws attention to materialities of coasts before proceeding to explore different, overlapping and plural expressions of time.

5.1 Foundations to a tempo-material framework

The theoretical foundations to this research were described in the literature review in Chapter 2 where five main themes were explored. The outcome of this review made several conclusions that feed into the development of a tempo-material framework that I will elaborate below. The first conclusion regards the identity and description of Arctic coasts where I argued that it is more fitting and appropriate to refer to them as environments rather than landscapes. The overarching reason for this was that an *environment* is open to include land, air and water unlike landscape that is restricted, in the physical sense, to land. This was, I felt, an important progression in my research which seeks to give attention to a range of materials (of the air, land and sea) that are integral to Arctic island coasts and the ways in which they are experienced.

The second conclusion from the literature review drew attention to the ‘islandness’ of the Arctic islands in this study which, in essence, refers to the specificity of

islands. This was examined through five criteria proposed by social scientist Godfrey Baldacchino. The last of his criteria called 'amplification' is of most relevance here as it is primarily about scale. In this regard, I referred to spatial and temporal scales in light of issues pertaining to climate change. These scales highlighted the relations between local and global consequences of climate change. An example I took was the reduction in sea ice in and around the island of Hopen. On a global level the earth is experiencing accelerated warming and this is amplified in Polar regions. On a local level, the consequences include disruptions to denning habitats of polar bears. A warming climate has reduced the longevity of sea ice along Hopen's coasts thus hastening coastal erosion along some parts of the island.

The third conclusion that emerged from the review also refers to the specificity of the Arctic islands in this study by bringing attention towards the changing conditions along these coasts. This was also elaborated upon in the third chapter. The conditions that I feel are most prominent on these islands concern temperature and light both of which dramatically change the material qualities of the coasts. One cannot dismiss the role of time affecting these spaces and materials when there are dramatic changes in light and temperature.

The fourth and final conclusion of my review that has reinforced a need to establish a tempo-material framework is the proposal of five concepts and considerations of time. These are 1) Duration, 2) Multiplicity, 3) Process 4) Multi-scalar, and 5) Inter-temporal. The first three of these I consider concepts of time which have been interpreted and developed largely through the philosophies of Henri Bergson and Alfred North Whitehead. Furthermore, these concepts have been adopted by a range of different disciplines including those relating to landscape. The last two time-based considerations –multi-scalar and inter-temporal – are extended notions of time that have been influenced by contemporary discussion relating to environments of the Anthropocene.

All five of the time concepts/considerations are inter-related and are particularly vibrant along Arctic island coasts. The first publication *Arctic islands, Archival Exposures* (2020) and third publication *What time is this coast?* (2021) paid particular attention to the inter-relatedness of the concepts of duration, multiplicity and process. The fourth publication *Temporal Perspectives on Arctic Peripheries* (under review), meanwhile, develops the notion of multi-scalar in relation to the Arctic islands in the study. All three of these publications illustrate how expressions of time weave and relate thus giving rise to the fifth consideration of time I call the inter-temporal. The tempo-material framework that I describe in this chapter further underpins this final consideration of time.

The four conclusions that I have drawn from my literature review in Chapter 2 help in establishing parameters for my tempo-material framework. They also

help to confront the final research question of this thesis which asks whether local, site-specific temporal readings of Arctic island coasts help confront wider environmental and climatic crises affecting other coasts around the world.

The previous chapter detailed my qualitative multi-method and situated approach and demonstrated how a range of methods can open out a range of temporalities that are inherent to coastal materials, research tools and the experiential dimensions of in-situ fieldwork practice. The tempo-material framework I propose expands on my methodological and practical positions. It does so firstly by exposing relations of time between materials of the air, land and sea. Secondly, it engages with scales of space and time in a two-fold manner by working primarily with site-specific scales before considering alternative scales that exceed the "local".

The framework that I propose develops over two stages. In the next section I will offer an interpretation of what an environment is composed of by introducing four *spheres*– the atmo*sphere*, bio*sphere*, hydro*sphere* and litho*sphere*. These will be elaborated upon in light of the Arctic islands in this study. I conclude this section by highlighting how the materials in each sphere are constantly moving and interacting differently in different locations and situations. The materials inherit different expressions of time as they move in and through these different spheres. In the following section, the second stage, I propose the tempo-material framework and describe how it is constructed and how it may be used. The framework builds upon the *spheres* to establish a spatial construct followed by the introduction of different concepts and considerations of time. Finally, the framework is appraised to highlight how materiality and time can be implemented along Arctic island coasts with suggestions on how it could be used in other coastal environments.

5.2 Unfolding the temporal through material spheres

The coastal environments in this study incorporate the air, land and sea. In order to give more detail and formality to these elements I propose referring to these as *spheres*. These include the atmo*sphere*, bio*sphere*, hydro*sphere* and litho*sphere* collectively known as earth systems.[1] In thinking with the Anthropocene there is an obligation to consider all four systems collectively and inter-connectively. Any change to one of these spheres impacts the other. More often than not these are described only in spatial terms. However, discussions connected to the Anthropocene raise questions on the duration of different materials, often pollutants, in these systems. An example of this is the longevity of micro-plastics in the environment, perhaps on land or in the ocean, which enter the food chain and deposit in different body tissue or organs of living organisms. This provokes

1 The cryosphere is the fifth sub-system that includes frozen parts of the planet. This is not used in my framework because of its temporary nature on these islands. Two additional sub-systems that are less commonly referred to are magnetosphere and technosphere.

consideration on how different materials can last for varying amounts of time in different environments. In the following sections I will briefly describe the materiality and temporalities that can typically be associated with each of these sub-systems.

5.2.1 Atmosphere

Atmosphere refers to the air surround the earth. It is a highly dynamic and changeable sub-system, contains a range of gases, and carries small particles. In appreciating the grave future of climate warming the concentration of some gases in the atmosphere plays a critical role in the speed and duration of global warming. According to a recent report by a group of climate scientists 'methane stays in the atmosphere for about nine years – a far shorter period than carbon dioxide. However its global warming potential is 86 times higher than carbon dioxide when averaged over 20 years and 28 times higher over 100 years' (Canadelle et al, 2020). Incidentally carbon dioxide stays in the atmosphere for between 300 and 1,000 years. Professor of literature and the environment David Farrier explains how these scientific facts may be understood, stating that 'The entire atmosphere now bears the marks of our passage, like a vast geochemical trace fossil of the journeys we have taken and the energy we have consumed (2020:9)

The weather we experience on a daily basis takes place in the lower part of the atmosphere and is characterized by ephemeral and spontaneous expressions of time. The varying weather parameters influence how people experience, perceive and memorise a space, touching all of our senses. Weather records allow us to go back in time to gain insights on past conditions as well as helping to forecast future climate patterns. The atmosphere contains a wide range of temporalities that interact with all of the other sub-systems and circulates on a local to global scale.

5.2.2 Biosphere

The biosphere contains living organisms that include animals, plants and micro-organisms. According to the National Geographic's website 'almost all life exists between about 500 meters below the ocean's surface to about 6 kilometers above sea level' (Rutledge, 2011). On the Arctic islands in this study birds make up the majority of animal species whilst plants are low-growing and mostly herbaceous. Lichen and mosses are found on all of the islands. The temporal span of the biosphere may be regarded as extensive and generative.

A forecasted wetter and warmer Arctic makes the biosphere in these regions very vulnerable to change. As previously discussed, more humid and wetter weather has hastened decay of wooden structures which are evident on many Arctic heritage sites. This has caused an increase in fungus growth on many of these structures (Flyen et al. 2020). Another expected outcome of climate change in Arctic regions is warmer and longer growing seasons that contribute to a term called *Arctic*

Greening (Ims et al. 2020).

In the oceans surrounding the islands a lot of research is carried out on marine ecosystems in the Barents Sea. This relatively shallow sea, with an average depth of 240m, surrounds the islands of Bjørnøya and Hopen. According to the Norwegian Polar institute the Barents Sea area has at least 20 million seabirds living there during summer but bird populations are rapidly declining in many areas (Fauchald et al., 2015).[2] Scientific papers and reports that document the monitoring of flora, fauna and human activity in the Arctic are often reported through comparative studies that operate over decadal timeframes.[3]

5.2.3 Hydrosphere

The hydrosphere is the amount of water on, under and over the earth's surface and includes its liquid, solid and gaseous states.[4] The hydrosphere is present in all of the other *spheres* discussed in this section. Earth scientist Zbigniew W. Kundzewicz explains that:

> There is abundance of water on the Earth's surface (hydrosphere: oceans and seas, polar ice, lakes, rivers, and streams, wetlands and marshes, snow pack and glaciers; containing liquid and solid water) and in the lithosphere (solid Earth), under the Earth's surface (in the rocks and soil, including permafrost, and deeper in the ground, down to the Earth crust – in liquid, solid, and gaseous phases), and in the biosphere (in plants and animals). The water is on a perpetual move… The main, in volumetric terms, water transfer takes place between the hydrosphere and the atmosphere in processes of evaporation and precipitation (Kundzewicz, 2008: 1925).

As I have previously discussed in chapter 03 and in my third publication *What time is this coast?* (2021), water is explicitly present in and around the Arctic islands in this research in its varying states from the salty seas surrounding the islands to the fogs that descend around the islands particularly during the summer months.

The presence of these, and all of the other water entities, are constantly moving in local and global systems. Humans can significantly interfere with these water systems, however. Examples of this, across the globe, include agriculture (draining

2 The glacous gull (*Larus hyperboreus*) population on Bjørnøya, for example, declined by 65% between 1986 and 2006. The main causes that have contributed to this sharp decline are pollutants, shortage of food, predation by growing fox populations and Increasing competition with great skuas. (Miljøovervåking Svalbard og Jan Mayen, 2021).

3 Research documented by Norway's *Environmental Monitoring of Svalbard and Jan Mayen* (Miljøovervåking Svalbard og Jan Mayen) attests to this.

4 According to Kundzewicz, (2008) 'Ice and snow – is sometimes called the cryosphere, while the domain of salty water is sometimes called the oceanosphere' (2008:1924).

land) and industry (damming rivers for the hydro-electric power or cooling nuclear power plants). Despite having huge control over the Earth's hydrosphere there are other aspects that appear (so far) beyond our control. An example is a warming climate causing the rapid decline of glaciers, icecaps and sea-ice.

Chemical contaminants released into water systems by humans have meant that they can circulate effortlessly in these systems. An interesting example of this is a submarine wreck that lies 180km off the southwest coast of Bjørnøya. In 1989 the Russian 'Komsomolets' submarine sank[5] with one nuclear reactor and two torpedoes tipped with plutonium warheads (Hommedal and Egeland, 2019). A survey conducted in 2019 by Norwegian scientists reported leaking of a radioactive substance called cesium-137 in very high concentrations. Although these local samples were of a high concentration the scientists claim that this has little significance for fish and seafood mainly because fish are not found at these depths and the pollution dilutes quickly.

An example that demonstrates the seamless connections between the atmosphere, biosphere and hydrosphere is in Lake Ellasjøen on Bjørnøya. This lake, unlike other lakes on the island has very high levels of persistent organic pollutants (POPs)[6]. Although Bjørnøya is located more than 500km from any known source of POPs these pollutants reach the island in two ways–atmospherically and biologically. Atmospherically, precipitation carries the pollutants to the lake and surrounding watersheds. Biologically, POPs arrive by large numbers of seabirds[7] who rest in and around Ellasjøen and deposit their guano (excrement) directly into the lake or in the catchment area (Evenset et al., 2004) after feeding in surrounding marine areas. The pollutants infiltrate the water in the lake, the sediments at the bottom of the lake and the biota living in the lake which includes zooplankton, tadpole shrimps and arctic charr.[8]

The dimensions of time that are present at Lake Ellasjøen are dense. Pollutants arrive to the lake in different ways depending on wind direction from industrial areas in the south or the seasonal arrival of birds that deposit pollutants in and around the lake. Sediment cores taken from the bottom of the lake by scientists show stratified layers of chemicals that have built up over time. Pollutants which are no longer is use such the insecticide DDT and PCBs (Polychlorinated Biphenyls) remain in these sediments. Newer contaminants such as flame

5 The submarine sank to a depth of 1,700 metres and 41 out of 69 crew members died.
6 These pollutants, derive from industrial emissions and agricultural pesticides and insecticides. According to Kallenborn et al. 'Although banned for decades in most of the industrialised countries, many legacy POPs are still found in considerable concentrations throughout the Arctic (2007: 1082).
7 The main bird species here are kittiwake (*Rissa tridactyla)*, little auk (*Alle alle)* and glaucous gull (*Larus hyperboreus*) (Evenset et al., 2004).
8 Arctic char living in lake Ellasjøen have one of the highest levels of toxins in fish in the Arctic region. Toxic chemicals in the fish have shown endocrine, immune system and genetic effects (Inderberg et al. 2021).

retardants remain in the upper layers of the sediments cores (Environmental Monitoring of Svalbard and Jan Mayen, 2016). POPs have entered the food chain of Arctic species that live in the lake and visit the lake seasonally. There is a complex flow of chemicals dispersed loosely in the air and surrounding sea but concentrated in the lake itself and the species that interact with the lake in different ways.

5.2.4 Lithosphere

The lithosphere is the rocky, outer part of the Earth's surface. Geoffrey Jerome Cohen who has written a book dedicated to the subject of stone states firstly that 'the lithic inhabits the secret interiors of the earth' (2015:19). Secondly, he observes that 'although sometimes withdrawn from the world's lively spaces, the lithic is most often glimpsed in boisterous landscapes. Full of relation, teeming with narrative, stone is seldom inert (2015:22). There have been several recent examples, from a range of disciplines, where stone, geology and the lithic have come under consideration. Some of the underlying reasons for this are to emphasise relations between humans and the deep earth.[9] Others have brought forward temporal links between the deep time of geology and the short-lived but long-lasting impact of humans on this lithic sphere.[10] Others still have developed links between the Anthropocene, which has its geological origins, and humans. In these cases the Anthropocene expands to inherit a number of other dimensions that cross climatic, political, ecological, economic and social concerns.[11] These dense and multiple interpretations of the lithosphere certainly activate and mobilize this layer.

The above examples express the lithosphere in different ways and demonstrate that it is not something that is complete and assigned to the past but is, rather, something that is continuously in the making. However, humans have now overtaken natural processes[12] as being the upper lithosphere's primary geomorphic agents.[13] Parallel to the erosional and depositional power of humans that are explicit in industries concerning agriculture and construction, there are new, synthetic layers that humans are adding to the existing lithosphere. Anthropologist

9 For example anthropologists such as Richard Irvine (2014), Anna Tsing (2015) Penny Harvey et al. (2019) and Hugh Raffles (2020) have, in different ways, theorized and described the rich entanglements between humans and geology.
10 For example, the work of geographers Kathryn Yusoff (2013, 2017 and 2018) and Jamie Lorimer (2012 and 2017); and in English literature David Farrier (2020) and Robert Macfarlane (2019).
11 Authors who have drawn attention to the complex and multi-dimensional entanglements between humans and the Anthropocene have been largely referred to in the second chapter of this thesis. These include Malm and Hornborg (2014), Dipesh Chakrabarty (2009, 2018), Pieter Vermeulen (2020), Elizabeth Deloughrey (2019) and Kate Brown (2013).
12 These natural processes include glaciers, rivers and the sea eroding and depositing large volumes of eartly material.
13 Professor of earth and environmental sciences, Bruce Wilkinson, states that 'human activity is many times the most important geomorphic agent acting on the surface of the modern Earth, a conclusion that evokes several nontrivial consequences.'(2005:163).

Patrick O' Hare adds that 'the encrusting of our geological strata with synthetic materials such as plastics has been held up as evidence of our living in an Anthropocene' (2022:63).

Temporally the lithosphere presents, most explicitly, expressions of deep time. However, the Anthropocene creates a certain sense of unease about notions of deep time and exposes the deep entanglements between human and non-human (lithosphere in this case). Ginn et al. expand on this, explaining that 'One of the most challenging aspects of the Anthropocene is the way it puts the present in contact with distant times beyond the scope of human experience or even imagining (2018:214). However they proceed to suggest thinking about 'our relationship with deep time: not as distant and abstract but as an intimate and compelling element woven into our everyday lives' (2018:223). This requires a shift in thinking about natural and synthetic materials, sediments, rocks and strata and how we encounter and engage with them daily.

5.2.5 Spheres of thickened time

The atmosphere, biosphere, hydrosphere and lithosphere that I have introduced and described show the dense entanglements and enmeshments between materials and time. Architect Jeremy Till refers to thick time as an 'expanded present' that 'gathers the past and also projects the future'. He continues, 'to be in (thick) time, however, is to be in the world, not a world of static objects but a world of social and temporal exchanges' (2009:98). In this study, I place emphasis on material and temporal exchanges that infiltrate humans and non-humans.

Common to all the sub-systems or *spheres* is that they all have the capacity to hold and move materials over varying durations of time. Materials translocate, dissolve, evaporate, decompose, erode, deposit, generate etc. through these spheres. To demonstrate this further and more specifically through the lens of the Anthropocene the burning of fossil fuels provides a good example. These fuels may be extracted from both the lithosphere (oil sands, fracking, oil and gas drilling, coal mining etc.) and the biosphere (peat/turf harvesting). When they are burned carbon is emitted into the atmosphere which in turn contributes to global warming. Global warming, in the short to medium term impacts the biosphere and hydrosphere (as well as the cryosphere) and in the long-term carbon particles deposit and thus contribute to the geological layer (lithosphere). Within all of these processes of extraction, burning, and depositing there are multiplicities of time playing out and the effects of these processes become further entangled in other processes affecting eco-systems habitats and habitation.

By introducing the atmosphere, biosphere, hydrosphere and lithosphere into this study there is a certain freedom that allows for materials to move through varying spatial and temporal scales. The following section will outline how this may be

implemented through a tempo-material framework.

5.3 A tempo-material framework

The idea for proposing a tempo-material framework was very much inspired by my time on Bjørnøya in 2018 when I observed how Venke Ivarrud carried out various weather measurements at the meteorological station. Her weather observations involved gathering technological data and sensing different conditions through her own visual assessments. Collectively, this crossover of methods involved looking up to read the different cloud formations, looking down to assess the ground conditions and looking across the landscape and sea to check visibility. There was, in essence, a demonstration of a thorough attunement towards materials of the atmosphere, biosphere and hydrosphere. As I reflected upon these meteorological methods of engaging with the local environment, I wondered whether landscape architects could expand on how to practice in-situ fieldwork a little differently.

To introduce my temporal framework I will use an illustration of a coast. Firstly, I will propose a vertical sectional reading of the coast that establishes the four spheres alongside typical expressions of time associated with each of these spheres. Secondly, I will propose a horizontal section that, again, sets out the four spheres and associated time frames. Finally, I will expand on the horizontal section and add materials that are located in each sphere with my new concepts and considerations of time that pose questions on how materials and time are inter-related. The illustration that I use and the materials that I propose are based upon my experience and observations on Bjørnøya.

5.3.1 A tempo-material reading

A vertical reading

To demonstrate my tempo-material framework I take an example of a three dimensional section of a coast. Fig. 5.1 shows a vertical axis alongside the illustration with two columns of information. On the left is a list of the four spheres–atmosphere, biosphere, hydrosphere and lithosphere. Next to this are typical temporal associations with each of the spheres. Aligned with these earth systems are conceptions of time that may be attributed to each of the spheres that vary along the axis. This very simple diagram shows a set of overt relations between space and time revealing dynamic layers in the middle towards the deep time of outer space and geology. The purpose of this introductory diagram is to engage the reader in considering the coastal environment as spheres as well as different expressions of time associated with these spheres.

Fig. 5.1 Diagram illustrating the use of a vertical axis that relates earth sub-systems or *spheres* alongside conceptions of time associated with each system.

A horizontal reading

The second axis I wish to highlight is horizontal. Figure 5.2 illustrates a coastal environment where there is a loose division between land, coast and sea. Each of these typologies, like the previous vertical axis, is assigned commonly used concepts of time. There are many shared concepts of time across the land, coast and sea. If we were to unpack each of these concepts we would see that each of these timeframes manifest differently. For example, wind may be identified as a phenomenon through a spontaneous frame of time. On the land this may involve the erosion and deposition of sand particles. On the sea, meanwhile the wind may produce wavelets on the sea surface. It is important to note that each concept of time requires an unpacking and unfolding to allow for more precision on what is occurring in a space or through a material.

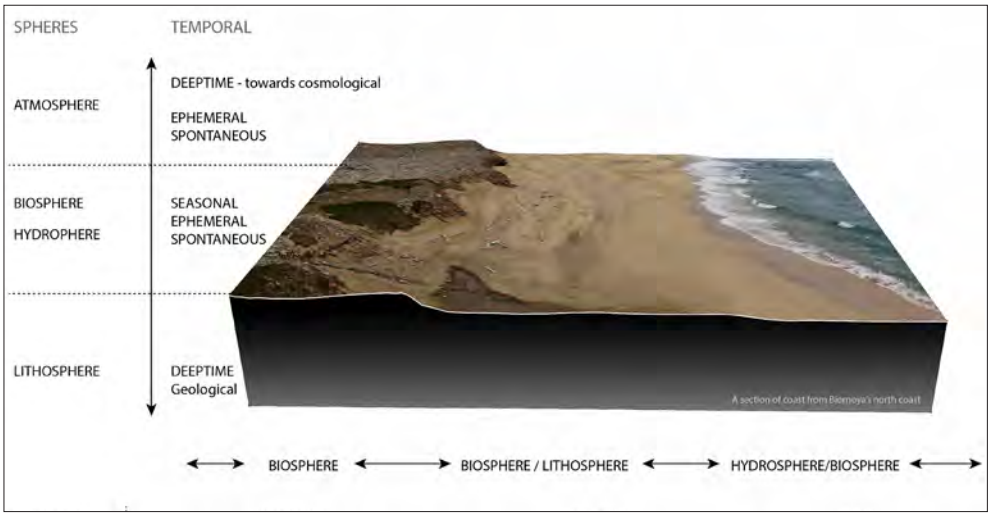


Fig. 5.2 Diagram illustrating the use of a horizontal axis that connects land and sea.

A tempo-material reading

The final diagram (Fig.5.3) brings the vertical and horizontal information together. The horizontal spheres are expanded upon further by introducing materials that may be found along different parts of the coast. Underneath these layers of materials are the five concepts and considerations of time that I have previously elaborated upon in the second chapter of this exegesis. A series of lines connect the materials to these time concepts/considerations which build up to reveal dense inter-connections between these materials and time. This diagram is also intended to extend beyond the localities of this coast where connections may be made to regional or global dimensions of space and time. The vertical and horizontal axes underpin the need to think on a multi-scalar level in order to start to comprehend change and the different tempi that they operate within.

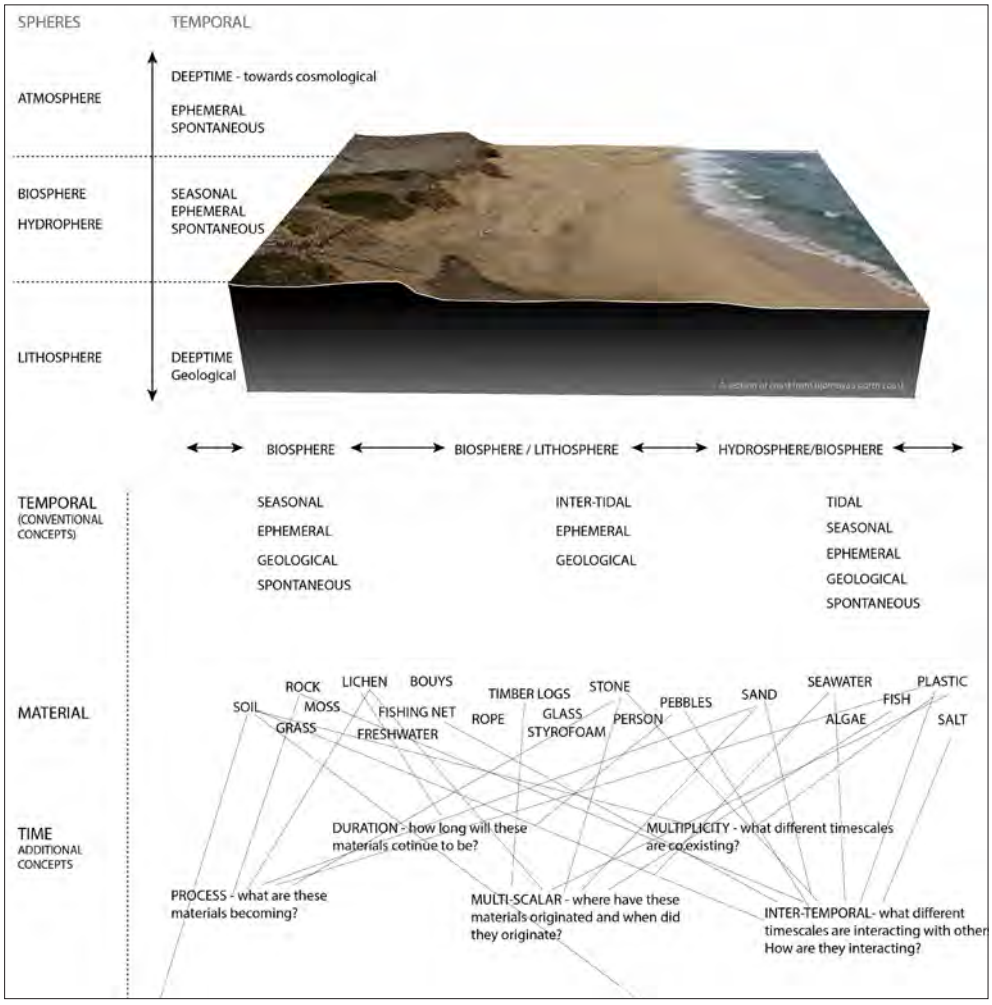


Fig. 5.3 Diagram illustrating the tempo-material framework. Here the vertical and horizontal axes are combined as well as introducing materials associated with each horizontal sphere and the time concepts/considerations developed earlier in this thesis.

5.3.2 Implications for coastal designs

The tempo-material framework that I propose asks what time concepts, timeframes and timescales can be associated with different coastal materials. This method allows for alternative examinations of time and materialities in a number of ways. Firstly, it brings the landscape architect in closer contact with materials. It requires close observation in seeking varied temporalities of a specific site through its materials. This approach also necessitates a situated and embodied response to a site.

Secondly, this framework draws attention towards coastal materials and reduces tensions between the human and more-than-human thus allowing for relations to develop. A landscape architect, for example, who finds synthetic materials on a coast, may consider the human involvement in its manufacture and its long-term duration along the coast or in the sea. In so doing, it positions humans as a part of a system of multiple durations rather than the top of a hierarchy.

Thirdly, a temporal examination and attunement toward a material urges consideration for a wider contextual examination. Landscape architecture is a discipline that already takes into account the context of a site, an object or a material. Contemporary demands on our environments require us to widen our scope in order to grasp the varied agencies at play. This approach brings into sharp focus the inter-relatedness of local and global scales connecting natural and synthetic materials, and the human and non-human.

Fourthly, this framework draws attention to processes, conditions and states affecting materials. This raises the following questions: why does a material appear a certain way? what agencies have acted upon the material, both within and beyond the site? is the material itself an agent of change? and if so how? An attunement towards materials requires consideration of what processes are acting upon the materials, an appraisal of the conditions of the site as well as the individual materials and a reflection on the differing states of the materials.[14]

Finally, attention towards materiality can operate on a number of temporal scales. The deep, geological time of a grain of sand is very much under the influence of wind, tides and anthropogenic disturbance, all of which have their own durative properties. This means that we can stretch our thinking beyond the local or beyond the site and look at other agencies that greatly affect the temporal and physical attributes of a material. This can work the other way round too. If we consider

14 Conditions and states are often used interchangeably. However, in an Arctic context I interpret the use of ‘states’ in reference to materials being frozen, semi-frozen, unfrozen, fluid. Conditions, I understand primarily as weather conditions where light, wind, precipitation are considered.

the ocean and the powerful currents within the sea as well as the air currents over its surface, we can understand how these play a role in the local materialities of a beach.

To summarise, the tempo-material framework that I propose offers an alternative examination of Arctic coastal environments. It approaches a coast as a moving, dynamic space where materials move across and through the land, sea and air. The framework places emphasis on the role of time as materials move through coastal sites. These move at very different tempi and over broad swathes of timescales. Attention towards each material encourages consideration of its immediate, local context as well as thinking about its journeys before it arrives to the site and after it leaves. In this sense, the framework entices a designer to think beyond the local scale of a site.

The framework has been developed specifically for the Arctic island coasts in this study. The parameters that I have proposed with regard to *spheres* and expressions of time could be applied to other coastal environments as the 'ingredients' for the framework are the same. The success of this framework will, I believe, depend on the sensibilities of a designer and their skills in attuning to materiality and time. However, even for the inexperienced designer I hope it offers a useful stepping stone in learning about coastal environments and a means to work with dynamic spaces.

CHAPTER 06 – CONCLUSION

6.1 A tempo-material approach to engaging with Arctic island coasts

6.1.1 Pluralities of time in landscape

During this doctoral study, I was fortunate to come across the published journal, *Modern Nature*, by film-maker and stage designer Derek Jarman (1942-1994). It was written in just under a two year period from the beginning of 1989 to September 1990 when illness sadly put an end to his journal entries. The setting was at his *Prospect Cottage* and garden along the 'ochrous sandbanks' of Dungeness on the south coast of England. Jarman's background in film and theatre was evident through his illuminating descriptions of his coastal garden. These descriptions exuded a performative quality above anything else and incorporated all of the senses. Throughout his journal, Jarman gently unwrapped the pluralities of time that he observed and experienced along this stretch of coast. He writes: 'On a beach of grey slate I would find spiral ammonites in rock pools; and it was here that I built my first driftwood sculptures, and photographed them before the tide came in' (1991:68). By touching upon various spectrums and scales of time, Jarman illustrated an attunement towards the found and nurtured materials of the shore. Furthermore, this human and more-than-human relation between Jarman, the slate, the ammonite, rockpool, driftwood, photograph and tide are effortlessly created even if momentary.

Given that my study was situated on Arctic islands, it may appear a little odd to begin this conclusion with a reference to a gardener and his garden. However, I found many associations between garden and island through reading Jarman's *Modern Nature*. Like Jarman's garden, the three islands I have worked with contain a diverse range of materials that are open to change over various timeframes and timescales. This research has centred upon the study of how the materiality of Arctic island coasts has changed over time and how they are currently changing in light of an accelerated warming Arctic context.

In order to understand these changes occurring on a local and global scale I have explored, developed and applied different concepts of time that, I suggest, are suited to a material study of Arctic island coasts. Key questions that have been posed in this research ask firstly, if there is a need to work with Arctic coastal environments differently from other terrestrial environments. Secondly, in considering the commonly used concepts of time used in landscape architecture, I question if alternative concepts are needed to articulate accelerated and unpredictable material change along Arctic coastal environments. Finally, a broader question is posed asking if a practice-based and situated approach informs a greater understanding of time in landscape architecture.

The Arctic islands in this study are far from being fixed and frozen outcrops in the Arctic but rather environments as vibrant as the oceans that surround them. Similar to Jarman's garden, these island coasts may be regarded as unbound, perforated, elastic environments (Pearson, 1985) with ever-changing processes and conditions traversing these spaces. Anthropologist and archaeologist Barbara Bender states that 'Landscape *is time materialized*. Or, better, Landscape *is time materializ-ing*: landscapes, like time, never stand still' (2002:103). In addition to approaching these coasts as an agglomeration of moving materials, it was also necessary to consider ways in which to negotiate the continually oscillating interactions between land, sea and air, all of which have different temporal associations and qualities. This meant appreciating the spatial and temporal scales in which the materials associated with land, sea and air operated.

6.1.2 Coastal materials: multiple expressions of time

In this research I have chosen to attend specifically to the island coasts of Jan Mayen, Bjørnøya and Hopen where interactions between land, sea and air explicitly play out. In order to understand these complex interactions, which are full of continuous movement and change, I have drawn attention to different dimensions or expressions of time associated with these changes. As a means to work with these dimensions of time along these coasts, I have chosen to examine the materials that were present during my visit to the islands. Through this enquiry I have observed and speculated on the processes, conditions and changing states that give a sense of agency to these materials and thus reveal different expressions of time. I have named this approach a *tempo-material* approach. In engaging with time and materiality I have tried to maintain a balance in giving voice to the more-than-human agencies of these coasts along with articulating the experiential aspects of my fieldwork process. This has worked towards reducing the nature/culture divide that persists in landscape architecture.

To address my temporal enquiries I wanted to learn of other concepts of time that could help in confronting notions of continual change and emergence; concepts that did not necessarily distinguish between humans and non-humans; and concepts that could incorporate the experiential facets of place. In my quest to have these temporal needs addressed there was reflection on how landscape architecture not only locates, positions and theorizes time but how it acts with and engages with time too. References to time, in landscape architecture, are typically raised in connection to plants and weather/climate where temporal concepts such as linear and cyclical times are established (Schneider, 2018). Although these notions are useful they suggest stableness and uniformity which cannot address contemporary environmental global change. Interesingly, Jackie Bowring and Simon Swaffield (2013) and later, Martin Prominski (2019) have commented on the apparent preference of some landscape architects to work within fixed, predictable frameworks of time to maintain control over a landscape.

However, there has been a notable shift in thinking about time in the discipline particularly with regard to climate crises and the Anthropocene which have inspired alternative thinking about time (Berrizbeitia, 2018; Sijmons, 2021). Considerations towards the complexities of disruption, unpredictability, disorder and spontaneity all point toward what architectural academic and artist Renata Tyszczuk (2022) refers to as, 'Times of Urgencies'. In an Arctic context, this translates to issues concerning melting glaciers, thawing permafrost, retreating sea ice, advancing tree lines, increase in air, sea and land pollution, and disrupted weather patterns. These 'times of urgencies', embedded across terrestrial, marine and aerial environments unfold over fast and slow, long and short timeframes of different scales. There is, consequently, a complex overlapping and intermingling of different times that are infused between these local and global concerns and crises.

Consulting other disciplines helped in finding concepts of time that could be suitably applied to Arctic island coasts. These disciplines included geography, anthropology, archaeology, history and geology. Through extensive reading I was led to the philosophies of Henri Bergson (1859-1941) and Alfred North Whitehead (1861-1947). These philosophers explored ideas of temporal multiplicities, process philosophy as well as strengthening connections between humans and non-humans through the acknowledgment that all matter has its own durative qualities. These philosophies have been challenged and explored robustly in other disciplines and provided a temporal framework that I could work within.

The main outcomes of my research, described in chapter 05, suggested a theoretical and practical framework on how to engage effectively with time along these Arctic coasts. Theoretically, I have suggested that five concepts and considerations of time are needed in design studies concerning Arctic coasts. These are 1) Duration, 2) Multiplicity, 3) Process 4) Multi-scalar, and 5) Inter-temporal. The first three of these concepts are directly influenced by the philosophies of Bergson and Whitehead. The latter two, I regard as considerations that are necessary in confronting contemporary environments that need to be read across and between temporal scales. These concepts of Duration, Multiplicity and Process are presented in my third publication *What time is this Coast?* (2021) where I demonstrate how these concepts may be activated in a coastal setting based on my fieldwork on Bjørnøya.

A second outcome of my research concerns the application or the 'practicing 'of these five time concepts and considerations. I have proposed adopting a vertical and horizontal diagram that incorporates looking at these concepts of time through land, air and sea in different ways. In 2018 I participated in a work shift with a member of staff at the meteorological station on Bjørnøya in 2018. I learned that weather observations are vertical – looking up to the sky, down to the ground, and horizontal – in looking across the land or sea to assess visibility. There was

a combination between technological sensing and the situated observations of the meteorologist. This, I found very useful in helping to expand the way in which landscape architects can improve the ways in which we observe and attune to environments around and beyond us. Learning how meteorologists observe different weather phenomena influenced the vertical and horizontal diagram I propose in my tempo-material framework described in Chapter 5 of this exegesis. Taking into account materials that are associated with land, sea and air encourages consideration of a range of materials not all of which are typically considered in landscape architecture. It also infiltrates studies beyond surfaces thus allowing relations to develop between invisible or overlooked aspects of coastal environments such as the air and below the sea.

6.1.3 Negotiating spatio-temporal scales

Although environmental global issues give a critical context to this study, the aim of this research has been to conduct a situated, relational and immersive engagement with materials and time in a region that is experiencing climatic, ecological and political change. Edensor et al. (2020) observe that 'climate change is a relational phenomenon that needs to be understood at the local level, attending to its distinctive spatialities and temporalities'. For this study, this has meant negotiating my research through a number of spatial and temporal scales. Spatially, this local, site-specific study that I have undertaken has global considerations with regard to the materials that I encounter. An example of this is plastic debris that was predominant on many of the beaches I visited. Although this debris did not originate on these islands, in some cases, they have become a part of the islands' littoral ecologies. Temporally, the scales of time that were considered in this research ranged from deep time considerations of sand to the more fleeting and subjective experience of the weather.

In terms of actively engaging with time, I have tried to draw attention to the importance of working in the present. This, I feel, goes hand in hand with attuning oneself to the materials, conditions, states and processes that are active at a certain time (now) in a certain place (Arctic coasts). I have found that situating oneself in the present helps in working with the rather overwhelming large scales of time and space concerning deep time and the Anthropocene. Working in the present allows for gradual relations to develop with other scales of time. As geographer Rachel Woodward states 'The most interesting stories lie in the connections between many seemingly small things that build a bigger picture, revealing networks' (2005:731). In addition to revealing spatial and temporal relations, I have found that working with an attunement to the *now* brings a sense of understanding towards the particularities and uniqueness of these island coasts.

6.1.4 Qualitative and situated research

In relation to research methodology I have adopted a qualitative mixed-method

approach throughout. This is partially in response to how, more generally, Norwegian high Arctic regions are often remotely sensed through quantitative, scientific means. There are few contemporary qualitative and situated accounts that engage with material change in these regions. Britten and Fisher's (1993:270) claim that qualitative methods give 'insights into processes as opposed to outcomes' usefully aligns with how I conducted my research and practice. My design skills and design-oriented methods were especially put into use during in-situ fieldwork on the islands and afterwards when I processed my material in different overlapping ways through visual, and to a lesser extent, audio means. The broad range of methods that were used helped to express, more fully, the multi-relational and multi-temporal ways of working on Arctic coasts.

My design skills and experience also helped in the selection and refinement of a range of different methods in different research spaces. Prior to in-situ fieldwork I consulted online historical photographic archives to explore the former conditions and material compositions of these coasts, and to gain insights on how people have interacted with different sections of the coasts. In-situ research which included travelling to the islands as well as being on the islands incorporated photography, walking, note-taking, sketching and audio recordings. Finally, the processing of material gathered on and off the islands continued through experimental model-making as well as writing articles for journal publications.

I was also made aware of different dimensions of time that I could associate with the broad range of tools and techniques used in this research. For example, 'clock time' was present in almost all of my tools with timers embedded in my camera, drone, phone, sound recorder and GPS device; and the technique of time-lapse photography captured equal durations of time in the recording of conditions that needed to be appreciated over long periods of time such as changing sea ice or cloud cover. Facer et al. observe that 'as scholars and researchers we work with time *all the time*' (2022:9). This was clear throughout my research process whereby awareness concerning the choices I made on how to carry out my research were also engrained with varying expressions of time.

6.2 Positioning my research enquiries

This doctoral research has raised a number of questions concerning 1) the identity and description of these islands coasts; 2) how time manifests in these environments and 3) how to engage practically with time along these coasts. I will elaborate briefly on each of these points.

6.2.1 Land, sea and air entanglements

Situating my research on three Arctic island coasts called for critical reflection on how these coasts were different to other coasts. In some respects these coasts are no different because they share the unrelenting beating drum of the tides with other

coasts all around the world. However, my research which ranged from reading historical accounts of visitors to Arctic regions to my own fieldwork excursions on the islands have demonstrated that these coasts are indeed different primarily due to the presence of a range of unique conditions. In particular, differences in temperature and light throughout the year mean that the material composition of each coast undergoes varying degrees of change thus emphasising the vibrancy of these coastal environments. Furthermore, prevailing weather patterns, such as lingering fog in the summer, are also unique to these High Arctic islands. Historical and contemporary accounts of the conditions of the islands were elaborated in the third chapter of this exegesis. In considering the unique conditions of these coasts in this study, then, was not about limiting my research to land but necessitated consideration and engagement with the diverse conditions of the air and sea.

When I began this doctoral study I understood these coasts as a distinct type of landscape. As the study progressed I became acutely aware of some of the emerging problems that the word 'landscape' has on these coasts. I began to interrogate this word along with other words that are associated with landscape and questioned whether they were appropriate or not in helping to label and describe coasts. Alternative words that I paid attention to were topography, topology and palimpsest which were queried in my second publication *Shifting coasts: Developing New Coastal Concepts* (in press). These terms raised further doubt rather than assurance. I turned to other disciplines to unlock this dilemma. I found solace in inter-disciplinary publications and research groups dedicated to coasts and blue spaces that were loosely categorized as blue humanities. This mainly incorporated the disciplines of geography, ethnography, anthropology and the social sciences. I worked towards finding intersections and overlapping points of interest between these disciplines and my research enquiries.

I found that the perspectives offered in the blue humanities challenge steadfast theoretical foundations that create distinctions between land and sea. In doing so, they provide useful examples on how to articulate the fluidity and flow of time and materials (Strang, 2004; Chen et al, 2013; Anderson and Peters, 2014; Peters and Steinberg, 2014). Ethnographer Phillip Vannini and photographer Jonathan Taggart, for example, point out that 'whether congealed or liquefied, frozen solid, muddy, or in the midst of breaking up or thawing out, the water-land-air meshwork reveals to us a domain of entanglement open to different relations with humans' (2014:93). By orienting away from land-based associations with coasts the sea can be appreciated as a mediating body with direct relations to the land and air. I concluded, in my literature review, that these coastal sites are best referred to as coastal environments rather than landscapes as they allow for more balance to the amorphous and inter-related conditions of the water, land and air.

6.2.2 Finding time(s) along Arctic coasts

The fluctuating character of coasts combined with shifting weather conditions meant that changes were unfolding at varying tempi throughout each hour, day, season and year. A certain negotiation of scale was required between knowing, more broadly, that these coasts are undergoing accelerated warming due to climate change, and situating myself on these coasts to gain a local perspective of change. In other words, finding positions of different scales of space and time and making connections between these positions were a challenging yet productive part of this research.

Numerous climate reports describe trends in weather patterns as well as providing forecasts of expected climate change across the globe. The timeframes covered in these reports are generally discussed over centuries but mainly decades. Added to this are discussions concerning the Anthropocene which extend scales of time from centuries to millennia and sometimes beyond. These scales of time are often difficult to comprehend because they exceed a human-centred world view and challenge us to imagine pasts and futures that are quite different to how we live today (Chapman and Thackwray, 1996). Putting my two feet on the shores of the three Arctic islands required a very different way of understanding time on these islands. When on the islands, the data from the climate reports and memories of lively lectures concerning the Anthropocene migrated to the back of my mind while I adjusted to the more intimate time of these islands. These close coastal encounters are brought to the fore in all of my publications and exegesis. The ways in which I worked closely with coastal materials were described in more detail in Chapter 4.

The reliable ebb and flow of the tides provided a constant temporal backdrop to all the other multiplicities of time playing out in the foreground. There was the time of the wind, time of the fog, time of the sun, time of the seabirds, time of the sand, time of the shellfish, time of my visits to these shores, time of the camera shutter – the list had no end. Spatially, these elements were simultaneously performing in the sea, air and on land. To bring a sense of coherence to the different scales of time on these coasts I decided to focus on the materials that I had a physical and visual connection to. In addition, I was curious to find ways to articulate the experiential aspects of engaging with time and these coastal materials. In essence, there was a study of the materials themselves, relations between the materials, and reflections on how I engaged with different material compositions.

The philosophies of Bergson and Whitehead enlightened my work enormously. It was important for this research to have philosophies of time that were qualitative as well as having the capacity to address contemporary issues pertaining to Arctic coasts. These philosophies offered a framework that was specific enough to meet the needs of my research enquiries yet broad enough to manoeuvre and experiment practically within this frame. To apply these concepts of time meant moving

towards a more experimental mode of enquiry as I began the practical phase of my research.

6.2.3 The practice of time

I adopted the term *practicing time* to articulate my thinking and doing in engaging with time in my empirical research process. The process was not bound to a particular environment as I had originally expected it to. Instead, I wanted to draw attention to how time manifested differently during different stages of my research practice. An example of this was incorporating how I travelled to each island which involved long, drawn out durations of time where I was cut off from the outside world sometimes for up to several days. However, this provided time to appreciate the moody ocean environment I was sailing through which was reduced to the raw elements of sky and water. Sailing to the islands also allowed for the islands to gradually mutate from distant shapes towards a rich, material diversity as I approached the islands and vice versa as I left those shores. Moving towards and around these islands emphasised not only how perceptions of space radically change but how space can be appreciated differently when there is a consciousness towards time.

On the islands I used several different methods to capture material change along the coasts such as photography, audio recording and note-taking. Time spent on the islands was quite short, only lasting a few days at a time, and therefore much reflection and processing of material took place after I left the islands. I continued working on the rich data and material I had gathered on the islands after I returned to my studio space. I was keen to pursue time and materiality further by making models using different materials that had the capacity to change between liquid and solid states. These methods, apart from audio recording, were skills I had developed previously through education and practice in landscape architecture. Finally, the writing process, dedicated to four publications in this research, provided rich opportunities to weave different types of knowledge and knowledge making.

Having applied different concepts of time to my work I could see a huge overlap of these concepts between my subjective experience of time, the methods I used, and the materials I was working with. It was challenging to separate these concepts out but at the same time it was important to elaborate on the specificities of individual time concepts and to stress how they can manifest differently. This was elaborated on in my third publication *What time is this Coast?* (2021) when my research had advanced enough to suggest relations between concepts of time and ways of knowing (a site) through the implementation of different methods.

The third publication developed around the theorizing and application of the three concepts of duration, process and multiplicity. I chose to implement these

practically through the methods of photography, fieldnotes and model-making. Through the process of writing this article I realised how the different concepts of time inherited different meanings when examining them through different contexts. For example, when discussing, more generally, how these concepts were integral to the study of coasts, I used many subjective responses to coasts from writers who have worked and lived with coasts such as Anna Ryan (2012), Robert Macfarlane (2012) and Christiane Ritter (1954). When I applied these concepts, specifically to a coastal site on Bjørnøya, the materiality of the site was the predominant 'voice'. The complexities of different states, conditions and processes inherent to these materials at a particular time, in a particular place, were expressed. This demonstrated how, through practical means, the more-than-human agencies of a site can be explored resulting in a very site-specific interpretation of a coastal environment.

6.2.4 Working across geographies of knowledge

My approach to 'practicing time' incorporated the study and reflection of tempo-material processes across different research environments. In my work, these environments included coasts, cabins, meteorological stations, coastguard vessels and studio, as well as the spaces in-between. I refer to my first publication which discussed 'geographies of knowledge' directly inspired by geographer Doreen Massey who advises:

> Being aware of the locations of your research…can itself induce reflection on the nature of the process in which you are involved. Indeed, one of the points you might…use to reflect upon your own research process, is this relation between particular activities of research, and types of knowledge, and their geographical location (2003:76)

Although this is derived predominantly from a spatial perspective, what Massey refers to has been of equal relevance to this research when it is understood from a temporal perspective. The *time* of my research methods, the *time* of my knowledge making, and the *time* of the environments I was working in have all generated different ways of knowing these Arctic coasts. The implications of this approach and awareness of working in different environments is very relevant to the discipline of landscape architecture which practices both in indoor and outdoor environments. It enhances critical thinking on how we work in different ways and why we work in specific ways. This reflexive exercise may challenge the status quo of working methods in the discipline and help open up alternative ways of practicing and knowing.

A further point to make on these situated ways of knowing in different environments draws upon the notion of timescales. This places emphasis on how

materials and environments are connected through time. The focus on different coastal materials in this study has demonstrated the capacity to project connections to other times and spaces. This was explored most effectively, I felt, in my fourth publication *Temporal Perspectives on Arctic Peripheries* (under review) that examined Arctic peripheries from different perspectives of time. An attunement to the multiplicities of time of each material shows that the material is always *of* different times and it is constantly interacting with local site conditions and processes of all scales. A tempo-material study, that considers the multi-scalar dimensions of materials, reinforces the realities of the constant movement and intertwinement of coastal environments.

6.3 Reflections and directions

6.3.1 Limitations, potentials and implications of this research study

This research has relied heavily upon a range of other disciplines that have established clear viewpoints on the subject of time and landscape, and time in the Anthropocene. Unfortunately there is currently little to fall back on within my own discipline of landscape architecture regarding theoretical perspectives on the subject of time. This, I found challenging. In helping to overcome this I developed a time-centred methodology over the four year period of this doctoral research. The time-centred approach places emphasis on making strong connections between theoretical discourse relating to time and materiality and how to practice this methodology from a landscape architecture perspective.

In relation to the outputs of this research, a question that deserves asking is who can benefit from this research? Who can use this tempo-material approach to working with a site that isn't necessarily coastal? I feel the greatest potential for this is in education and research where this method, or elements of this method, may be implemented in different environments. From an educational perspective, in landscape architecture, there is a need to expand fieldwork practices in light of diverse changes that are occurring across the globe. The Anthropocene, for example, reminds us that humans are the predominant force shaping the planet (Shannon, 2018). Although it is crucial to engage with global scales and indeed, be informed by such scales, I have tried to demonstrate in this research, that starting fieldwork on a local scale and using diverse research methods, allow for multiple relations beyond the site to be established. Scooping a handful of sand can trigger a student to think where it came from, where it is going, and what or who will in interact with it on its long journey.

In an Arctic context there are opportunities to develop trans-practice relations with other research disciplines. The predominance of earth science research in Norwegian High Arctic regions means that research outputs are largely confined to scientific communities. The modes of representing this data are commonly reduced

quantitatively in the form of figures, graphs and tables. The design-oriented approach that I have undertaken has the capacity to access remote and intangible scales of time and space through eliciting the materialities of the Arctic and to shed light on the tangible and textural richness of Arctic environments.

This research, as it currently stands, certainly has limitations in landscape architectural practice due to the time demands of the extensive methodological inputs that this process consumes. Doctoral research conducted by landscape architect Noel van Dooren found that 'landscape architects report that even if they wished to pay explicit attention to the aspect of time, there is limited support from theory and best practice (Van Dooren and Nielsen, 2019: 998). The discipline, in my view, also lacks creativity when it comes to engaging with time which incorporates in-situ practice and the representation of time during the design process. There is much to be learned from other disciplines that are pushing towards practice-based engagement with time. A recent example is the edited book called *Working with Time in Qualitative Research* by Facer et al. (2022). Contributions in this publication come from the arts, humanities and the social sciences. In this book, the authors explore some of the themes that have been central to this research such as multiplicities of time in the research process as well as illustrating the role of time in different research practices which is somewhat similar to my reference to 'geographies of knowledge' mentioned in the previous section. I would like to build upon my time-orientated approaches from this doctoral research and extend my work towards examining the movement of materials in different environments and organisms through practical and theoretical means.

Readers of this exegesis and related publications may point toward the brief engagement with the users of these Arctic islands. These users, namely those working at the meteorological station, have very defined living and working schedules that could have benefited from introducing another concept of time. Rhythmanalysis is one such method that suggests 'multiple rhythms of place, body, nature and mobility' (Edensor, 2014:169).[1] While I did spend time on a work shift with one meteorologist on the island of Bjørnøya, the purpose was to observe the different ways in which weather parameters were measured which ranged from technological to subjective readings. To undertake a study of how people were living and working at the meteorological station would have required a whole set of ethnographic skills that would not have helped me answer the questions I wanted to answer in this research. However, there is potential, in future studies, to work with other teams of researchers from other disciplines to undertake a time-centred study of how meteorologists observe weather phenomena through technological and

1 Examples of how rhythmanalysis may be applied may be found in Vannini, 2012, and Ojala and Hautala, 2019

relative means.

The timing of this research is worth noting because as I end this work there is a growing number of publications emerging that are examining the role of time in landscape architecture. A network of very interesting topics and methods are being proposed as the discipline positions itself in a rapidly changing world. Some of the publications include *Reciprocal Landscapes* (2019) by Jane Hutton who explores material movement operating on a number of spatial and temporal scales; *Revealing Change in Cultural Landscapes* by Catherine Heatherington (2020) which examines the ways in which landscape architects engage differently with change; *Site Matters* (2021), second edition, edited by Andrea Kahn and Carol Burns which dedicates two chapters of the book that draw attention to time and the Anthropocene. In the online article *Accelerated and Decelerated Landscape* Brett Milligan asks 'Can we learn to see landscapes through and across time? Can we embrace the phenomena of multiple, shifting temporalities, overlapping in the present?' (2022). These publications are indicative of a growing interest to study how landscape architects engage with materiality and time. I see this as being crucial rather than desirable because the discipline urgently needs to work more intelligently and creatively with time and time-scales.

6.4 Future enquiries

I regard this study as a spring-board to embark on a range of other studies centred on the subject of time and materials in the Arctic and sub-Arctic regions. I see there as being three key areas or directions in which this research could proceed.

Firstly, further critical thinking about scales of time is needed in landscape architecture. My key interest, however, is in developing ways to practice time in order to make explicit the agency of time. In *practicing time* I firmly believe that being situated in the environment under study is essential. There are huge advancements being made, at present, in the development of remote sensing techniques. While I support these technological practices, an immersive, tangible attunement to a site is still required and has much room for development in the discipline. I wish to bring this area of interest into my teaching at the University of Tromsø, in Northern Norway, where I have just begun the position of associate professor in landscape architecture since February 2022.

Secondly, I would like to share my work and knowledge through collaborations with individuals from other disciplines. Landscape architecture is a design discipline that works best when ideas can be shared, critiqued and reflected upon with others. Having worked alone during this doctoral research I feel my ideas can be strengthened further with others which will also help my research interests advance and take new directions. I would like, in particular, to develop a landscape architecture oriented position in blue humanities studies. There is scope, I feel, in

bringing more design sensibilities to this area of research.

Thirdly, I am very interested in continuing to pursue my research in the Arctic and to extend my island interests in this region. I have followed, with great interest, the eruption of island research amongst research scholars from diverse disciplines. However, I am keen to address the lack of research output that focuses on Arctic islands and I would like to pursue this with other research groups that are not necessarily design-oriented. I feel that my design skills and capacity to illustrate and analyse information and knowledge in different ways can contribute to Arctic island studies. Furthermore, I have strived to create a closely connected theoretical and practical framework for working with time that can strengthen research practice in dynamic environments such as along Arctic island coasts.

I began this conclusion with reference to Derek Jarman and I wish to draw it to a close with another gardener, Gilles Clément. Like Jarman, Clément brings attention to the diverse changes that continually unfold in his garden and discusses the importance of observation in assisting effective action. In 1992 he conceived the concept of *The Planetary Garden* (le jardin planétaire). Rather than thinking of the garden as an enclosed space he multiplies this idea of enclosure to a planetary scale. According to Clément, 'the planetary garden cannot be subjected to traditional cartography. It is everywhere, it occupies the biosphere, its territory comprises the multiple layers of living matter' (2015:32). Clément's ecologically based concept exercises some of the themes that have structured this thesis as well as other themes that have emerged through the process of this research. These themes include explorations of scale, climate crises and the Anthropocene, human and more-than-human relations, and material agency. It is the subject of time that has woven these themes together in this study.

BIBLIOGRAPHY

Aasgaard, G., 1946, I Svalbard under og etter Verdenskrigen, *Norges Svalbard- og Ishavs-undersøkelser*, 11(2), pp.4-14.

Adam, B., 1994. Perceptions of time. In: T. Ingold, ed. *Companion Encyclopedia of Anthropology*. London: Routledge. pp.503–526.

Adam, B., 2004. *Time*. Cambridge: Polity Press.

Adams Sitney, P., 2008. Immanent Domain: The Films of Peter Hutton. *Artforum*, 46(9), [Online] Available at: < https://www.artforum.com/print/200805/immanent-domain-the-films-of-peter-hutton-19968> [accessed 12 August 2021].

Alaimo, S., 2016. *Exposed: Environmental Politics and Pleasures in Posthuman Times*. Minneapolis: University of Minnesota Press.

Alaimo, S., 2021. The Atlas at Hand: Mapping as New Materialist Practice, Politics + Design. In: M. Seibert, ed. *Atlas of Material Worlds*. Abington: Routledge. pp.xii-xv.

Aldred, O., 2021. *The Archaeology of Movement*. Abington: Routledge.

Anderson, B. and Harrison, P., 2010. *Taking Place: Non- Representational Theories*. Farnham: Ashgate.

Anderson, J., 2014. Exploring the space between words and meaning: Understanding the relational sensibility of surf spaces. *Emotion, Space and Society*. 10. pp.27-34.

Anderson, J. and Peters, K., 2014. *Water Worlds: Human Geographies of the Ocean*. Farnham: Ashgate.

Arctic Council, 2016. *Arctic Resilience Report*. Stockholm: Stockholm Environment Institute and the Stockholm Resilience Centre.

Arctic Monitoring and Assessment Programme, 2021a. *Arctic Climate Change Update 2021: Key Trends and Impacts: Summary for Policy-makers*. Tromsø: Arctic Monitoring and Assessment Programme.

Arctic Monitoring and Assessment Programme, 2021b. *Litter and Microplastics Monitoring Plan*. Tromsø: Arctic Monitoring and Assessment Programme.

Arlov, T., 1994. *A Short History of Svalbard*. Oslo: Norsk Polarinstitutt.

Ash, J. and Simpson, P., 2016. Geography and post-phenomenology. *Progress in Human Geography*, 40(1), pp.48–66.

Avango, D. and Roberts, P., 2017. Heritage, Conservation, and the Geopolitics of Svalbard: Writing the History of Arctic Environments. In: L. Körber, S. MacKenzie and A. Westerståhl Stenport, eds. *Arctic Environmental Modernities: From the Age of Polar Exploration to the Era of the Anthropocene*. Cham: Palgrave Macmillan. pp.125-144.

Backhaus, A., Fryd, O. and Dam, T., 2017. The urban water challenge. In: A. Van den Brink, D. Bruns, H. Tobi and S. Bell, eds. *Research in landscape architecture - methods and methodology*. London and New York: Routledge, Taylor & Francis Group, pp.285–306.

Baldacchino, G., 2012. The lure of the island: a spatial analysis of power relations. *Journal of Marine and Island Cultures*. 1(2), pp.55–62.

Baldacchino, G., ed. 2018. *The Routledge International Handbook of Island Studies: A World of Islands*. New York: Routledge.

Barnett, R., 2000. Exploration and discovery: a nonlinear approach to research by design. *Landscape Review*, 6(2), pp.25-40.

Barnett, R., 2013. *Emergence in Landscape Architecture*. London: Routledge.

Barr, S., 1987. *Norway's Polar Territories*. Oslo: Aschehoug.

Barr, S., 2004. Polar Monuments and Sites – an Introduction. In: S. Barr, S. and P. Chaplin, eds. *Cultural Heritage in the Arctic and Antarctic Regions. Monuments and Sites VII*. ICOMOS. pp.18-23.

Barr, S., 2015. *Jan Mayen: Norges utpost I vest:* Øya's *historie gjennom 1500år*. 3rd ed. Oslo: Kolofon Forlag.

Barr, S. and Strøm, H., 2004. Bjørnøya Natur og historie. *Ottar,* 5, pp.4-12. Tromsø: Tromsø Museum, Universitetsmuseet i Tromsø.

Bastian, M., 2017. Liberating clocks: developing a critical horology to rethink the potential of clock time. *New Formations: a journal of culture/theory/politics,* Special Issue: Timing Transformations. 92. pp.41-55.

Bender, B., 2002. Time and Landscape. *Current Anthropology*, 43(4), pp.103-112.

Bergson, H., 1889. *Time and Free Will: An Essay on the Immediate Data*. Translated by F. L. Pogson., 1950. London: George Allen and Unwin Ltd.

Bergson, H., 1896. *Matter and Memory*. Translated by N.M. Paul and W.S. Palmer., 1991. New York: Zone Books.

Bergson, H. 1911. *Creative Evolution*. Translated by A. Mitchell. 1998. Mineola: Dover Publications.

Bergson, H., 1922. *Duration and Simultaneity: With Reference to Einstein's Theory*. Translated by L. Jacobson. 1965. New York: Bobbs-Merrill.

Berrizbeitia, B., 2018. Criticism in the Age of Global Disruption, *Journal of Landscape Architecture*, 13(3), pp.24-27.

Birkenmajer, K., 2004. Geology of Jan Mayen Island and Surroundings. In: S. Skreslet, ed. *Jan Mayen Island in Scientific Focus*. New York: Springer Science+Business. pp.13-26.

Bjornerud, M., 2018, *Timefulness: How thinking like a geologist can help save the world*. Princeton and Oxford: Princeton University Press.

Blunden, J. and Arndt, D., 2020. State of the Climate in 2019. *Bulletin of the American Meteorological Society*. 101(8), pp.i–S429.

Bowring, J. and Swaffield, S., 2013. Shifting Landscapes In-Between Times. *Harvard Design Magazine*. 36. pp.96-104.

Bowring, J., 2016. *Melancholy and the Landscape: Locating Sadness, Memory and Reflection in the Landscape*. Abington: Routledge.

Bowring, J., 2021. The temporalities of memories in an abandoned landscape: Christchurch's Residential Red Zone. In: C. Heatherington, ed. *Revealing Change in Cultural Landscapes: Material, Spatial and Ecological Considerations*. Abington: Routledge. pp.145-155.

Braae, E., 2017. Approaching the "As Found". In: C. Girot, A. Susann, I. Fehlmann and L. Mehling, eds. Delta Dialogues. Pamphlet 20. Zürich: gta Verlag, pp.46-59.

Braae, E. and Steiner, H. eds., 2019. *Routledge Research Companion to Landscape Architecture*. Abington: Routledge.

Bremner, L. ed., 2019. *Monsoon [+ Other] Waters*. London: Monsoon Assemblages.

Bremner, L. and Cook, J. eds., 2020. *Monsoons [+other] Grounds*. School of Architecture and Cities, University of Westminster: Monsoon Assemblages.

Britten, N. and Brian Fisher, B., 1993. Qualitative Research and General Practice, *The British Journal of General Practice*, 43 (July), pp.270-271.

Brook, I., 2019., Aesthetic Appreciation of Landscape. In: P. Howard, I. Thompson, E. Waterton and M. Atha, eds. 2019. *The Routledge Companion to Landscape*

Studies. 2nd ed. Abington: Routledge. pp.39-50.

Brown, K. and Martynyuk, O., 2016. *The harvests of Chernobyl*. [online] 29 November 2016. Available at: <https://aeon.co/essays/ukraine-s-berry-pickers-are-reaping-a-radioactive-bounty> [Accessed 14 November 2021].

Brown, K., 2013. *Plutopia: Nuclear families, Atomic Cities, and the Great Soviet and American Plutonium Disasters*. New York: Oxford University Press.

Brown, M. and Humberstone, B.,eds., 2015. *Seascapes: shaped by the sea*. Farnham: Ashgate Publishing Limited.

Bruns, D., van den Brink, A., Bruns, D., Tobi, H. and Bell, S., 2017. Advancing Landscape Architecture Research. In: A. van den Brink, D. Bruns, H. Tobi and S. Bell, eds., *Research in Landscape Architecture: Methods and Methodology*. Abingdon: Routledge. pp.11-23.

Buchan, D., 1843. *A Voyage of Discovery Towards the North Pole*. London: Richard Bentley.

Buck, D., 2017. *A Musicology for Landscape*. London, New York: Routledge

CAFF and AMAP, 2007. AMAP-CAFF Coordinated Monitoring Effort Status Report, Narvik: *The Arctic Council*.

Canadell, P., Stavert, A., Poulter, B., Saunois, M., Krummel, P. and Jackson, R., 2020. Emissions of methane–a greenhouse gas far more potent than carbon dioxide–are rising dangerously. *The Conversation*,[online] Available at: <https://theconversation.com/emissions-of-methane-a-greenhouse-gas-far-more-potent-than-carbon-dioxide-are-rising-dangerously-142522> [Accessed 23 March 2022].

Carrington, D., 2021. Microplastics found in human blood for first time. *The Guardian*. March 24. [Online] Available at: <https://www.theguardian.com/environment/2022/mar/24/microplastics-found-in-human-blood-for-first-time?CMP=Share_AndroidApp_Other&fbclid=IwAR3tKm6spkhleDo6m-53YTGos4DLua5KSJuQpNfgW4u4Kz4H-V-_3fX4cEU> [Accessed 22 April 2022].

Carson, R., 1998. *The Edge of the Sea*. Boston: Houghton Mifflin Company.

Casey, E., 2001. Body, self, and landscape: A geophilosophical inquiry into the lifeworld. In P. C. Adams, S. Hoelscher and K. E. Till, eds., *Textures of place: Exploring humanist geographies*. Minneapolis: University of Minnesota Press. pp.403-425.

Cash, B. and Studebaker, L., eds. 2017. *A Conversation with Alessandra Ponte* [online] 02 November 2017. Available at: < https://yalepaprika.com/folds/horizon/a-conversation-with-alessandra-ponte> [Accessed 13 March 2022].

Chakrabarty D., 2009. The climate of history: Four theses. *Critical Inquiry*, 35, pp.197–222.

Chakrabarty, D., 2018. Anthropocene Time. *History and Theory*, 57(1), pp.5-32.

Chapman, G. and Driver, T., 1996. Time, mankind and the earth. In: T. Driver and G. Chapman. *Time-scales and environmental change*. London: Routledge.

Chen, C. 2013, Mapping Waters: Thinking with Watery Places. In: C. Chen, J. MacLeod and A. Neimanis, eds., *Thinking with Water*, Montreal & Kingston: McGill-Queen's University Press. pp.274-298.

Chen, C., MacLeod, J. and Neimanis, A., eds., 2013. *Thinking with Water*. Montreal and Kingston: McGill-Queen's University Press.

Clément, G., 2015. *The Planetary Garden and other Writings*. Translated by S. Morris. Philadelphia: University of Pennsylvania Press.

Clement, S., 2021. Walking with the rain: Sensing family mobility on-foot. In: K. Barry, M. Borovnik and T. Edensor, T.,eds. *Weather: Spaces, Mobilities and Affects*. London: Routledge. pp.51-66.

Cohen, J., 2015. *Stone: An Ecology of the Inhuman*. Minneapolis: University of Minnesota Press.

Conway, M., 1906. *No Man's Land: A history of Spitsbergen from its discovery in 1596 to the beginning of the scientific exploration of the country*. Cambridge: Cambridge University Press.

Cooney, G., 2004. Introduction: Seeing land from the sea. *World Archaeology*, 35(3), pp.323-328.

Corner, J., 1999. Introduction: Recovering Landscape as a Critical Cultural Practice. In: J. Corner, ed. Recovering Landscape: Essays in Contemporary Landscape Architecture. New York: Princeton Architectural Press. pp.1-26.

Corner, J., 2014. Preface. In: J. Corner and A. Bick Hirsch, eds. 2014. *The Landscape Imagination: Collected Essays of James Corner, 1990–2010*. New York: Princeton Architectural Press. pp.7-12.

Cosgrove, D., 2008. Images and Imagination in 20th Century Environmentalism: From the Sierras to the Poles. In: K. Yusoff, ed. *Bi-Polar*. London: The Arts Catalyst. pp.10-31.

Crang, M., 2011. Time. In: J. Agnew and D. Livingstone, eds. *The SAGE Handbook of Geographical Knowledge*. London: SAGE Publications Ltd. pp.331-343.

Cunliffe, A. M., Tanski, G., Radosavljevic, B., Palmer, W. F., Sachs, T., Lantuit, H., Kerby, J. T., and Myers-Smith, I. H., 2017. Rapid retreat of permafrost coastline observed with aerial drone photogrammetry, *The Cryosphere*, 13, pp.1513–1528.

Dallmann, D. ed., 2015. *Geoscience Atlas of Svalbard*. Report Series No. 148. Tromsø: Norwegian Polar Institute.

Daston, L., 2011. *Observation as a Way of Life: Time, Attention, Allegory; the Hans Rausing lecture 2010 Uppsala University*. Uppsala: Uppsala Universitet.

Daston, L., 2016. Cloud Physiognomy - Describing the Indescribable. *Representations*, 135, Special Issue: Description Across Disciplines. pp.45-71.

Davies. J., 2016. *The Birth of the Anthropocene*. Oakland: University of California Press.

Davis, H., 2022. *Plastic Matter*. Durham and London: Duke University Press.

De Veer, G., 1876. *The Three Voyages of William Barents to the Arctic Regions*. London: The Hakluyt Society.

Dege, W., 2004. *War North Of 80: The Last German Arctic Weather Station of World War II*. Alberta: University of Calgary Press.

Deleuze, G., 1991. *Bergsonism*. Translated by H. Tomlinson and B. Habberjam. New York: Zone Books.

Della Dora, V., 2011. Inverting perspective: icons' performative geographies. In: S. Daniels, S. DeLyser, N. Entrikin and D. Richardson, eds. *Envisioning Landscapes, Making Worlds*. London: Routledge. pp.239-246.

DeLoughrey E. M., 2019. *Allegories of the Anthropocene*. Durham: Duke University Press.

Deming, M.E. and Swaffield, S.R., 2011. *Landscape architecture Research: Inquiry, Strategy, Design*. Hoboken, N.J: Wiley.

Denbigh, K., 1981. *Three concepts of time*. Berlin: Springer-Verlag.

Denning, L., 2019. Rhyne & Huish. In: L. Bremner, L., ed. *Monsoon [+ other] Waters*. London: Monsoon Assemblages. pp.79-90.

Denzin, N. K., & Lincoln, Y. S., 2017, *The Sage handbook of qualitative research*. 5th ed. Thousand Oaks, CA: Sage.

Derocher, AE, Andersen, M., Wiig, O., Aars, J., Hansen, E. and Biuw, M., 2011. Sea ice and polar bear den ecology at Hopen Island, Svalbard. *Marine Ecology-*

Progress Series,441, pp.273–279.

DeSilvey, C., 2017. *Curated Decay: Heritage Beyond Saving*, Minneapolis: University of Minnesota Press.

Di Palma, V., 2016. Is Landscape Painting? In: G. Doherty and C. Waldheim, eds., *Is Landscape...? : Essays on the Identity of Landscape*. London; New York: Routledge, pp.44–70.

Diedrich, L., Lee, G and Braae, E., 2015. The Transect as a Method for Mapping and Narrating Water Landscapes: Humboldt's Open Works and Transareal Travelling, *NANO: New American Notes Online* [online], 6: Cartography and Narratives Available at: https://nanocrit.com/issues/issue6/transect-method-mapping-narrating-water-landscapes-humboldts-open-works-transareal-travelling [accessed 22 July 2021]

Dodds, K., 2018. *Ice: Nature and Culture*. London: Reaktion.

Dodds, K. and Nuttall, M., 2019. *The Arctic: What everyone needs to know*. New York: Oxford University Press.

Dodgshon, R., 2008. Geography's Place in Time. *Geografiska Annaler, Series B, Human Geography*, 90(1), pp.1-15.

Doherty, G and Waldheim, G., eds., 2016, *Is Landscape …? Essays on the Identity of Landscape*. London: Routledge.

Drivenes, E. and Jølle, H. eds., 2004. *Norsk Polarhistorie 2: Vitenskapene*. Oslo: Gyldendal.

Driver, T. and Chapman, G., eds., 1996. *Time-scales and Environmental Change*. London: Routledge.

Duempelmann, S. and Herrington, S. 2014. Plotting time in landscape architecture. *Studies in the History of Gardens & Designed Landscapes*, 34(1), pp.1-14.

Dufour-Beauséjour, S., Wendleder, A., Gauthier, Y., Bernier, M., Poulin, J., Gilbert, V., Tuniq, J., Rouleau, A., and Roth, A., 2020. Combining TerraSAR-X and time-lapse photography for seasonal sea ice monitoring: the case of Deception Bay, Nunavik, *The Cryosphere*, 14. pp.1595–1609.

Eckerstorfer, M., Christiansen, H. H., Rubensdotter, L., and Vogel, S., 2013. The geomorphological effect of cornice fall avalanches in the Longyeardalen valley, Svalbard, *The Cryosphere*, 7. pp.1361–1374.

Edensor, T. ed., 2010. *Geographies of Rhythm: Nature, Place, Mobilities, and Bodies*. Farnham: Ashgate.

Edensor, T., 2014. Rhythm and arrhythmia. In: P. Adey, D. Bissell, K. Hannam, P. Merriman and M. Sheller, eds. *The Routledge Handbook of Mobilities*. Abington: Routledge. pp.163-171.

Edensor, T., 2015. Light Art, Perception, and Sensation, *The Senses and Society*, 10(2), pp.138-157.

Edensor, T., 2017. *From Light to Dark: Daylight, Illumination, and Gloom*. Minneapolis: University of Minnesota Press.

Edensor, T., 2020. *Stone: Stories of Urban Materiality*. Singapore: Palgrave Macmillan.

Edensor, T., Head. L., Kothari, U., 2020. Time, Temporality and Environmental Change. *Geoforum*. 108, pp.255-258.

Edensor, T. Barry, K. and Borovnik, M., 2021. Introduction: placing weather. In: K. Barry, M. Borovnik and T. Edensor, T.,eds. *Weather: Spaces, Mobilities and Affects*. Abington: Routledge. pp.1-22.

Eliasson, O. and May, S., 2003. *Olafur Eliasson: the weather project*. London: Tate Publications.

Ellis, E., 2018. *Anthropocene: A Very Short Introduction*. Oxford: Oxford University Press.

Environmental Monitoring of Svalbard and Jan Mayen, 2016. *Pollutants in lake sediments*. [online] Available at: <https://www.mosj.no/en/influence/pollution/forurensning-innsjosedimenter.html> [Accessed 26 March 2022].

Facer, K., Siebers, J. and Smith, B. eds., 2022. *Working with Time in Qualitative Research - Case Studies, Theory and Practice*. London: Routledge.

Farrier, D., 2020. *Footprints: In Search for Future Fossils*. New York: Farrar, Straus and Giroux.

Fjågesund, P., 2008. When science came to the Arctic. Constantine Phipp's expedition to Spitsbergen in 1771. *Journal of Northern Studies*, 2, pp.77-92.

Fleischmann Holmes, B., 1907. *The log of the "Laura" in polar seas; a hunting cruise from Tromsö, Norway to Spitsbergen, the polar ice off east Greenland and the island of Jan Mayen in the summer of 1906*. Cambridge: The University Press.

Flyen, A., Flyen, C. and Mattsson, J., 2020. Climate change impacts and fungal decay in vulnerable historic structures at Svalbard. *E3S Web of Conferences*. 172. pp.1-8.

Fowler, M., 2013. Soundscape as a Design Strategy for Landscape Architectural Praxis. *Design Studies*. 34(1), pp.111-128.

Foxley, A., 2010. *Distance & Engagement: walking, thinking and making landscape*. Baden: Lars Müller Publishers.

Frayling, C., 1993, Research in art and design, *Royal College of Art Research Papers*, 1(1), pp.1–5.

French, H. 2018. *The Periglacial Environment*. 4th ed. Chichester: John Wiley & Sons Ltd.

Friedrich, D., 2018. Arctic browning: an overlooked threat that might accelerate climate change. *High North News*. [online] Available at: <https://www.highnorthnews.com/en/arctic-browning-overlooked-threat-might-accelerate-climate-change> [Accessed 29 March 2022].

Førland, E.J. ed., 2009. *Climate development in North Norway and the Svalbard region during 1900–2100*. Report series no.128. Tromsø: The Norwegian Polar Institute.

Gabrys, J., 2013. Plastic and the work of the biodegradable. In: J. Gabrys, G. Hawkins and M. Michael, eds. *Accumulation: The material politics of plastic*. Abington: Routledge. pp.208-227.

Gabrys, J., Hawkins, G. and M. Michael, eds. 2013. *Accumulation: The material politics of plastic*. Abington: Routledge.

Gabrys, J., 2018. Becoming Planetary. [online] *e-flux* October. https://www.e-flux.com/architecture/accumulation/217051/becoming-planetary/[accessed 22 July 2021].

Gange, D., 2019. Time, Space and Islands: Why Geographers Drive the Temporal Agenda. *Past and Present*, 243, pp.299-312.

Gaskill, N. and Nocek, A. eds., 2014. *The Lure of Whitehead*. Minneapolis: University of Minnesota Press.

Gibbs, L., 2017. Shores. In: K. Peters, P. Steinberg and E. Stratford, eds. *Territory Beyond Terra*. London: Rowman & Littlefield International, pp.203–220.

Gillis, J., 2014. Not continents in Miniature: Islands as Ecotones. *Island Studies Journal*, 9(1) pp.155-166.

Ginn, F., Bastian, M., Farrier, D. and Kidwell, J. 2018. Unexpected encounters with Deep Time, *Environmental Humanities*, 10(1), pp.213-225.

Girot, C., 1999. Four Trace Concepts in Landscape Architecture. In: J. Corner, ed.

Recovering Landscape: Essays in Contemporary Landscape Architecture. New York: Princeton University Press. pp. 55-89.

Gjelsvik, T., 1971. Volcano on Jan Mayen alive again. *Nature*. 228. p.352.

Gjertz, I. and Wiig, Ø., 1994. Past and Present Distribution of Walruses in Svalbard. *Arctic*. Vol.47(1), pp.34-42.

Godfrey, A., 2020. *Active Landscape Photography: Theoretical Groundwork for Landscape Architecture*. Abington: Routledge.

Groat, L. and Wang, D., 2013, *Architectural Research Methods,* 2nd ed. Hoboken: John Wiley & Sons.

Grosz, E,. 2000. Deleuze's Bergson: Duration, the Virtual and a Politics of the Future. In: C. Colebrook and I. Buchanan, eds. *Deleuze and Feminist Theory*, Edinburgh: Edinburgh University Press. pp.214–34.

Grydehøj, A. and Swaminathan, R., 2018. Cities and Urbanisation. In: G. Baldacchino, ed. *The Routledge International Handbook of Island Studies: A World of Islands*. New York: Routledge. pp.312-323.

Grønnestad, K., 2016. What Is the Arctic? *Barents Watch*. [online] Available at: <https://www.barentswatch.no/en/articles/Hva-er-Arktis/> [Accessed 05 April 2022].

Hacquebord, L., 2001. Three Centuries of Whaling and Walrus Hunting in Svalbard and its Impact on the Arctic Ecosystem. *Environment and History*, Vol. 7(2), pp.169-185.

Hacquebord, L., 2004. Dutch Cultural Heritage in the Arctic. In: S. Barr and P. Chaplin, eds. *Cultural Heritage in the Arctic and Antarctic Regions*, Lørenskog: ICOMOS IPHC. pp.72-78.

Hagenæs-Kjelldahl, D., 2006, *Bear Island: The Story of an Isolated Arctic Island - Exploration, People, Culture and Nature*. London and Whitby: IK Foundations and Company Ltd.

Halewood, M., 2005. On Whitehead and Deleuze: The process of materiality. *Configurations*, 13(1), pp.57-76.

Hamblyn, R., 2001. *The Invention of Clouds: How an amateur meteorologist forged the language of the skies*. New York: Farrar, Straus and Giroux.

Hamblyn, R., 2008. *The Cloud Book: How to Understand the Skies*. Exeter: David & Charles.

Hanssen-Bauer, I., Førland, E., Hisdal, H., Mayer, S., Sandø, A. and Sorteberg, S. eds., 2019. *Climate in Svalbard 2100: a knowledge base for climate adaptation*. Report no. 1/2019. [no place]The Norwegian Centre for Climate Services.

Haraway, D., 2016. *Staying with the Trouble*. Durham and London: Duke University Press.

Harmanşah, Ö., 2020. Deep Time and Landscape History: How Can Historical Particularity Be Translated? In: B. Wiggin, C. Fornoff and P. Kim, eds. *Time scales: Thinking across Ecological Temporalities*. Minneapolis: University of Minnesota Press. pp.39-53.

Harrisson, F. and Macken, M. 2018. Performing Drawing in Time. *LA+ Interdisciplinary Journal of Landscape Architecture*, pp.44-49.

Harvey, F., 2016. Arctic ice melt could trigger uncontrollable climate change at global level. *The Guardian*. [online] 25 November 2016. Available at: <https://www.theguardian.com/environment/2016/nov/25/arctic-ice-melt-trigger-uncontrollable-climate-change-global-level> [Accessed 28 October 2021].

Harvey, P., Krohn-Hansen, C. and Nustad, K. eds., 2019. *Anthropos and the Material*. Durham: Duke University Press.

Heatherington, C., 2015. *Perceptions of Landscape Continuity and Change*. PhD. The University of Sheffield.

Heatherington, C., 2021. *Revealing Change in Cultural Landscapes: Material, Spatial and Ecological Considerations*. Abington: Routledge.

Helin, J., Hernes, T., Hjorth, D. and Holt, R. eds., 2014. *The Oxford Handbook of Process Philosophy and Organization Studies*. Oxford: Oxford University Press.

Hemmersam, P. and Kampevold Larsen, J., 2018. Landscapes as Archives of the Future?. In: S. Frank and K. Jakobsen. eds., *Arctic Archives: Ice, Memory and Entropy*. Bielefeld: Transcript Verlag.

Hendy, D., 2013. *Noise: A human history of sound and listening*. London: Profile Books.

Heykoop, L., 2015. *Temporality in designed landscapes: the theory and its practice in works of some major landscape designers 1945-2005*. PhD. The University of Sheffield.

Hill, K., 2021. Shifting Sites: Everything is Different Now. In: A. Kahn and C. Burns, eds. *Site Matters: Strategies for Uncertainty Through Planning and Design*. 2nd ed. pp.131-151.

Hogue, M., 2017. Matter Displaced, Organized, Flattened: Recording the

Landscape. In: J. Hutton, ed. *Landscript 5: Material Culture*. Berlin: Jovis Verlag. pp.175-194.

Hommedal, S. and Egeland, J., 2019. Skal finne ut om atomubåtvrak i Norskehavet lekker. *Havforskningsinstituttet*. [online] 05 July 2019. Available at: <https://www.hi.no/hi/nyheter/2019/juli/skal-finne-ut-om-atomubatvrak-i-norskehavet-lekker> [Accessed 25 March 2022].

Hough, P., 2013. *International Politics of the Arctic: Coming in from the Cold*. Abington: Routledge.

Hudson, S., Gjelten,H., Isaksen, K. and Kohler, J., 2019. *An assessment of MOSJ: Environmental status for atmospheric and terrestrial climate in Svalbard and Jan Mayen*. Brief report no. 50. Tromsø: Norwegian Polar Institute.

Hurkxkens, I., Pigram, D., and Melsom, J., 2021. Shifting Sands: Experimental Robotic Earth-Moving Strategies in Dynamic Coastal Environments. *Journal of Digital Landscape Architecture*, 6, pp.66-74.

Hutton, J., 2020. *Reciprocal landscapes: Stories of material movements*. Abington: Routledge.

Ims, R., Henden, J., Strømeng, M. and Jepsen, J., 2020. The Arctic is greening, bird populations are declining: Is there a link?, In: J. Holmén, ed. *Fram Forum Annual Report 2020*, 9. pp.14-17.

Inderberg, H., Neerland, E., McPartland, M., Sparstad, T., Bytingsvik, J., Nikiforov, V., Evenset, A., and Krokje, Å., 2021. Expression of DNA repair genes in arctic char (*Salvelinus alpinus*) from Bjørnøya in the Norwegian Arctic. *Ecotoxicology and Environmental Safety*, 210, pp.1-9.

Ingold, T., 1993. The Temporality of the Landscape. *World Archaeology*, 25(2), pp.152-174.

Ingold, T., 2006. Rethinking the animate, re-animating thought. *Ethnos*, 71(1), pp.9–20.

Ingold, T. and Vergunst, J.,eds., 2008. *Ways of Walking: Ethnography and Practice on Foot*. Aldershot: Ashgate.

Ingold, T., 2011. *Being Alive: Essays on Movement, Knowledge and Description*. Abington: Routledge.

International Panel on Climate Change (IPCC), 2021. *Climate Change 2021: The physical science basis. Contribution of working group I to the sixth Assessment Report of the Intergovernmental panel on Climate Change*. [online] Cambridge University Press.

Ip, M., 2018. Hyperlandscape: The Norwegian-Russian borderlands. In: J. Kampevold Larsen and P. Hemmersam, eds., *Future North: The Changing Arctic Landscapes*. London: Routledge. pp. 65-85.

Irvine, R., 2014. Deep time: An Anthropological Problem, *Social Anthropology/ Anthropologie Sociale*. 22(2). pp.157–172.

Iversen, T. 1926. Hopen (Hope Island), Svalbard: Results of a Reconnaissance in the Summer 1924. *Det Norsk Videnskaps-Akademi i Oslo*, 10.

Jacks, B., 2004. Reimagining walking: Four practices. *Journal of Architectural Education*, 57(3), pp.5-9.

Jansson, M., Vicenzotti, V. and Diedrich, L., 2019. *Landscape design based on research: A methodological guide to design-oriented projects for students and teachers in landscape architecture*. Swedish University of Agricultural Sciences. Report number: 10.

Jacobs, P., 2000. Playing with time. *Studies in the History of Gardens & Designed Landscapes*, 20(4), pp.325-339).

Jarman, D., 1991. *Modern Nature*. Minneapolis: University of Minnesota Press.

Jenkins, K., 2018. Field Exercises. *Journal of Landscape Architecture*, 13(1), pp.6-21.

Johansen, H., 1899. *With Nansen in the North: A record of the Fram Expedition 1893-96*. London: Ward, Lock and Co. Limited.

Jue, M., 2020. *Wild Blue Media: Thinking through Seawater*. Durham : Duke University Press.

Jue, M. and Ruiz. R. eds., 2021. *Saturation: An Elemental Politics*. Durham: Duke University Press.

Jørgensen, K. Karadeniz, N., Mertens, E., Stiles, R. eds., 2019. *The Routledge Handbook of Teaching Landscape*. London: Routledge.

Kahn, A. and Burns, A. eds., 2021. *Site Matters: Strategies for Uncertainty Through Planning and Design*. 2nd ed. Abington: Routledge.

Kallenborn, R., Christensen, G., Evenset, A., Schlabach, M. and Stohl, A., 2007. Atmospheric transport of persistent organic pollutants (POPs) to Bjørnøya (Bear island). *Journal of Environmental Monitoring*, 9, pp.1082-1091.

Kampevold Larsen, J., 2018. Landscape in the New North. In: J. Kampevold Larsen and P. Hemmersam, eds. *Future North: The Changing Arctic Landscapes*. London: Routledge. pp. 86-105.

Kampevold Larsen, J. and Hemmersam, P. eds., 2018. *Future North: The Changing Arctic Landscapes*. London: Routledge.

Kapfer, J.,Virtanen, R. and Grytnes, J.,2012. Changes in arctic vegetation on Jan Mayen Island over 19 and 80 years. *Journal of Vegetation Science*. 23(4), pp.771-781.

King, A. and Jennings, J. N., 1939. The Imperial College Expedition to Jan Mayen Island. *The Geographical Journal* , 94 (2), pp.115-131.

Klett, M., 2011 Repeat Photography in Landscape Research. In: E. Margolis and L. Pauwels, eds. *The SAGE Handbook of Visual Research Methods*. London: SAGE Publications Ltd. pp.114-131.

Krause, F. 2013. Seasons as Rhythms on the Kemi River in Finnish Lapland, *Ethnos*, 78(1), pp. 23-46.

Kristensen, L. and Benn, D., 2012. A surge of the glaciers Skobreen–Paulabreen, Svalbard, observed by time-lapse photographs and remote sensing data, *Polar Research*, [online] Available at: <https://polarresearch.net/index.php/polar/article/view/2585/pdf.> [Accessed 18 August 2021].

Kull, C., 2005. Historical landscape repeat photography as a tool for land use change research. *Norsk Geografisk Tidsskrift–Norwegian Journal of Geography*, 59, pp.253–268.

Kullmann, K., 2018. The Drone's Eye: Applications and Implications for Landscape Architecture. *Landscape Research*, 43(7), pp. 906–921.

Kundzewicz, Z.W., 2008, Hydrosphere. In: S. Jørgensen, B. Fath. eds., *Encyclopedia of Ecology*, Amsterdam: Elsevier B.V, pp.1923-1930.

Kwa, C., 2005. Alexander von Humboldt's Invention of the Natural Landscape. *The European Legacy*. 10(2), pp.149-162.

Labadini, A., 2017. *Immaterial Landscapes: Formulating the Intangible in Northern Landscapes*. Ph.D. thesis, Oslo School of Architecture and Design.

Lapaine, M., 2018. Modelling the World. In: J. Alexander and P. Vujakovicpp, eds., *The Routledge Handbook of Mapping and Cartography*. Abingdon: Routledge, pp.187-201.

Leane, E., Philpott, C. and Delridge, M., 2020. Performing Ice: Histories, Theories, Contexts. In: C. Philpott, E. Leane and M. Delbridge, eds. *Performing Ice*. Cham: Palgrave Macmillan.

Lee, G and Diedrich, L., 2019. Transareal Excursions into Landscapes of Fragility

and Endurance: A Contemporary Interpretation of Alexander von Humboldt's Mobile Science. In: E. Braae and H. Steiner, eds. *Routledge Research Companion to Landscape Architecture. London: Routledge*. pp. 90-102.

Lee, J. and Ingold, T., 2006. Fieldwork on foot: perceiving, routing, socialising. In: S. Coleman and P. Collins, eds. *Locating the Field: Space, Place and Context in Anthropology*. Oxford: Berg, pp.67-85.

Lenzholzer, S., Duchhart, I. and Koh, J., 2013. Research through designing in landscape architecture. *Landscape and Urban Planning*, 113(2), pp.120–127.

Lenzholzer, S., Duchhart, I. and van den Brink, A., 2017. The relationship between research and design. In: A. Brink van den, D. Bruns, H. Tobi and S. Bell, eds., *Research in Landscape Architecture: Methods and Methodology*. Abingdon, Oxon: Routledge, pp.54–64.

Lewis, S. and Maslin, M., 2015, Defining the Anthropocene, *Nature*, 519. pp.171-180.

Lid, J., 1964. *The Flora of Jan Mayen*. Oslo: Norsk Polarinstitutt.

Linstead, S. and Mullarkey, J., 2003. Time, Creativity and Culture: Introducing Bergson. *Culture and Organizatio*n, 9(1), pp.3-13.

Lorimer, H., 2005. Cultural geography: the busyness of being 'more-than-representational'. *Progress in Human Geography*, 29(1), pp.83-94.

Lorimer, H., 2008. Cultural geography: Non-representational Conditions and Concerns. *Progress in Human Geography*, 32(4), pp.551–559.

Lorimer, J., 2012. Multinatural Geographies for the Anthropocene. *Progress in Human Geography,* 36(5), pp.593–612.

Lorimer, J., 2017. The Anthropo-scene: A guide for the perplexed. *Social Studies of Science*, 47(1), pp.117–142.

Lund, K. and Wilson, M., 2010. Slipping into Landscape. In: K. Lund, K. and K. Benediktsson, eds. *Conversations with Landscape*. Farnham: Ashgate. pp. 97-108.

Lury, C, Fenshan, R, Heller-Nicholas. A. eds. 2018. *Routledge Handbook of Interdisciplinary Research Methods*, London: Routledge.

Lønø, O., 1972 Norske fangstmenns overvintringer. Del 1: 1795 til 1892. *Polarboken 1971-1972*. pp.9-72.

Macfarlane, R., 2012. *The Old Ways*. London: Penguin Books.

Macfarlane, R., 2019. *Underland: A Deep Time Journey*. London: Hamish Hamilton.

Harrisson, F. and Macken, M., 2018. Performing drawing in time. *LA+ Interdisciplinary Journal of Landscape Architecture,* 08, pp.44-49.

Macpherson, H., 2010. Non-Representational approaches to body-landscape relations. *Geography Compass*, 4(1), pp.1-13.

Malm, A. and Hornborg, A., 2014. The geology of mankind? A critique of the Anthropocene narrative, *The Anthropocene Review*, 1(1), pp.62-69.

Margolis, E. and Rowe, J., 2011, Methodological Approaches to Disclosing Historic Photographs. In: E. Margolis and L. Pauwels, eds. *The SAGE Handbook of Visual Research Methods*. London: SAGE Publications Ltd. pp.337-358.

Massey, D., 2005. *For Space*. Sage: London.

Massey, D., 2011. Imagining the field. In: M. Pryke, G. Rose and S. Whatmore, eds. *Using Social Theory*. London: SAGE Publications Ltd., pp.72–88.

Mathur, A. and da Cunha, D., eds. 2014. *Design in the terrain of water*. Philadelphia: Applied Research + Design.

May, J. and Thrift, N., eds., 2001. *Timespace: Geographies of temporality*. London: Routledge.

Matless, D., 2018. Next the Sea: Eccles and the Anthroposcenic. *Journal of Historical Geography*, 62, pp.71-84.

Metcalfe, A., 2016. Repeat Photography and Educational Research. In: J. Moss and B. Pini, eds. *Visual Research Methods in Educational Research*. Basingstoke: Palgrave Macmillan. pp.153-171.

Met Office, 2019. What is the Atlantic Meridional Overturning Circulation? [online]. Available at: < https://www.metoffice.gov.uk/weather/learn-about/weather/oceans/amoc> [Accessed 07 November 2021].

Milligan, B., 2019. Making terrains: Surveying, drones and media ecology, *Journal of Landscape Architecture*, 14(2), pp. 20-35.

Milligan, B., 2022. Accelerated and Decelerated Landscapes, *Places Journal*. [online] Available at: <https://placesjournal.org/article/accelerated-and-decelerated-landscapes/> [Accessed 14 February 2022].

Misrach, R. and Orff, K., 2012. *Petrochemical America*. New York: Aperture Press.

Monsoon Assemblages, 2020. *Executive Summary*. [online] Available at: <http://

www.monass.org/project/executive-summary/> [Accessed 07 April 2020].

Motloch, J., 2000. *Introduction to landscape design*. New york: Wiley.

Miljøovervåking Svalbard og Jan Mayen (MOSJ), 2021, *Glaucous gull*. [online] Available at: <https://www.mosj.no/en/fauna/marine/glaucous-gull.html/> [Accessed 23 March 2022].
National Snow and Ice Data Center, 2022, *Is a "greener" Arctic a better Arctic?* [online] Available at: <https://nsidc.org/cryosphere/icelights/2013/04/greener-arctic> [Accessed 28 March 2022].

Neimanis, A., 2017. *Bodies of Water: Posthuman Feminist Phenomenology*. London: Bloomsbury Academic.

Nicu, I., Stalsberg, K., Rubensdotter, L. Vandrup Martens, Flyen, A. 2020. Coastal Erosion Affecting Cultural Heritage in Svalbard. A Case Study in Hiorthhamn (Adventfjorden)—An Abandoned Mining Settlement. *Sustainability*,12, pp.1-21.

Nielsen, M., Højen Sørensen, A. and Riede, F., 2020. Islands of Time. Unsettling Linearity Across Deep History, *Ethnos*, 86(5), pp.943-962.

Niemanis, A. 2017. *Bodies of water: Post-human feminist phenomenology*. London: Bloomsbury Academic.

Nijhuis, S., & de Vries, J., 2020. Design as Research in Landscape Architecture. *Landscape Journal*, 38(1-2), pp.87-103.

Nilsen, Y. and Vollset, M., 2016. V*inden Dreier: Meteorologiens historie I Norge*. Oslo: Scandinavian Academic Press.

Ninsalam, Y. and Rekittke, J., 2016. Landscape architectural foot soldier operations. *Sustainable Cities and Society*, 20, pp.158-167.

Nordli, Ø., 2010. The Svalbard Airport Temperature Series. *Bulletin of Geography*, 3, pp.5-25.

Norsk institutt for kulturminneforskning (NIKU), 2019, [online] Available at: <https://www.niku.no/en/prosjekter/cultcoast/> [Accessed 30 March 2022].

Norwegian Petroleum Directorate, 2021, Activity per Sea Area. [online] Available at: <https://www.norskpetroleum.no/en/developments-and-operations/activity-per-sea-area/> [Accessed 04 November 2021].

Norwegian University of Science and Technology, 2013. *Deepwater mining in Norway*. [online] Available at: < https://phys.org/news/2013-10-deepwater-norway.html> [Accessed 04 November 2021].

Olivier, L. 2001. Duration, memory and the nature of the archaeological record. In:

Karlsson, H., ed. *It's about time: The concept of time in archaeology*. Göteborg: Bricoleur Press.

Olsen, B., 2010. *In Defense of Things: Archaeology and the Ontology of Objects*. Lanham: AltaMira press.

Orekses, N., 2007. The Scientific Consensus on Climate Change: How Do We Know We're Not Wrong. In: J. Dimento and P. Doughman, eds., *Climate Change: What It Means for Us, Our Children, and Our Grandchildren*. Cambridge: The MIT Press. pp.65-100.

Orff, K., 2020. What is Design Now? Unmaking the Landscape. *Architectural Design*, 90(1), pp.94-99.

Overland, J., E. Dunlea, J.E. Box, R. Corell, M. Forsius, V. Kattsov, M.S. Olsen, Pawlak, J., Reiersen, L. and Wang, M., 2018. The Urgency of Arctic Change. *Polar Science*. 21. pp.6-13.

Overrein, Ø., Henriksen, J., Fossli Johansen, B. and Prestvold, K., 2015a. Bjørnøya's Wildlife. [online] Available at: <https://cruise-handbook.npolar.no/en/bjornoya/wildlife.html> [Accessed 30 March 2022].

Overrein, Ø., Henriksen, J., Fossli Johansen, B. and Prestvold, K., 2015b. Hopen's Vegetation and Wildlife. [online] Available at: < https://cruise-handbook.npolar.no/en/hopen/vegetation-and-wildlife.html> [Accessed 30 March 2022].

Pallasmaa, J., 2005. *The eyes of the skin: architecture and the senses*. Chichester: Academy Press.

Juhani Pallasmaa, 2016, 'Dwelling in Light: Tactile, emotive and life enhancing light'*, D/A Magazine*, No.26. [Online]. Available from: https://www.daylightandarchitecture.com/library/dwelling-in-light/?consent=none&ref-original=https%3A%2F%2Fwww.google.com%2F. [Accessed 04 May 2021].

Pearson, K. and Mullarkey, J., 2002. *Henri Bergson: Key Writings*. New York: Continuum.

Pearson, M.N., 1985. Littoral Society: The Case for the Coast. *The Great Circle*, 7(1), pp.1–8.

Pedersen, M. and Nielsen, M. 2013. Trans-temporal hinges. Social Analysis, 57(1), pp.122-142.

Perkins, C., 2020. Mapping Place. In: T. Edensor, A. Kalandides, A and U. Kothari, eds. 2020. *The Routledge Handbook of Place*. Abington: Routledge. pp.357-366.

Peters, K. and Steinberg, P., 2014. Toward a Wet Ontology, *Harvard Design*

Magazine, 39, pp.124-129.

Peters, K., 2021. Writing (extra)planetary geographies of weather-worlds. In: K. Barry, M. Borovnik and T. Edensor, eds. *Weather: Spaces, Mobilities and Affects*. Abington: Routledge. pp.250-262.

Phelan, J. 2007. *Seascapes: Tides of thought and being in Western perceptions of the sea*. London: Goldsmiths: University of London.

Phoenix, G. K., and Bjerke, J. W., 2016, Arctic browning: Extreme events and trends reversing arctic greening. *Global Change Biology*, 22(9), pp.2960–2962.

Pink, S., 2015. *Doing sensory ethnography*. 2nd edition. London: Sage Publications.

Ponte, A., 2014. *The House of Light and Entropy*. London: Architectural Association.

Prestvold, K., 2015. *Bjørnøya's History and Cultural Remains*. [online] Available at: <https://cruise-handbook.npolar.no/en/bjornoya/history-and-cultural-remains.html> [Accessed 30 March 2022].

Prestvold, K., 2016. *Whaling in the Arctic*. [online] Available at: <https://svalbardmuseum.no/en/kultur-og-historie/hvalfangst/> [Accessed 30 March 2022].

Prominski, M., 2014. Andscapes: Concepts of nature and culture for landscape architecture in the 'Anthropocene', *Journal of Landscape Architecture*, 9(1), pp.6-19.

Prominski, M., 2016. Research and design in JoLA, *Journal of Landscape Architecture*, 11(2), pp.26-29.

Prominski, M., 2017. Design Guidelines. In: A. van den Brink, D. Bruns, H. Tobi and S. Bell, eds., *Research in Landscape Architecture: Methods and Methodology*. London, New York: Routledge, pp.194–208.

Prominski, M., 2019. Designing Landscapes of Entanglement. In: E. Braae, E. and H. Steiner, eds. *Routledge Research Companion to Landscape Architecture*. Abington: Routledge. pp.171-183.

Pugh, J and Chandler, D., 2021. *Anthropocene Islands: Entangled Worlds*. London: University of Westminster Press.

Purchas, S., 1625. *Hakluytus Posthumus or Purchas His Pilgrimes: Contayning a History of the World in Sea Voyages and Lande Travells by Englishmen and others*. Volumes XIII and XIV (Reprint 1906 J. Maclehose and sons).

Raffles, H., 2020. *The Book of Uncomformities: Speculations on Lost Time*. New

York: Pantheon Books.

Randerson, J., 2021. *Weather as Medium: Toward a Meteorological Art*. Cambridge: The MIT Press.

Reimers, B., Griffiths, CL., and Hoffman, MT., 2015. Repeat photography as a tool for detecting and monitoring historical changes in South African coastal habitats. *African Journal of Marine Science*, 36(3), pp.387-398.

Rekittke, J., 2015. Mandatory fieldwork. In: C. Girot and I. Hurkxkens, eds., *Field Instruments of Design*. Zürich: gta Verlag, pp.56–67.

Renner, A., Dodd, P. and Fransson, A., 2018. *An assessment of MOSJ: The state of the marine climate system around Svalbard and Jan Mayen*. Brief report nr 048. Tromsø: Norwegian Polar Institute.

Ritter,C., 1954. *A Woman in the Polar Night*, translated by Jane Degras. 2019. London: Pushkin Press.

Riquet, J., 2020. Filming Bear Island-Arctic Island Narratives, Polar Exploration and Poetic Geometry. *Shima: The International Journal of Research into Island Cultures*. 14(1), 47-66.

Roberts, T., 2014. From things to events: Whitehead and the materiality of process. *Environment and Planning D: Society and Space*, 32, pp.968-983.

Roberts, T., 2019. Resituating Post-phenomenological Geographies: Deleuze, Relations and the Limits of Objects. *Transactions of the Institute of British Geographers*, 44, pp.542–554.

Robinson, K. ed., 2009. *Deleuze, Whitehead, Bergson: Rhizomatic connections*. Basingstoke: Palgrave MacMillan.

Robinson, T., 2007. *Setting Foot on the Shores of Connemara and other Writings*, Dublin: The Lilliput Press.

Rose, G. and Wylie, J., 2006. Animating landscape. *Environment and Planning D: Society and Space*, 24, pp.475-475.

Rose, G., 2016. *Visual Methodologies: An introduction to researching with visual materials*. 4th ed. London: SAGE Publications Ltd.

Royle, S., 2014. *Islands: Nature and Culture*. London: Reaktion Books Ltd.

Royle, S. and Brinklow, L. 2018. Definitions and typologies. In: G. Baldacchino, ed., *The Routledge International Handbook of Island Studies: A World of Islands*. New York: Routledge. pp.3-20.

Rutledge, K., Ramroop, T., Boudreau, D., McDaniel, M., Teng, S., Sprout, E., Costa, H., Hall, H. and Hunt, J. 2011. *Biosphere*. [online]. Available at: <https://www.nationalgeographic.org/encyclopedia/biosphere/> [Accessed 23 March 2022].

Ryan, A., 2016. *Where Land Meets Sea Coastal Explorations of Landscape, Representation and Spatial Experience*. Abingdon: Taylor and Francis.

Ryall, A., Schimanski, J. and Wærp, H.H. eds., 2010. *Arctic Discourses*. Newcastle upon Tyne: Cambridge Scholars Pub.

Schneider, A., 2018. Designing Dialectical Landscape. *LA+ Interdisciplinary Journal of Landscape Architecture*, pp.28-35.

Schultz, H. and van Etteger, R., 2017. Walking. In: A. van den Brink, D. Bruns, H. Tobi and S. Bell, eds., *Research in Landscape Architecture: Methods and Methodology*. Abingdon, Oxon: Routledge, pp.179–193.

Schultz, H., 2014, Designing large-scale landscapes through walking, *Journal of Landscape Architecture*, 9(2), pp.6–15.

Schwägerl, C., 2014. *The Anthropocene: the human era and how it shapes our planet*. Sante Fe: Synergetic Press.

Scott, M., 2020. *Greenland ice loss in 2020 was below the record but above average*. [Online]. [Accessed 07 June 2021]. Available from: https://www.climate.gov/news-features/featured-images/greenland-ice-loss-2020-was-below-record-above-average.

Seibert, M., ed. 2021. *Atlas of Material Worlds*. Abington: Routledge.

Selinger, F. 1986, German Automatic Weather Stations in the Arctic 1942- 1945. *Polar Geography and Geology*, 10(2), pp.89-104.

Senger, K., Brugmans, P., Grundvåg, S., Jochmann, M., Nøttvedt, A., Olaussen, S., Skotte, A. and Smyrak-Sikora, A., 2019. Petroleum, coal and research drilling onshore Svalbard: a historical perspective. *Norwegian Journal of Geology*. 99(3). pp.1-30.

Shannon, K., 2018. Urgent interventions needed at the territorial scale—now more than ever. In: E. Braae and H. Steiner, eds. *Routledge Research Companion to Landscape Architecture*. London: Routledge. pp.2017-218.

Sijmons, D., 2021. In the Anthropocene, Site Matters in Four Ways. In: A. Kahn and C. Burns, eds. *Site Matters: Strategies for Uncertainty Through Planning and Design*. London: Routledge. pp.110–130.

Simonetti, C., 2019. The petrified Anthropocene. *Theory, Culture & Society*, 36(7-

8), pp.45-66.

Simpson, P., 2012. Apprehending everyday rhythms: rhythmanalysis, time-lapse photography, and the space-times of street performance. *Cultural Geographies*, 19(4), pp.423-445.

Smith, T., 2007. Repeat Photography as a Method in Visual Anthropology. *Visual Anthropology*, 20(2), pp.179–200.

Sprackland, J., 2013. *Strands: A year of Discoveries on the Beach*. London: Penguin.

Steffen, W., Crutzen, P. and McNeill J., 2007. The Anthropocene: Are humans now overwhelming the great forces of nature? *Ambio* 36(8). pp.614–620.

Steinberg, P., Tasch, J. and Gerhardt, H., 2015. *Contesting the Arctic: Politics and Imaginaries in the Circumpolar North*. London: I. B. Tauris.

Stratford, E. 2008. Islandness and struggles over development: A Tasmanian case study. *Political Geography*, 27. pp.160-175.

Strang, V., 2004. *The Meaning of Water*. Oxford: Berg.

Strang, V., 2014. Fluid consistencies: Material relationality in human engagements with water. *Archaeological Dialogues*, 21(2), pp.133-150.

Strang, V., 2015. On the Matter of Time. *Interdisciplinary Science Reviews*, 40(2). pp.101–123.

Søreide, O., 1994. *Hopen: Ishavsøy og Meteorologisk Stasjon*, Øystese: Friske Tankar A.S.

IPCC (The Intergovernmental Panel on Climate Change), 2019. *Polar Regions*, Special Report on the Ocean and Cryosphere in a Changing Climate. UN. pp.203-320.

IPCC (The Intergovernmental Panel on Climate Change). 2021. *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. UN.

The Kenan Institute for Ethics, 2021. *Facing the Anthropocene Series: A Conversation Kate Brown*, [online] Available at: <https://www.youtube.com/watch?v=r2q2nVvk8Tc> [Accessed 14 November 2021].

The Norwegian University of Science and Technology ,2013. Deepwater mining in Norway. *Science daily*, [Online] Available at: <https://www.sciencedaily.com/releases/2013/10/131021094726.htm> [Accessed 31 March 2022].

Thompson, I., 2014. *Landscape Architecture: A very short Introduction*. Oxford: Oxford University Press.

Thrift, N., 1996. *Spatial formations*. London: Sage.

Thrift, N., 2008. *Non-representational theory: Space/ politics/affect*. London: Routledge.

Till, J., 2009. *Architecture Depends*. London: The MIT Press.

Tinkler, P., 2013. *Using Photographs in Social and Historical Research*. London: SAGE Publications Ltd.

Toland, A., 2013. Walking—Landscape—Urbanism. *On-Walking Conference*. The University of Sunderland. 28-29 June. Sunderland: Arts Editions North, pp.299-307.

Treib, M., 2018. *The landscapes of Georges Descombes*. San Francisco: ORO Editions.

Tsing, A., 2015. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton and Oxford: The Princeton University Press.

Tsing, A. and Lassila, M., 2017. Interview with Anna Tsing. *Suomen Antropologi: Journal of the Finnish Anthropological Society*, 42(1), pp.22–30.

Tsing, A., Swanson, H., Gan, E. and Bubandt, N. eds., 2017. *Arts of Living on a Damaged Planet: Ghosts of the Anthropocene*. Minneapolis: The University of Minnesota Press.

Turlyun, D., 2021. Is it snowing microplastics in Siberia? Russian scientists find airborne fibers in remote samples. *Arctic Today*. March 19. [Online] Available at: < https://www.arctictoday.com/is-it-snowing-microplastics-in-siberia-russian-scientists-find-airborne-fibers-in-remote-samples/ > [Accessed 22 April 2022].

Tynan, E. and Kampevold Larsen, J., 2017, Cold Climates and Performative territories. In: A. Altés, A. Jara and L. Correia, eds. *The Power of Experiment*, ARTÉRIA - Humanizing Architecture 4th Edition of Lisbon Architecture Triennale. pp.140-155.

Tynan, E., 2020. Arctic islands, Archival Exposures (On Jan Mayen, Bjørnøya, and Hopen islands), *Shima Journal*, 14(1), pp.67-89.

Tynan, E., 2022. [Pre-print]. Shifting coasts: Developing New Coastal Concepts. *Building Material (Architectural Association of Ireland)*.

Tynan, E., 2021. What time is this coast? Temporal encounters in the Arctic. *Journal of Landscape Architecture*. 16(2), pp.10-25.

Van den Brink, A., and Bruns, D., 2014. Strategies for enhancing landscape architecture research. *Landscape Research*, 39(1), pp.7–20.

Van Dooren, N., 2016. *The representation of change and dynamics in Dutch landscaoe architecture practice after 1985*. PhD. University of Amsterdam.

Van Dooren, N., 2018, Time for Time, *LA+ Interdisciplinary Journal of Landscape Architecture,* 08, pp.36-41.

Van Dooren, N. and Nielsen, A., 2021. The representation of Time: Addressing a Theoretical Flaw in Landscape Architecture. *Landscape Research*, 44(8), pp.997-1013.

Vannini, P. Waskul, D. Gottschalk, S., Ellis-Newstead, T. 2012. Making Sense of the Weather: Dwelling and Weathering on Canada's Rain Coast. *Space and Culture*. 15(4), pp.361-380.

Vannini, P. 2012. In time, out of time: Rhythmanalyzing ferry mobilities. *Time & Society*, 21(2), pp. 241–269.

Vannini, P. and Taggart, J., 2014. The Day We Drove on the Ocean (and Lived to Tell the Tale About It): Of Deltas, Ice Roads, Waterscapes and Other Meshworks. In: J. Anderson and K. Peters. eds. *Water Worlds: Human Geographies of the Ocean*. Farnham: Ashgate. pp. 89-102.

Vannini, P.ed., 2015. *Non-Representational Methodologies: Re-Envisioning Research*. Abington: Routledge.

Vermeulen, P., 2020. *Literature and the Anthropocene*. New York: Routledge.

Vogt, G., 2010, Forward, In: A. Foxley. ed., *Distance and Engagement: Walking, Thinking and Making Landscape*, Baden: Lars Müller Publishers, pp.7–23.

Vogt, G., Bornhauser, R. and Kissling, T. 2015. *Landscape as a Cabinet of Curiosities: In Search of a Position*. Zurich: Lars Müller Publishers.

Warf, B., 2008. T*ime-space Compression: Historical geographies*. London: Routledge.

Waterman, T. Wolff, J. and Wall, E. eds., 2021. *Landscape Citizenships*. Abington: Routledge.

Waterton, E., 2019. More-than-representational Landscapes. In: P. Howard, I. Thompson, E. Waterton and M. Atha, eds. *The Routledge Companion to Landscape Studies*. 2nd Edition. Abington: Routledge. pp.91-101.

Webb, R., Boyer, D., and Turner, R. eds., 2010. *Repeat Photography: Methods and*

Applications in the Natural Sciences. Washington: Island Press.

Welland, M., 2009. *Sand: The never-ending story*. Berkeley: University of California Press.

West-Pavlov, R., 2013. *Temporalities*. Abington: Routledge.

Whiston Spirn, A., 2014. *The Eye is a Door: Landscape, Photography, and the Art of Discovery*. [kindle] Wolf Tree Press. Available at: Amazon.com < https://www.amazon.com/Eye-Door-Landscape-Photography-Discovery-ebook/dp/B00KGL8X1Q>[Accessed 20 July 2021].

White, A., 1671. *Spizbergen and Greenland: F. Marten's voyage to Spitzbergen*. London: Hakluyt Society.

Whitehead, A. N., 1920. *The Concept of Nature*. 1964. Cambridge: Cambridge University Press.

Whitehead, A. N., 1929. *Process and Reality: An Essay in Cosmology*. Cambridge: Cambridge University Press.

Whitehead, L.A., 1925. *Science and the Modern World*. New York: New American Library.

Whitehead, L.A., 1938. *Modes of thought*. New York: The Free Press.

Whitrow, G., 1980. The natural philosophy of time. Oxford: Clarendon Press.

Wiggin, B., Fornoff, C. and Kim, P. eds., 2020. *Time scales: Thinking across Ecological Temporalities*. Minneapolis: University of Minnesota Press.

Wilkinson, B., 2005. Humans as geologic agents: A deep- time perspective. *Geology*, 33, pp.161– 164.

Wobus, C., Anderson, R., Overeem, I., Matell, N., Clow, G.,and Urban, F. 2011. Thermal Erosion of a Permafrost Coastline: Improving Process-Based Models Using Time-Lapse Photography. *Arctic, Antarctic, and Alpine Research*, 43(3). pp.474–484.

Wohlgemuth, E.1886. *Die Osterreichische Polarstation Jan Mayen*. Wien : K.u. K. Hof- und Staatsdruckerei.

Wolff, J., 2017. Lexicon as Theory: Some definitions at the edge of San Francisco Bay. In: C. Girot, S. Ahn, I. Fehlmann and L. Mehling, eds., *Delta Dialogues*. Zürich: gta Verlag, pp.14–24.

Wolff, J. 2021. Portfolio: Sites, Stories, Representations, Citizens. In: A. Kahn and C. Burns, eds. 2021. *Site Matters: Strategies for Uncertainty Through Planning*

and Design. 2nd ed. Abington: Routledge.pp.204-214.

Wood, D., 2019. *Deep Time Dark Times: On being Geologically Human*. New York: Fordham University Press.

Woodward, R., 2005. From military geography to militarism's geographies: Disciplinary engagements with the geographies of militarism and military activities. *Progress in Human Geography,* 29, pp. 718–740.

Wordie, J., 1922. Jan Mayen Island. *The Geographical Journal* , 59(3), pp.180-194.

Wunderlich, F., 2008. Walking and rhythmicity: Sensing urban space. J*ournal of Urban Design*, 13(1), pp.125-139.

Wylie, J., 2006. Cultural geographies in practice: Smoothlands: fragments/ landscapes/fragments. *Cultural Geographies*, 13(3), pp.458–465.

Wylie, J., 2007. *Landscape*. Abingdon: Routledge.

Wylie, J., 2017. The Distant: thinking towards renewed senses of landscape and distance. *Environment, Space and Place*, *9*(1), 1-20.

Wylie, J., 2005. A single day's walking: narrating self and landscape on the South West Coast Path. *Transactions of the Institute of British Geographers*, 30, pp.234–247.

Yaneva. A., 2017. Architectural Theory at Two Speeds. *Architectural Design Theory*. 1. pp.89-101.

Young, O. R., 2012. Arctic tipping points: governance in turbulent times. *AMBIO*, 41(1), pp.75–84.

Yusoff, K., 2005. Visualizing Antarctica as a Place in Time. *Space and Culture*. 8(4), pp.381-398.

Yusoff, K., 2007. Antarctic Exposure: Archives of the Feeling Body. *Cultural Geographies*. 14. pp.211–233.

Yusoff, K., 2013. Geologic life: prehistory, climate, futures in the Anthropocene. *Environment and Planning D: Society and Space.* 31, pp.779 – 795.

Yusoff, K., 2015. Anthropogenesis: Origins and Endings in the Anthropocene. *Theory, Culture & Society*, 33(2), pp.3–28.

Yusoff, K., 2017. Geosocial strata. *Theory, Culture & Society*, 34(2–3), pp.105–127.

Yusoff, K. 2018. *A Billion Black Anthropocenes or None*. Minneapolis: University of Minnesota Press.

Zalasiewicz, J. 2017.The Extraordinary Strata of the Anthropocene. In: S. Oppermann and S. Iovino. Eds., *Environmental Humanities: Voices from the Anthropocene*. London: Rowman and Littlefield International. pp.115-132.

ARCTIC ISLANDS, ARCHIVAL EXPOSURES

(On Jan Mayen, Bjørnøya, and Hopen islands)

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ABSTRACT: This article examines a selection of coastal sites on Jan Mayen, Bjørnøya, and Hopen, three remote Arctic islands, in an investigation of the material changes to these vulnerable environments over time. To engage with these changes, I journey through "geographies of knowledge" by mediating between historical photographic archives and contemporary site analysis. Based on recent fieldwork on these islands, I propose an extension of existing conceptual framings in landscape architecture site analysis to include perspectives and agencies of non-human actors/participants/objects and processes. This allows me to focus on the materiality and temporality of site analysis. My investigation provides insights into the types of changes that have occurred, whether natural and anthropogenic. It argues for the relevance of in-situ research in landscape studies that allows one to engage more affectively, critically, and interpretatively with landscape. Through descriptive and illustrative means, the inquiry extends beyond the boundaries of archival material to present situated, embodied, and relational knowledge and thereby renew our understanding of these coastal sites.

KEYWORDS: Arctic coastlines, history, photography, time, materiality, fieldwork, landscape, geographies of knowledge, Jan Mayen, Bjørnøya, Hopen.

I. Background and focus

Represented by a host of fierce sea monsters in 16th Century cartography, the Arctic has become the site of a very different kind of foreboding.[1] Having previously been construed as a mysterious, inhospitable, and largely unknown region, it now points towards unprecedented change in a very vulnerable environment. Although past and present representations mediate what the Arctic is or could be in very different ways, they certainly all stimulate the imagination. Today, the polar regions resemble large, icy Petri dishes under the scrutiny of scientists and politicians. These regions have been referred to as "barometers" or indicators of climate change because of the significant transformations that are increasingly evident there (Wehrmann, 2016). These changes, thus far, have included retreating glaciers, melting sea ice, thawing permafrost, migration of people, changes to eco-systems, and alterations in weather patterns. If we increase the magnification of the Petri dish, we observe numerous islands and archipelagoes in the Arctic region, three of which will be examined in this article.

[1] See Bonnet (2018) and Waters' (2013) discussion of the *Carta Marina*, 1527-39.

Tynan: Arctic Islands, Archival Exposures

The Norwegian Arctic islands of Jan Mayen, Bjørnøya, and Hopen are all showing the effects of a warming climate. Meteorological stations are located on all three islands. A comparison between the historical weather data and present-day weather observation records confirms significant changes to the climate in this region. It is the fragile edges of these islands that have proven to be particularly vulnerable and where notable physical and material change is evident. As a landscape architect researching the material and temporal changes of these Arctic coastal environments, I examined the practice of knowledge-making. Landscape architecture is a future-oriented profession; more often than not, it begins by considering the present before projecting ideas and designs into the future. However, as landscape historian John Dixon Hunt warns, "history impacts a site even before the designer makes his proposals for it" (2014: 16). He outlines the diverse and intertwining time frames within which the geology, topography, and climate of a given landscape are shaped and transformed.

In this article, I examine a selection of island coasts. I argue that in order to understand the changes that we see today, knowledge of the islands' histories is necessary. Visiting these islands, it is easy to assume that changes-spurred by a warming climate are the main culprit that has caused destruction along these coasts. However, the consequences of the islands' political history, notably during the Second World War, have played a significant role in what we encounter today. The material changes to these coastlines reveal disturbances of deep time geologies; the weathering of materials that were once alien to the islands such as timber, steel, concrete, and glass, and the gradual mixing and morphing of these materials, have generated new ecologies.

Therefore, as a starting point to this research, the history of the islands will be brought to the fore through the use of historical photographs. Early photographs of the islands were predominantly taken by scientists visiting them at different times from the late 19th to the mid-20th centuries. Through these various scientific lenses, a diverse and expansive photographic collection has been left behind. Five collections, located across Norway, were accessed for this study and will be elaborated on in Section IV. This historical context gives us insights into how the islands were used and what purposes they served. To assess how their coastlines have transformed over time, I visited the sites where the photographers had stood. Through the processing of these physical and material dimensions of the coasts, the experiential layer of fieldwork became a dynamic component of working in different knowledge-making environments. In my research, I draw on the different perspectives of my professional background as a practitioner, teacher, and researcher of landscape architecture. This influenced the mixed qualitative and interdisciplinary methods that I used (Brink et al, 2017; Lury et al, 2018). The study follows a sequence of ways of doing and knowing that were adapted to each site that I studied. The three Arctic islands I worked with were selected for a number of reasons. Prior to knowing their specificities, I knew that many heritage sites on these Arctic islands were increasingly under threat from climate-related phenomena (Barr and Chaplin, 2004). I wanted to know how these sites had evolved over time: what they had been used for, and why, and what they had become. Many Arctic islands have a rich scientific history, and the three islands that I selected were of particular interest as a number of meteorological stations had been established on them at different times.

I visited the island of Bjørnøya in 2017 as a preliminary pilot for this study to explore situated fieldwork with these coastal settings. I subsequently carried out three iterative studies on Bjørnøya, Jan Mayen, and Hopen in 2018. Each visit to the islands informed and improved the way I worked and collected information. The combination of working with

historical photograph archives and different fieldwork practices meant that many different methods were needed for this project. The study brings together photographic archival research, site observations through photography and field notes, and personal reflections on knowledge building as I traversed different sites of knowing. The work presented uses different rhetorical techniques, styles of writing, and forms of imaging as a response to the changing sites of knowing that I worked through.

II. Approaching an Arctic island site

To negotiate this transition between the history of Arctic island coasts and their present-day conditions, I argue for a relational approach to the analysis of these specific coastal landscapes. This relational approach opens a dialogue between object and subject, the tangible and the intangible, as well as the human and nonhuman. These relations expose the different temporal and spatial complexities that exist in the study of Arctic islands. There is an emerging body of work in island studies that expresses a "relational turn" in the way we research and study islands (Hayward, 2016; Pugh, 2018). One interesting example of a relational approach to islands via on-site experiences is the work of writer and cartographer Tim Robinson. Robinson developed intimate readings of the landscape in the Aran Islands off the west coast of Ireland through the merging of deep historical research, cartography, and personal writings (Wylie, 2012; Gange, 2019). In a similar vein, there are approaches applied in landscape architecture that incorporate the in-site experience of the designer into the design process.

One such approach is the notion of *trace concepts*, which was coined by the landscape architect Christophe Girot[2] in 1999. Briefly, the four concepts Girot proposes are:

- *Landing,* relating to the initial site reconnaissance and moves from the unknown to the known;
- *Grounding* referring to reading and understanding the site;
- *Finding* entailing the act of discovery, whether that is something physical on the site or an idea emerging;
- *Founding,* the synthesis of the previous three concepts where the designer brings something to the site.

The main merit of this approach is that the designer's experience and intuition play a central role in the analysis of the site. The downside, in light of the Arctic island context that I work within, is two-fold. Firstly, these concepts are very much focused on an individual site with the assumption that it has a defined boundary. In an Arctic island context, the boundary cannot simply be a coastline that defines the island's edge. Instead, the messiness of this ragged edge must be considered. Secondly, the concept may be considered as manifesting a very anthropocentric approach. Although it encourages the designer to consider the nonhuman, it is really the designer's experiential reaction to the site that takes precedence.

[2] Girot's approach is widely used and taught in landscape pedagogy (see Herrington, 2019). The concept was born out of an observation that "a site project has all too often been reduced to systematic and quantitative formulas for analysing the site from a distance" (Girot, 1999: 65).

In his essay 'The Lure of the Island', Godfrey Baldacchino provides a rich description of the shore as "a dynamic interface" where "histories and ecosystems collide"; he presents the shore as an environment that is in constant movement and continually shifting, depositing, and eroding material (2012: 59). A shore necessitates descriptions and engagements that are different from our understandings of land, as a more stable entity, and the sea, as a more fluid and unpredictable medium. Working in such distinct environments, it was important for me to consider the complex interconnection of time frames – from the geologic timescales in which the islands emerged to the ephemerality of the weather conditions affecting the experience of fieldwork. Guided by the overarching knowledge that a climate emergency is actively playing out on these islands, my study operated on a local level to assess site-specific conditions, characteristics, and contexts. This level of detailed analysis, I argue, is necessary to truly uncover the realities and complexities of what is happening to the islands now. In other words, they must be viewed in a number of spatial and temporal dimensions.

Consequently, the remainder of this article is structured as follows. Section III offers an overview of the imaginaries and realities of Arctic islands. It briefly traces how the Arctic has been imagined pictorially and textually over time. The representation and discourse surrounding these islands have always been very much centred on science and politics. The section proceeds to outline the problematics of the scientifically driven representations of the Arctic. Rather than attach fixed characterisations to the islands, it reasserts that islands, like all landscapes, are always in a process of becoming. It argues that to understand the present a retrospective reading of these coasts is required.

In Section IV, I read the rich histories of these islands to contextualise the changes that have occurred over time whilst the more visual and tangible layers are exposed through photography. The history of the coasts is activated through historical and contemporary photography. I utilise a selection of these archival photographs and compare them to contemporary photographs that were taken during my visits to the islands in 2018. The experiential layer is woven in through this process as I move between the historical archive and the contemporary site.

In the Section V, my journeys to the islands are linked to what Doreen Massey (2011) refers to as "geographies of knowledge", where knowledge produced in the indoor setting of the photographic archive expands and deepens as it transfers to the island sites. The study is not exclusively about the embodied experience of the researcher in the field but reaches out to the nonhuman objects of the photographs as it moves through these geographic sites. In turn, perception of the coasts is transformed through this tempo-spatial journeying. The encounters with the historical photographic archive, the people working at the meteorological stations, and the coastal sites themselves are all described as different geographies of knowledge that lend themselves to building a new understanding of the present islands.

IV. Being and becoming: Arctic island imaginaries

The Arctic has never failed to fascinate and unsettle Western perceptions of the far North. Steinberg, Tasch and Gerhardt use the term *imaginaries* to describe "ideas of what the Arctic is, and what it can be" (2015: 6). These imaginaries, however, are always

transforming, as is evident when we consider how the Arctic has been illustrated and described. The infamous *Carta Marina* from the 16th Century provided a wild display of fearsome sea monsters emerging from the seas of a largely unknown region (Figure 1). Books and diaries from early polar expeditions also convey colourful accounts. The Marquess of Dufferin, for example, described English Bay in Spitsbergen as a place where "no atom of vegetation gave token to the earth's vitality… I suppose in scarcely any other part of the world is this appearance of deadness so strikingly exhibited" (1856: np). Some decades later, Hjalmar Johansen, accompanying Fridtjof Nansen to the far reaches of the Arctic, reflected that it would "have been most interesting to be able to bring home with us the voice of this generally silent desert of ice, groaning in anger, as it seemed, because mankind had ventured to force their way into it to lay bare its hidden secrets" (1899: 65).

Figure 1 - The 1530 *Carta Marina* depicting the Arctic as a largely unmapped region full of perilous sea creatures threatening the voyager's northward pursuits. (Source: https://en.wikipedia.org/wiki/Carta_marina)

The detailed, situated accounts of the Arctic give great insights into the thoughts of the early travellers and explorers as we get a sense of the stark and unfamiliar environments they found themselves in. Their accounts also contributed to the "popular framing of the Arctic as a place of extremes, a last frontier with pristine but dangerous nature…" (Wormbs, 2018: 5). If we fast-forward to today's Arctic scenario, we must question whether our imaginaries have really changed all that much. Climate reports describe the Arctic as a region undergoing unprecedented warming, which has resulted in a fractured and

increasingly fluid environment. Our imaginaries, as a result, have shifted to a preoccupation with ecology, tourism, oil and gas exploitations, political territorial claims, etc. (Schimanski and Spring, 2010). The underlying feeling of unknown futures, however, has been retained, albeit in a different guise.

Knowledge about the Arctic is nowadays conveyed largely through scientific/cartographic representations. Geographer Denis Cosgrove expresses concern over a disconnect that exists between human experience and the maps illustrating statistical information. He extends these concerns to our use of Google Earth, which gives "a strong illusion of real presence that simultaneously distances us from the animate world" (2008: 29). On the one hand, we have increasingly precise maps; on the other, there is a groundlessness in these statistical media. Architect Alessandra Ponte adds that these technologies lead to "the almost total suppression of the materiality of the cartographic representation" (2017: 209). In a related manner, Tim Robinson's aforementioned consideration of time and space shows a deep understanding that the landscape is in continual motion and in a process of *becoming*. In the Arctic, where the landscapes and oceans are experiencing flux and fluidity, I looked beyond the map and instead strove for situated readings of the three Norwegian islands. The research conducted on these islands became a multi-spatial, time-travelling journey where knowledge of specific sites thickened in sense and meaning. However, it thereby also raised questions on the future imaginaries for these vulnerable coastal edges.

Figure 2 - The 1696 *Terra Artiche* map of the Arctic region. Source: © Norwegian Polar Institute

In accounts of 19th and 20th Century Arctic exploration, the islands of Jan Mayen and Bjørnøya are mentioned, as is Hopen, though to a lesser extent. The early maps point towards ill-defined blobs suggesting some landmass existed at these approximate locations (Figure 2). But over time, as explorers, hunters, and geologists became more acquainted with the islands; cartographies were gradually and meticulously plotted. The three islands in question are remotely scattered across the High Arctic[3] between the latitudes of 72°N and 76°N (Figure 3). Unlike other Arctic regions at similar latitudes, none of the islands has permanent residents. In fact, temporary habitation has been the norm throughout the past 400 years in this region of the Norwegian Arctic. The islands have experienced waves of different visitors over the centuries who have occupied the coasts by establishing huts and stations.

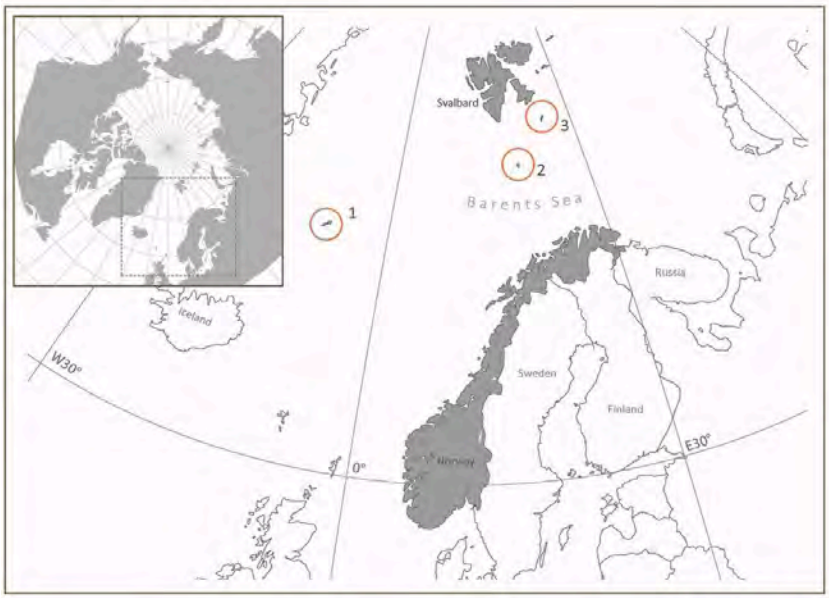

Figure 3: Map illustrating the location of the three Norwegian Arctic islands of 1) Jan Mayen; 2) Bjørnøya, and 3) Hopen, which lie to the west and north of mainland Norway.

There is a meteorological station on each of the islands. Additionally, on Jan Mayen there is a Norwegian Defence Force base (*forsvaret*). The only inhabitants of the islands - meteorologists, military personnel, cooks - work at these outposts for six months at a time. Researchers make short trips to the islands, particularly during the summer months, when the days are long and outdoor working conditions are optimal. The meteorological stations have been in operation for around one hundred years, allowing present-day researchers a good overview of climatic trends.

[3] The High Arctic may be described as the northernmost part of the Arctic. For definitions of the Arctic, see, among others, Barr and Chaplin (2004) and Grønnestad (2016).

The meteorological data collected at these stations confirms that the islands are currently experiencing warmer seasons in line with general trends witnessed in the Arctic (Holmén, 2018; Kovacs and Bjørge, 2018). The reduction and retreat of sea ice, caused by rising temperatures, has meant that the coastlines of the islands have become more vulnerable to the full ferocity of storms with no ice for protection (Fang et al, 2018). This has hastened the action of coastal erosion, which has already damaged and continues to pose threats to the buildings, infrastructures, and heritage sites. With the physical destruction evident on the islands and the scientific confirmation of climate change from the meteorological stations, the specifics of these material changes over time warrant further investigation.

In landscape architecture, it is common practice to examine chronologies of maps linked to the particular site of interest to see how it has developed over time and expertise and skills in dealing with visual media are well developed. However, spending time examining the history of a site is not regarded as a priority by many practitioners. Landscape historian John Dixon Hunt (2014) has written extensively on the importance of reading the history of a site through its many and varied time frames, which include the scales within which geological, topographical, and cultural change takes place. It is easy to picture the geological and topographical character of remote Arctic islands because of their increasing presence on television and the Internet. The cultural layers that go beyond the contemporary are more difficult to imagine as it is easy to assume that these islands, due to their remoteness, were devoid of life. However, "the Arctic has felt the footsteps of men along most of its shores… even though the prints may not immediately be visible to the trained eye" (Barr, 2004: 18).

To engage with the history of the three islands, I principally worked with photography in an attempt to allow the past to inform the present. Prior to visiting the islands, I spent time researching historical photograph collections. The purpose of looking at these photographs was to examine what the coastlines of the three selected islands had been like in the past, how and why people had engaged with them, and what remains of their histories today. The consequences of these histories impinge on our current perceptions and experience of the islands and establish a reality against which future imaginaries can unfold.

IV. Histories, photos, and archives

Figure 4 - Geological exposures and human activity on the islands of (left-right) Jan Mayen, Bjørnøya, and Hopen. (Sources - left to right - Norwegian Polar Institute, Svalbard Museum and Svalbard Museum.

Bjørnøya, Hopen, and Jan Mayen have a rich collection of historical photographs dating back as far as the 1870s. Through this research, I engaged with five historical photograph

collections that are held in the archives of Svalbard Museum, the Norwegian National Library, Tromsø Museum, as well as the Norwegian Meteorological Institute in Oslo and Tromsø and the Norwegian Polar Institute. The historical photographs in these archives depict how people have lived differently on the islands for decades and provide insights into how the coasts have been used and modified over time (Figure 4).

The photographic archives at Svalbard Museum, the Norwegian National Library, Tromsø Museum, and the Norwegian Polar Institute have been catalogued and digitised and are publicly available online. Each of the digital photographic databases provides different interfaces. The collection from the Meteorological Institute is less formalised. At the main office in Oslo, part of the collection has been digitised.[4] At the Meteorological Institute in Tromsø, an analogue system is in place where ring-binder photograph albums are labelled with the names of the islands. The folders that I had access to amounted to eight albums. It is difficult to know exactly how many historical photographs exist in the above institutions, mainly because many of the photographs are vaguely and, very often, incorrectly categorised, but they amount to at least a couple of thousand.

The first significant group of photographs produced in the early 20th Century was mainly taken by visitors who were sent to survey the islands and examine their geology. Unfortunately, a great number of the historical photographs from this period have unnamed photographers. However, some names repeatedly mentioned include Gunnar Horn (a petroleum geologist), Thor Askheim (a surveyor), Johannes Lid (a botanist), and Paul Berge (a photographer who joined geologist Adolf Hoel). This period in Arctic history, the early 1900s, was a time when visitors to the islands were primarily seeking out the natural resources for potential extraction. A small number of historical photographs have been printed in books describing the history and geography of Jan Mayen, Bjørnøya, and Hopen,[5] but the vast majority remains in the archives.

The photographs from this period are formal in character. Images of the scientists show clean, well-dressed gentlemen sometimes posing with their cumbersome scientific equipment. There are glimpses of other people on the islands, too. For example, from 1916-25, a mining village on Bjørnøya called Tunheim was in full operation. A large number of photographs exist from this period across the archives. There are photographs of the men working in the coal mines. Some of the photographs are very casual, showing the men with their hands in their pockets and looking grimly at the camera. Other photographs show the miners at work, their weary, blackened faces lit by the flash of the camera.

Over time, the quantity of the photographs increased and the content began to differ, too. From around the 1950s onwards, there are more photographs that depict how the people at the meteorological stations lived. Photographs of the meteorologists conducting their work, for instance launching weather balloons outside the stations, increasingly appear. Activities involving visitors to the islands are also present. The arrival of boats at the islands was evidently an event that warranted taking a photo: from a blip on the horizon to the gradual presence of new people and supplies, it inevitably caused a stir of excitement. Other scientists made short visits to the islands to conduct fieldwork pertaining to ornithology, geology, heritage, cartography, seismology (on Jan Mayen) etc. Over time, more leisurely accounts were added to the archives, such as the meteorologists playing

[4] These files may only be viewed during an arranged visit to the Norwegian Meteorological Institute.

[5] Historical photographs appear in books about Jan Mayen (Barr, 1991), Bjørnøya (Kjelldahl, 1973), and Hopen (Søreide, 1994).

with polar bear cubs, while others show fishing, hiking, and skiing activities. With regard to the visitors and inhabitants of these islands, one could argue that very little has changed as today's interests are also largely scientific. While the search for natural resources in the early part of the 20th Century was terrestrial, today the vast seas surrounding the islands have attracted much interest from the petrochemical industry with new surveys constantly being expanded and updated.

The first step in dealing with this large and diverse photographic archive was to select relevant images that displayed the coast. This meant discarding all photographs taken inside buildings or cabins and many that were taken in the inland areas of the islands. This process greatly reduced the number of photographs to work with. Following on from this, I printed the selected photographs onto A4 paper to examine the resolution quality, the format of the photograph, and the angle of view. Choosing photographs that provided a generous width of coastline, I reduced my selection to ten photographs for each of the three islands. These were re-printed and placed into individual A4 plastic sheets that I took with me on my fieldwork.[6] Systemising all of the photographs to A4 format suited my needs for outdoor fieldwork. It allowed the smaller photographs to be enlarged so that details could be examined, which eased the process of re-photographing the places where the original photographs had been taken.

Prior to my travels, I familiarised myself with the islands by closely studying maps and aerial photographs to get a sense of the topography and the types of coastlines that existed on each island. Engaging with the photographs and maps was my first encounter with the islands. The historical photographs fuelled my island imaginaries as I could scrutinise images of past constructions and past human activity while beginning to anticipate contemporary realities. My knowledge of the islands was starting to develop and inform a new sense of site-specificity through the details of the interaction between the people and the three coastal places as well as the built and natural topographies.

V. Shifting geographies of knowledge: From the cabinet to the island outpost

Examining archives in isolation leads to a certain abstraction. This abstraction generates information but also represents "a loss, an abstraction from the complexity and richness of use, a loss of context" (Sekula, 2003: 444). Each historical photograph in the archives that I explored had been removed from its original context. In this study, I embed archival material back into the site in an attempt to release and expose the rich dynamics at play between past and present, indoor and outdoor. In a personal account, human geographer Gillian Rose describes her experience and engagement with historical photographs in different contexts – a museum archive and her own study room, where she interacts very differently with the material (Rose, 2000). Writing about the museum, she describes the formality and stability of the space, which resulted in a tension between her and the historical photographs. Recounting her experiences in the study room, conversely, she describes the historical photographs as becoming part of herself. Her embodied experience of working in different contexts and the materiality of these spaces affected her interpretation of the photographs.

[6] Printing all of the varied photographs onto the same format (A4) and same paper felt a little crass as an entire material layer belonging to the original print was removed in this process. Of course, the digitisation process generally leads to this problem.

This awareness of working in different contexts chimes with Massey's discussion of fieldwork. Distinguishing between "the cabinet" and "the field", she associates the former with a study or laboratory and the latter with outdoor exploration. Crudely put, "the field" indicates immersion and "the cabinet" distance. These contexts are "spatialities of knowledge-production" or "geographies of knowledge" (Massey, 2011). Massey stresses that both locations are very much connected and not isolated from one another. The transfer from one geography of knowledge to another brings with it different conditions to work in. The indoor environment where I examined the historical photographs was quiet and had a thermostat to ensure a comfortable temperature to work in. "Out in the field, however, in real life and real-time, the researcher has to deal with the endless number of interconnected phenomena that are all in uncontrollable motion" (Rekittke, 2015: 57). This heightened awareness of what is happening to the photographs as they transfer from one geography to another changes the way in which the photograph itself and the context to which it belongs – and belonged – are interpreted.

During my fieldwork excursions to the islands, I stayed at the meteorological stations. Through my historical archive work, I had imagined and expected to land in more unfamiliar territory. I had envisaged a more basic form of life in these remote outposts and had attached a sense of hardship to the idea of living here. In reality, the way of life there was more hospitable with photographs, maps, and enormous bear hides adorning the walls of the stations. There were aerial photographs of the stations and, more noticeably, group portraits of the different teams that had worked at the stations, spanning several decades. I was also introduced to a large collection of photo albums that had accrued over the years. Unlike with the historical photographs that I had become accustomed to in the various museums and institutions, looking at these was more akin to viewing a family album. Each album was labelled by season and year for each group that had worked at the station. The pictures were predominantly of the people there celebrating birthdays, Easter, and Christmas alongside activities such as fishing, hiking, skiing, etc. Already I was experiencing a contemporary version of what I had seen in my historical archives. Although the activities of the meteorologists had changed very little, there was now a less formal air to the photographs.

It took many months to prepare a visit to each of the Arctic islands. I travelled to the islands with the Norwegian Coastguard. This involved many days at sea. For example, it took three days to travel from mainland Norway to the island of Jan Mayen. For my trip to Bjørnøya and Hopen, I flew from Oslo to Longyearbyen in Svalbard, where I met the Norwegian Coastguard, and from there we sailed to the islands. On my arrival at each island, I met with the staff of the meteorological stations and discussed the historical photographs with them. All of the photographs plus a map of the island were placed on a table in an effort to establish where the photographs were likely to have been taken. Unfortunately, some of the places in the photographs that I had chosen prior to travelling to the island could no longer be selected as sites to visit because of accessibility issues, or they could not be reached in the time frame that I had for my fieldwork. Spending time with experts at the meteorological stations to discuss the contexts from which the historical photographs had originated gave me new perspectives on the sites. It sparked discussion and concern about the changes that had been happening along the coasts in recent years. The knowledge that I had gained through my desktop or "cabinet" research was starting to become more specific, local, and real from the moment I arrived on the islands.

For Massey (2011), "discovery/construction/transformation" takes place when the researcher enters "the field". She makes a convincing case that the field is not waiting to be discovered. Instead, it has already been previously constructed and it is the aim of the researcher to reformulate this construction in order to open up new ideas. Rather than the unknown, the space entered by the researcher is more akin to the not-yet-understood (Massey, 2011). Transferring across these different sites of knowledge, from the first site (the archive) to the second site (the meteorological station), was already creating a renewed sense of what to expect from the third site: the location of the historical photograph.

VI. Embodying island coasts

When I found the locations where the historical photographs had been taken. I recorded my experience and thoughts in a notebook in the form of fieldwork notes. The following descriptions are excerpts from my fieldwork notes that reflect on three historical photographs and the sites where they were taken.

Figure 5 - Map of Jan Mayen indicating the location of the meteorological station and the site where the photographs, fieldwork notes, and sketches were taken, written, and drawn. (Developed by the author from base maps provided by Geonorge and the Norwegian Polar Institute.)

I am very fortunate to have a guide from the meteorological station accompany me on my visit to the western part of Jan Mayen. I am eager to see the former weather station, Gamle Metten, perched above Nordlaguna. When we arrive at the station, I am pleasantly surprised to see most of the buildings intact although severely weathered by the wind, sun, rain, and everything that the weather can throw at this exposed clifftop site. It is very breezy and cool as we look at the expansive volcanic beach below. As we approach a tall wooden structure on the cliff edge the ground suddenly drops to the beach below with large boulders piled up at the base. My colleague informs me that the wooden structure was constructed for the weather station to winch goods from the beach. We carefully navigate our way down the unstable slope to the beach, where I begin to scout around for the same location as my predecessor, Kaare Z. Lundquist, in 1949. The weather is much calmer on the beach and the sea appears as a glassy glaze. Looking up at the wooden structure is overwhelming – the scene before me is almost unrecognisable in the historical photograph in my hand. From this view, massive chunks of the coast have been chewed away by the sea. I record my location at 71° 0'44.41"N; 8°27'53.38"W. Studying the historical photograph again – the buildings, driftwood, people that enlivened this place were long gone. The sea had successfully removed their traces. How long would the wooden structure that resembled a beacon remain standing, I wondered?[7] (Fieldwork notes, 7th August 2018.)

Figure 6 - Illustration combining the historic photograph of Gamle Metten (top of hill) on Jan Mayen with a sketch I made during fieldwork. Left, photograph by Kaare Z. Lundquist (1949), Norwegian Polar Institute; right, sketch by Eimear Tynan (7th August 2018).

[7] Gamle Metten, the old meteorological station located on the west side of Jan Mayen, was in operation from 1949 to 1962.

Figure 7 – Author's photographs illustrating how the Gamle Metten site appeared in 2018. Left, photograph taken from the same location as the historical photograph in Figure 6 (above); right: three small photographs showing details of the material composition of the site, where there is a mix of vegetation, volcanic rock, and plastic debris that has washed ashore, almost imitating the forms of the rocks around it.

Figure 8 - Map of Bjørnøya indicating the location of the meteorological station and the site where the photographs, fieldwork notes, and sketches were produced. (Developed by the author from base maps provided by Geonorge and the Norwegian Polar Institute.)

Standing N74° 28.971' and E019° 11.075 according to my trusted GPS gadget, I don't attempt to step any closer to the cliff edge. I am quite sure, but not certain, that my predecessor who took the photograph was standing on a cliff edge that has since collapsed into the sea below. There is a light breeze from the east, which reassures me that I won't blow off this perilous edge. As I look out to sea, the water is a plane of blue calm but it still manages to brew up some loud waves that crash upon the crumbling cliffs. I stand here contemplating the striking absence of the harbour, the ship, the miners, the toil of everyday life that was surely tough on this desolate part of the island. The ground collapsing into the sea catches my attention as I wander around this site, skirting the large rocks that appear to be firmly stuck in the ground, embedded in fine, firm clay. Some of these rocks have shattered into horizontal and vertical patterns, presumably from the constant seasonal freeze-thaw action in these Arctic conditions. Near the harbour itself, strips of sun-bleached timber illuminate the blackened ground of the chipped coal deposits. And then, a collection of tubular geologic cores lie broken and cracked in a small pile reminding me of Robert Smithson's Non-Site collection of rocks.[8] *Even though I am fully present in the site, there is a feeling of non-site within me as I imagine I have stepped into a collapsed and broken-down archive that overwhelms me – I am here but at the same time I am anywhere but here!* [9] (Fieldwork notes, 28th August 2018.)

Figure 9 - Left: Photograph by unknown photographer (c1920-1930), Svalbard Museum; right: author's sketch (28th August 2018).

[8] See Pantaleon (nd) for discussion.

[9] Prior to visiting Bjørnøya, I learned that approximately 100 years ago the short-lived mining village of Tunheim was in operation. A wooden harbour with a concrete base was constructed to facilitate the export of coal from the mine that was intentionally destroyed by British forces during the Second World War, along with the village, to prevent Germany from using the site as an Arctic base.

Figure 10 – Author's photographs illustrating how the site appeared in 2018. Left, photograph taken from the same location as the historical photograph; right: three small photographs showing details of the material composition of the site. The former railway track linking the mine to the harbour is in a rusted state today with derelict carriages still standing on the tracks. There is also evidence of geologic cores that now remain open.

Figure 11 - Map of Hopen indicating the location of the meteorological station. The site where the photographs, fieldwork notes, and sketches were taken, written, and drawn is adjacent to the station. (Developed by the author from base maps provided by Geonorge and the Norwegian Polar Institute.)

My final day on Hopen. There has been fog on the island all morning but finally, the sun came through so I could continue my repeat-photography exercises and sound recordings. The fog prevented me from working outdoors in the morning so I drank plenty of coffee and finally got to talk with some of the meteorologists, the cook, and the maintenance crew who were visiting the island to tend to the weather instruments and computer systems. One of the technicians told me that in 2010 they had been able to drive the tractor in front of the weather station but that the ground has since become too unstable and dangerous. It is evident that the coastline in front of the station is undergoing a lot of erosion. Apparently, 1.5m of this stretch of coastline have been eroded in the past two years – incredible. Some infrastructures such as the helipad have been rebuilt several metres inland from the coast. The reason for the erosion is echoed by everyone I talk to here – less sea ice to protect the coast from heavy seas. It is sad to imagine this island physically crumbling at such a speed. The historical photographs that I have selected from the archives to bring with me here show a very snowy, icy, desolate island. Instead, I am now standing in a grey-brown landscape, listening to the squawking birds by the nearby cliffs and trying to comprehend all the vulnerabilities that climate change is inflicting on this little, beautiful island.[10]
(Fieldwork notes, 20th August 2018)

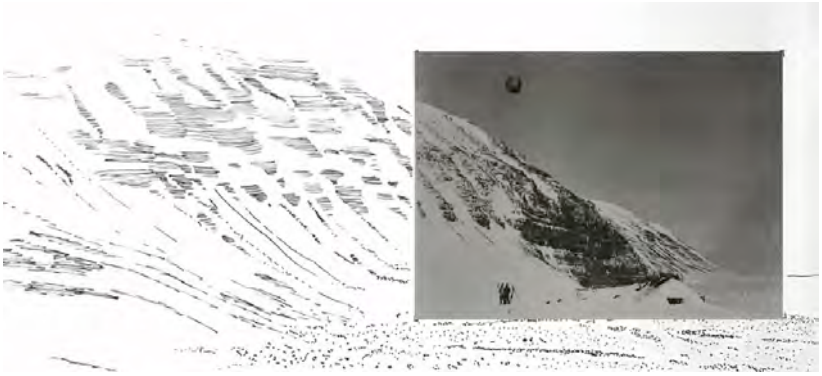

Figure 12 – Left, author's sketch of the site in 2018; right, photograph by unknown photographer (c1930-1940), Svalbard Museum.

[10] The historic photograph shows a weather balloon launch at a German weather and radio station that was operated on the island from 1940 to 1945. No trace of the station is visible today, only small pieces of driftwood are scattered on the raised beach.

Figure 13 – Author's photographs illustrating how the site appears in 2018. Left, photograph taken from the same location as the historical photograph; right, three small photographs show details of the material composition of the site.

My third geography of knowledge allowed me to finally return the historical photographs to their original contexts. In reality, what I encountered barely resembled the earlier compositions. The human layer that added such a strong presence to the historical photographs had disappeared. The exoticism that had fuelled my ideas of what these places would be like was dimmed. I was saddened a little by the destroyed scenes I encountered. The silence and calm of the black-and-white photographs were prisms that, when I was physically present on site, opened up into spectrums of green, blue, grey, and brown, with squawking seabirds providing the soundtrack to these scenes. The construction materials that had once formed the human layer lay strewn across two of the sites and had become part of the island. Their original use as building materials appeared alien to the island in the historical photographs. Now, the lichen, mosses, grasses, and guano had begun to embed these materials into the island.

Massey refers to the transformations that occur during the fieldwork process. There is obviously a gap in knowledge as to what happened to these sites over time, and I am left to speculate and interpret what is before me. Questions arise as to what changes have occurred between the historic and contemporary scenes, and for what reason. Conceptually, this is like having two similar dots on a page and imagining what kind of line or squiggle will connect them (Ingold, 2007). My way of joining these dots involved walking to the selected coastal sites from my base at the meteorological station. Walking allowed me time to become familiar with the materials around me. On Jan Mayen, it felt a little strange to walk on volcanic stone and sand, where the crunching sounds beneath my feet were very different from those on the other two islands. On Bjørnøya, the journey to the site meant walking along a meandering cliff top for several hours. Going to these sites, I took many photographs to record the journey, and when I reached my destination, I also sketched the scenes that I witnessed. Sketching involved close observation and gathering details of the materials around me. These methods allowed me to gain specific, local knowledge of these sections of the island coasts.

VII. Discussion

The process of moving from cabinet to field extended the temporal and spatial conventions of fieldwork in landscape architecture by combining different sites of knowledge. I will now review the four main categories with which the work may be analysed and appraised.

1) *Journeys through sites of knowledge*. Rather than begin the analysis of these Arctic coastal sites through the conventions of working in a bounded outdoor environment, I started the process as a desktop enquiry into the historical photographs. I used these photographs to mobilise and catalyse the building of new knowledge that could inform the present and help me envisage the future of the island coasts. This established how sections of the coasts had once been used and for what purpose. It required integrating the images with specific readings of the islands' histories. As I journeyed to the next site of knowledge with the historical photographs, contemporary readings of the site were gained through informal dialogue with staff from the meteorological stations. Here, a new layer of knowledge regarding the realities of the coastlines started to unfold as they shared their opinions on how the coasts had changed. Finally, the last site of knowledge involved the immersion of the researcher and the historical photographs in the specific coastal sites. Here, the realities of the material changes to these coasts were observed in situ. The very apparent differences and similarities between past and present could be assessed.

2) *Marking and mark-making.* In this study, I attempted to go beyond the anthropocentric approach that is more usually adopted in landscape architecture fieldwork. I developed a parallel awareness of how I was approaching and entering each site and how the sites themselves impacted on my experience there. This approach resonates with a study conducted by geographer Kathryn Yusoff (2007)[11] in which she refers to *marking* as not only physical markings on the landscape but also imprints on people's memories. The analysis of the historical photographs reveals how previous users marked these coastlines through the addition of built structures relating to their particular activities. From some of the initial photographs encountered in the archive, such as those of the miners on Bjørnøya, we can gain a sense of the hardships that were endured as the Arctic environment in turn marked these men. Nicola Whyte introduces time into this discourse on marking. She dismisses the notion of reading time chronologically and suggests that the messiness and chaos of time be embraced because a clear distinction between past and present does not exist when people are constantly engaging with the past in different ways. She proceeds to argue that the movement of people in the landscape involves marking and claiming (Whyte, 2015). This was certainly the case during fieldwork practice on these islands – there was continual interaction with (and distance from) different temporalities as I moved myself and the photographs through different geographies.

3) *Human and nonhuman interactions.* To extend this notion of *marking,* I would like to address contemporary readings of how the historical photographs were marked and of how I was marked by both the photographs and the realities of the site. The historical photographs were marked as they were held down with rocks, a GPS device, or my foot as I tried to align the historical view with my contemporary vision. The photograph scrunched and folded under these materials as it resisted the gusts of wind trying to dislodge it (Figure 10). I felt the photograph and the site made their markings on me as my imaginaries of the site's history were juxtaposed with the stark realities of the island coasts that largely revealed destruction and decay. The materials that I encountered in my fieldwork have inscribed their own stories in the landscape (Figures 7, 10, and 13). As humans have

[11] Yusoff's study involved the reading of a selection of historical photographs from an early Antarctic expedition. In it, she refers to "the anxieties of representation that emerge from the interplay between mark making and being marked, and the marks that fall beyond this visual register" (2007: 211).

retreated from these parts of the coasts, nature has advanced to colonise what they left behind. Rather than regard these decaying materials as the remains of something that once was, however, we should consider them as something that is always *becoming* and interacts with the agencies of a changing environment. In addition, as my fieldwork has shown, these materials greatly affect the experience of the space itself. As a researcher encountering decay, erosion, and – quite differently from what I had expected – deposition, I attached new meanings to the sites as they transformed from space to place (see Tuan, 1977). These meanings may be personal, but they open up a larger discussion on the specifics of changing Arctic islands.

4) *Past to future imaginaries.* Apart from the nonhuman objects that are grounded in the site, the nonhuman dimensions of climate change must be considered. The knowledge of a warming Arctic has great significance in how we can anticipate change along these island coasts. On all three islands, I was informed of the increasing threats of sea erosion to the coastal edges. The historical photographs from Jan Mayen and Bjørnøya, compared to today's situation, clarified the destructive power of sea erosion battering the coasts. As the land gradually tumbles into the ocean, the built constructions hasten in their decay. However, there is also a story that speaks of deposition rather than erosion in an increasingly warmer Arctic. Mosses, lichens, and low-growing plants have new opportunities to establish themselves more extensively in these warmer environments. We may assume that the bare, stony earth that currently dominates the islands will gradually give way to a greener veneer.

There is an interesting intersection of different temporalities in the situation just described. The slow geologic emergence that produced the islands is being chipped away at by the seasonal occurrences of storms. The cumulative effect of shifting weather patterns and conditions such as freeze/thaw processes speed up this process of geologic disintegration. Meanwhile, the human layer evident in the built structures that we can still see functioned for as long as the people on the islands needed them. Their abandonment and destruction have given way for new ecologies to establish themselves and the temporality associated with vegetation becomes a new condition to engage with.

VII. Conclusion

The Arctic is under the watchful eye of researchers, scientists, and politicians in the face of global warming. The speed of climate change in these vulnerable environments is unsettling. While the changes are understood on a regional scale, and largely through a scientific lens, this study has paid particular attention to the specificities of such changes on three selected Arctic islands. In order to grasp the types of changes that are occurring along the coasts of these islands, it engaged with time, space, and materiality. Time plays a crucial role in the understanding of what is encountered on the islands today. Learning about their former users and the different political milieus that prevailed at different times helps us understand the material remnants that are visible today. Without a retrospective reading of these coasts, it is very difficult to differentiate between natural and anthropogenic changes. It is therefore necessary to engage with different temporalities for a more comprehensive reading. This demanded a site-specific undertaking with mixed methods, including qualitative and transdisciplinary inquiries.

Through this site-specific way of knowing, an approach interrelating time, space, and materiality emerged. The different aspects of this approach were categorised as follows: 1)

journeys through sites of knowledge, 2) marking and mark-making, 3) human and nonhuman interactions, and 4) past to future imaginaries. It emphasised the temporal and spatial aspects of the Arctic islands through engagement with historical materials, documents, and photographs. In the journeys from the archives to the three island coasts, the agencies that have shaped them in the past and present became ever more apparent.

Earlier, I referred to Baldacchino's description of shores as evocative spaces whose dynamic, interstitial, and liminal qualities allow for new imaginaries to arise (2012: 59). In my relational approach, I became a reader of and active participant in the environment of these island shores. I claim that it is by extending our understanding of the islands' spatial and temporal dimensions that we can engage more affectively and critically with the human and nonhuman agencies of change that have moulded them. Some of them tangible, others intangible, these agencies are active participants in shaping what the islands were, what they are now, and what they may become.

BIBLIOGRAPHY

Baldacchino, G (2012) 'The Lure of the island: A spatial analysis of power relations', *Journal of Marine and Island Cultures* v2n1: 55–62

Barr, S (1991*) Jan Mayen Norges utpost i vest: øyas historie gjennom 1500 år*, Oslo: Schibsted, Norsk Polarinstitutt.

Barr, S (2004) 'Polar Monuments and Sites: An Introduction' in Barr, S and Chaplin, P (eds) *Cultural Heritage in the Arctic and Antarctic Regions, Monuments and Sites*, Lørenskog, Norway: ICOMOS IPHC: 18–23

Barr, S and Chaplin, P (eds)(2004) *Cultural heritage in the Arctic and Antarctic regions. Monuments and Sites*, Lørenskog, Norway: ICOMOS IPHC

Bonnet, A (2018) *Beyond the Map: Unruly Enclaves, Ghostly Places, Emerging Lands and Our Search for New Utopias*, Chicago: University of Chicago Press

Brink, A van den, Bruns, D, Tobi, H and Bell, S (eds) (2017) *Research in Landscape Architecture: Methods and Methodology*, Abingdon: Routledge

Cosgrove, D (2008) 'Images and Imagination in 20th Century Environmentalism: From the Sierras to the Poles' in Yusoff, K (ed) *Bipolar*, London: The Arts Catalyst: 10–31

Dixon Hunt, J (2014) *Historical Ground: the Role of History in Contemporary Landscape Architecture,* Abingdon: Routledge

Fang, Z, Freeman, P, Field, C and Mach, K (2018) 'Reduced sea ice protection period increases storm exposure in Kivalina, Alaska', *Arctic Science* v4n4: 525–537

Gange, D (2019) 'Time, Space and Islands: Why Geographers Drive the Temporal Agenda' *Past & Present* v243 n1: 299–312

Girot, C (1999) 'Four Trace Concepts in Landscape Architecture', in Corner, J (ed) *Recovering Landscape*, New York: Princeton Architectural Press: 58–67

Grønnestad, K (2016) 'What Is the Arctic?', *Barents Watch:* https://www.barentswatch.no/en/articles/Hva-er-Arktis/ - accessed 1st May 2018

Hayward, P (2016) 'Towards an expanded concept of Island Studies' *Shima* v10 n1: 1–7

Herrington, S (2019) A Phenomenological Method for the Landscape Studio, in Jørgensen, K, Karadeniz, N, Mertens, E and Stiles, R (ed) *Teaching Landscape: The Studio Experience* (first edition), Abingdon: Routledge, Taylor & Francis Group: 80-94

Holmén, J (ed)(2018) *Fram Forum 2018, Theme: Oceans*, Tromsø: Fram Center

Ingold, T (2007) *Lines: A brief history*, New York: Routledge

Johansen, H (1899/2019) *With Nansen in the North - A Record of the Fram Expedition in 1893–96* (translated by Brækstad, H.L) (reprint), Franklin: Franklin Classics

Kjelldahl, D (1973) *Bjørnøya: På Utpost i Ishavet*, Oslo: Grøndahl

Kovacs, K and Bjørge, A (2018) 'Stark warning from scientists that climate change already has severe impacts on marine mammals at Svalbard', Norwegian Polar Institute: http://www.npolar.no/en/news/2018/10-30-klimaendringer-rammer-marine-pattedyr.html - accessed 28th November 2018

Lury, C, Fenshan, R, Heller-Nicholas. A et al (eds) (2018) *Routledge Handbook of Interdisciplinary Research Methods*, London: Routledge

Massey, D (2011) 'Imagining the field' in Pryke, M, Rose, G and Whatmore, S (eds) *Using Social Theory*, London: SAGE Publications Ltd: 72–88

Pantaleon (nd) 'Theory of Non-Sites, by Robert Smithson (1968): http://www.multiplode6.com/theory-of-non-sites-by-robert-smithson-1968/ - accessed 5th February 2020

Ponte, A (2017) 'Mapping in the age of Electronic Shadows' in Girot, C and Imhof, D (eds) *Thinking the Contemporary Landscape*, New York: Princeton Architectural Press

Pugh, J (2018) 'Relationality and island studies in the Anthropocene' *Island Studies Journal* v13 n2: 93–110

Rekittke, J (2015) 'Mandatory fieldwork', in Girot, C and Hurkxkens, I (eds) *Field Instruments of Design*, Zürich: gta Verlag: 56-67

Rose, G (2000) 'Practising photography: an archive, a study, some photographs and a researcher', *Journal of Historical Geography* v26n4: 555–571

Schimanski, J and Spring, U (2010) 'A Black Rectangle Labelled "Polar Night": Imagining the Arctic after the Austro-Hungarian Expedition of 1872-1874', in Ryall, A, Schimanski, J and Wærp, H (eds) *Arctic Discourses*, Newcastle upon Tyne: Cambridge Scholars Publishing: 19-42

Sekula, A (2003) 'Reading an Archive: Photography between labour and capital', in Wells, L (ed) *The Photography Reader*, London: Routledge: 443-452

Søreide, O (1994) *Hopen: Ishavsøy og Meteorologisk Stasjon*, Øystese: Friske Tankar A.S.

Steinberg, P, Tasch, J and Gerhardt, H (2015) *Contesting the Arctic*, London: I.B. Tauris

The Marquess of Dufferin (1856/2007) *Letters from High Latitudes* (reprint), Fairford: The Echo Library

Tuan, Y-F (1977) *Space and Place: The Perspective of Experience*, Minneapolis: University of Minnesota Press

Waters, H (2013) 'The Enchanting Sea Monsters on Medieval Maps', *Smithsonian Magazine*: https://www.smithsonianmag.com/science-nature/the-enchanting-sea-monsters-on-medieval-maps-1805646/ - accessed 31st October 2019

Wehrmann, D (2016) 'The Polar Regions as "barometers" in the Anthropocene: Towards a New Significance of Non-state Actors in International Cooperation?' *The Polar Journal* v8 n2: 379-397

Whyte, N (2015) 'Senses of place, Senses of time: Landscape History from a British perspective', *Landscape Research* v40 n8: 925–938

Wormbs, N (2018) 'Introduction: Back to the Futures of an Uncertain Arctic', in Wormbs, N (ed) *Competing Arctic Futures: Historical and Contemporary Perspectives*, Cham: Palgrave Macmillan: 1–18

Wylie, J (2012) 'Dwelling and displacement: Tim Robinson and the questions of landscape' *Cultural Geographies* v19 n3: 365–383

Yusoff, K (2007) 'Antarctic Exposure: Archives of the Feeling Body' *Cultural Geographies* v14: 211–233

Building Material 24

Topography

Eimear Tynan Research

Shifting coasts: Developing New Coastal Concepts

Coastal environments are closely under the radar of the impact of climate change. Approximately 680 million people live in low-lying coastal zones according to the most recent Intergovernmental Panel on Climate Change (IPCC) report from 2019.[1] The report presents key threats to coastal environments that include permanent submergence, more frequent and intense flooding, loss and change of ecosystems and the salinization of the ground. In arctic and sub-arctic regions, thawing permafrost has weakened coastlines resulting in accelerated coastal erosion. In addition, the reduction of sea ice has left coasts in these regions without a buffer to protect them against severe wave erosion. The report concludes with certainty that coastal environments, especially in low lying regions, have challenging futures ahead. Designers and artists are reacting to these changes. Many competitions, exhibitions and art installations relating to threatened coastal environments expose this contemporary trend. *Some* notable examples include the *Rising Currents: Projects for New York's Waterfront* exhibition at MOMA in 2010; *Boston: Living with Water* competition from 2015 and in 2019 a light installation highlighting future sea levels called *Lines* on the island of

Uist in the Outer Hebrides.[2] A recent architectural design competition called *Warming: Architecture for a Warming Climate* dared competitors to 'Imagine Miami Beach permanently underwater… and heat waves that render Barcelona unlivable. A future like this currently occupies our imagination but inches closer to reality each day'.[3]

These realities concerning the effects of climate change are unfolding rapidly across the globe. This paper seeks to examine how architects and landscape architects can respond to such change when environments that are conventionally regarded as stable and secure have become more fluid and uncertain. I begin in the first section of this paper by taking a critical reading of terrestrial words that are commonly used in architecture and landscape studies and highlight the problems that arise when they are applied to coastal environments. To counter the persistence of projecting such words onto coastal descriptions I suggest that it is time to look outward towards the sea in order to develop new modes of thinking and theorizing about our coasts. After all, as the early twentieth-century American biologist Rachel Carsen wrote 'the shore has a dual nature, changing with the swing of the tides, belonging now to the land, now to the sea'.[4] Attention towards the sea is emerging as a renewed field of interest in geographical enquiry. Many scholars, such as geographers Kimberley Peters and Peter Steinberg, argue that 'the sea provides a unique space for developing an understanding of fluidity'.[5] This involves new practical and theoretical perspectives that consider spatial, temporal and material dimensions of more fluid future environments.

It is through an enquiry of these words that I propose two overarching coastal concepts in the second section of this paper. These concepts are a way of developing potentially

new modes of thinking and theorizing about coasts. These sea-orientated concepts have the aim of re-orientating and reimagining our dialogue with coastal environments in order to design and adapt for unpredictable futures. The first concept refers to the materiality of coasts as porous and elastic intermediary spaces where human and non-human participants engage. The second concept serves to articulate the dynamic and multi-temporal complexities of coastal environments with particular emphasis on unpredictable futures.

The final section incorporates the two suggested concepts through textual and illustrative means. The complexity and site-specificities of coastal environments will be explored through the coasts of three Norwegian Arctic islands - Jan Mayen, Bjørnøya and Hopen. Of particular interest is the rich and varying materiality of these coasts and the local conditions that influence their compositions and forms. These examples demonstrate the influence of the sea upon the materiality of these coasts. Through a descriptive analysis of these photographs, a glossary of words implicitly emerges to assert the specificities inherent to these coasts.

Terrestrial concepts and the coast

'I stood looking out over the undulating plain with its endless lines of wild white horses with tossing manes, and watched the interminable rollers surging up from the west…'.[6] This is an excerpt from the account of Norwegian explorer Fridjof Nansen when he journeyed along Greenland's eastern coast in 1925. What is of particular interest is his comparison of the sea to the land. The sea is transformed into an 'undulating plain' while the waves become 'wild white horses'. Later on, he compares glaciers to 'snow-clad islands'.[7] In his efforts to communicate what

the open seas and the Arctic looked like he resorted to using comparable descriptions to which his audience could more easily relate.

Nansen's use of terrestrial words to describe the sea is not uncommon. The glossary of words, definitions and descriptions that we place on land is broad and, in Nansen's case, adapt easily to the sea. These words evolve and adapt as users challenge them for different reasons over different periods of time. *Topography* is one such word. The dictionaries state it is a noun describing the physical features or relief of an area. Professor of architecture, David Leatherbarrow extends topography's physical association by returning to its ancient Greek origins that may be translated as 'writing the site'. He explains that 'topographical inscriptions do, indeed, give evidence of previous enactments but they also indicate those that are still occurring and that may unfold in future'.[8] Leatherbarrow re-introduces the temporal aspects of topography back into its original meaning. In doing so, topography inherits a performative and active role and accommodates its constantly changing formations.

The metaphor of palimpsest is another word commonly referred to in landscape discourse. Geographer Richard Muir describes the original meaning of palimpsest 'as a parchment from which earlier inscriptions have been erased to make space for new writing, but on which the older writing is still faintly visible'.[9] This has been translated to describe the organisation of landscape as a chronological accumulation of material layers that mark different events and traces of present and past users.[10] Although this is a very simplified way to describe the earth as neatly and chronologically layered it reduces the landscape to an order that does not necessarily exist. Archaeologist Oscar

Aldred points out that 'the way in which accumulation takes place is not in terms of layers but a complex mix of use and reuse, making and building'.[11] In this sense, the historical aspects of the landscape are not regarded as passive layers but agencies that shape and influence present and future landscapes.

A third conceptualisation of landscape that I wish to draw attention to is *topology*, developed by landscape architect Christophe Girot.[12] Topology's Greek origins *topos* (place) and *logos* (language) have been adopted in mathematics to describe a connected or continuous surface. However, Girot's meaning is about 'developing a new set of disciplinary tools capable of responding fully to a continual terrestrial situation'.[13] Girot's topology incorporates the physical, technical, ethical, aesthetic, cultural and temporal dimensions of the land.[14] Like Leatherbarrow, Girot also pays attention to past traces and marks on the land. Geographer John Wylie provides further insights into the meanings of topology when he develops the idea of connections being woven through space and time where 'relations come before positions'.[15] Wylie's reflections help to break down the conventional definition of topology to one that serves today's needs and concerns and that considers the complexities of connections and relations.

While Leatherbarrow, Aldred and Girot's contemporary interpretations of ancient concepts and words develop our understanding and theorizing of the land, the application of their readings becomes slightly problematic in a coastal setting. *Topography*, *topology and palimpsest* are terrestrial words and metaphors that refer to stable physical environments. This is not to say that the land is fixed but as geographer Jon Anderson states, it is 'stationary in terms of their grid reference and location'.[16] In coastal

environments and particularly those that are under severe threat of erosion, submergence or flooding, traces from the past disappear from view, dislodge or transfer to another place and perhaps in a different form. These environments are constantly in motion and are increasingly regarded as fluid rather than fixed. Architect and cultural geographer Anna Ryan describes how the 'coast has long struggled with an illusion of it as being fixed and permanent in nature, a concept alien to its essential mobility'.[17] This compels us to reconsider how we define coasts and the meanings attached to such spaces.

Developing new coastal concepts

What would happen if we instead viewed the land from the perspective of water? What would happen if we wanted to see similarities and overlaps between land and water, rather than distinctions and boundaries? [18]

Philip Vannini and Johnathan Taggart pose two very interesting questions to their readers. Their questions require a shift in perspective and one that places the reader in a more unfamiliar, aqueous environment. The distinction and boundary between the land and water varies enormously depending on the type of coastline one finds oneself in. On many contemporary cartographic representations of the coast, however, the distinction is very apparent. Often, a coastline is represented as one line that neatly separates the green and brown hues of the land from the blue water. It is a matter of concern and frustration for those working with or studying the coast because this line does not exist in reality. As architect and landscape architect Dilip da Cunha and Anuradha Mathur explain '…not only are these lines everywhere, their presence is taken for granted as natural'.[19]

Writer and map maker Tim Robinson gives practical insights into the challenges of map-making and cartography. In the creation of his maps of the Aran Islands, he resists drawing a line to represent the coast. Instead, he recalls his experience of these places – 'I relived with my pen the hourly give-and-take of land and sea'.[20] The practice of map-making was, for Robinson, 'tentative and instinctual' that led him to have an intimate understanding and knowledge of the islands' coasts.[21] Time is richly enfolded in his maps where the delicate hand-drawn textures effuse a sense of impermanence. It is a reminder of the traces on the landscape that Leatherbarrow refers to whereby the dense materiality of the coast leaves its physical inscriptions. However, Robinson was very aware that the materials captured in his cartographic representations were constantly shifting, disappearing and reappearing under the powerful forces of the Atlantic Ocean.

With the increasing trend for architects and landscape architects to work with coastal environments, there appears to be an inclination to adopt ecological terminology such as adaptation, succession, resilience, ecosystem, conservation, etc. This is clearly demonstrated in the work of SCAPE landscape architects,[22] the writings of Chris Reed and Nina-Marie Lister,[23] and the research of Bradley Cantrell and Justine Holzman.[24] This ecological approach benefits process-orientated design and indeed favours the more-than-human actors and agencies in a place. However, I would argue that emphasis is placed more on the resiliency and robustness of the land rather than its fluid connections with the sea.

I propose a shift in perspective from the terrestrial-centric thinking towards the sea through two concepts. These concepts are situated in both a theoretical and

applied approach to re-thinking and re-knowing coasts as designers. The first sea-orientated concept that I refer to is *re-materialising our relationship with the coast.* This concept draws attention to our relational and material engagement with coasts and calls for consideration of the non-human agencies shaping our coasts. The second concept, *re-conditioning our approach to coastal change*, confronts the chaos of coastal spaces and turns towards an anticipatory approach to coastal futures. The concepts may be regarded as generative principles to work from rather than a conclusive framework.

1 Re-materialising our relationship with the coast

Unlike the flat, two-dimensional blue plane that we are familiar with on maps, the sea stretches horizontally and vertically. The seabed is as diverse as the physical undulations on land. Unlike the surface on land, however, the seas and oceans are constantly in motion, steadily moving with the currents and tides. There is a constant interaction and flow with the conditions in the air and the land. This gives the ocean a dynamically shifting character, shape and form. David Lambert et al. encourage '...consideration of the relationships between different elements and materials - water, wind, wood, salt, cloth, metal, coal, rope, plastics - and the cultures of nature that combine them within different practices and technologies'.[25] These connections and relationships are constantly in processes of assembling and disassembling.

In the seas and oceans, the metaphor of palimpsest is defied. Along a coast, the tides deposit materials that spur the imagination as to their origins. Lighter materials such as shells, dry seaweed and plastics often gather in striated accumulations parallel to the sea. One can observe the

different local seaweeds and organisms intermingled with plastic debris. The gentle and powerful forces of the sea leave behind traces along a coast creating an interface between the human and non-human. Historian Michael Pearson maintains that the coast presents a material world that is porous, elastic and unbounded.[26] The materials that we encounter along a coast acquire new values and meanings when we consider how they relate to the coast they inhabit. As designers, we can interpret new roles that these materials bring to a coastal site and find ways to negotiate between the human and non-human. Conceiving the coast from a sea perspective positions non-human objects or organisms into a more active role rather than assigning them to a passive backdrop of an anthropocentric world. Through this concept attention to local specificities are prioritized through engagement with both the sea surface and the depths below. By re-considering and accepting the chaos of materiality and the inevitable changes to our coasts designers may open up to new ways of knowing coasts, as illustrated in the proceeding section *Coastal specificities*.

2 Re-conditioning our approach to coastal change

Unprecedented changes being experienced along coastal environments around the world, and predictions of worsening conditions, are generating feelings of anxiety. Some notable examples are from Arctic environments such as the re-location of the Alaskan village of Newtok due to coastal erosion and thawing permafrost.[27] Climate-related anxiety relates strongly to unpredictable events. The concept of unpredictability, according to philosopher Elizabeth Grosz, generates words like uncontrollable, unsettled, upheaval and disorder.[28] To counter the negativity surrounding unpredictable futures she suggests

engaging more openly with time and duration, with the acknowledgement and acceptance of undetermined futures. Grosz highlights the natural sciences, and biology in particular, with regard to approaches that work with open-ended, random and transformative processes such as mutation and metamorphosis. A study undertaken by anthropologist Mark Nuttall examined the effects of a warming climate on Greenlandic indigenous people living along vulnerable coasts. To confront unprecedented change he proposes an ontology of anticipation claiming that 'while adaptation is largely about responses to climate change, anticipation is about intentionality, action, agency, imagination, possibility, and choice; but it is also about being doubtful, unsure, uncertain, fearful, and apprehensive'.[29] Nutall also asserts that anticipation is relational 'in the sense of connecting several points in time' echoing Wylie's position on topology.[30]

Moving more specifically to the more-than-human actors of the coast, archaeologist Þóra Pétursdóttir discusses material futures and the role of drift matter or seaborne debris along coastal environments of Iceland and northern Norway. The random materials washing up along the shores 'are seen as out of place, control, and context – as mistakes, intruders and pollutants overriding the trajectories and destinations defined and anticipated for them'.[31] Similar to Grosz, she confronts notions of randomness and chaos. She challenges coastal heritage approaches of preservation and curation which are modes of 'tidying up' and 'making sense'. The accumulation of drift matter along coasts is approached through a sense of open-ended futures. Rather than invite a new way of *thinking* she proposes a new way of *knowing*. This is done by engaging with time and coastal processes that condition the future of these materials. Grosz, Nuttall and Pétursdóttir offer theoretical modes on how to break down

the apparent resistance that exists in accepting unpredictable futures. This is particularly useful in the context of coastal environments that are already enduring such futures. The images illustrated in Figure 2 in the proceeding section illustrate the diversity and vulnerabilities of Arctic coasts. The changes to these coasts are happening under an accelerated warming climate which forces a re-assessment on how we think about time and manage its material consequences. This applies to coastal environments all over the world especially those in low lying areas.

Coastal specificities

To illustrate the diversity of Arctic coasts I will apply photographic and descriptive methods. While photography is regularly employed in architectural enquiry and practice, written accounts documenting what is seen and experienced is less common. However, there are interesting examples of how to engage with words and texts as tools to elevate the spatial, material and temporal specificities of a site. The office of landscape architect Günther Vogt, for example, employs a glossary of terminology to 'enrich our design vocabulary'.[32] As a designer, Vogt has extensive knowledge of the diverse materials he works with as well as the agencies that condition them. On a broader scale, landscape architect Jane Wolff pays close attention to words and language in her study of San Francisco Bay. Here the bay 'demonstrates a problem ubiquitous in contemporary landscapes: it defies the vocabulary we've inherited for describing the world around us'.[33] Wolff brings to the fore the inadequacies of terrestrial vocabulary being applied to coastal environments. Concerns relating to environmental change and local perceptions of San Francisco Bay prompted a reassessment of the language that is used to describe the bay. She suggests the use of a lexicon to incorporate words

used to specifically describe the bay and the perception of its users. Wolff explores how these meanings and perceptions differ from various user groups – from casual users to politicians. The lexicon she proposes offers a means to communicate more fully the meanings that the bay holds today as well as developing language for the future. Wolff's work provides a useful approach on how to reassess our connection with coasts and the potential to change the language we use to describe them.

The experiential connection to landscape, linking photography and text, are highlighted in an essay by Johan Ottosson. The rehabilitative dimension of the landscape is experienced first-hand by the author. He identifies how the seasonal fluctuations in a Swedish landscape conditions the materials he encounters and the feelings that are evoked as a consequence of these changes. Ottosson draws attention to the importance of a multi-sensory engagement with the landscape:

Out in Nature – to which people have been attuned since time immemorial – we experience more basic sensations and we perceive more basic signals that penetrate more directly our psyche.[34]

Also of interest is artist Richard Long who utilises words to reinforce the material and experiential facets to his walking artworks. His walks are often transformed into what he calls *textworks*. Creating specific vocabulary for a project and/or experience both enriches the engagement with a site and gives attention to site-specific materials and processes that may be otherwise overlooked. Horst Ruthrof adds that there is also non-verbal engagement with landscape that cannot be fully articulated through textual representation but is crucial to recognise as a way of knowing the world.[35]

To convey how photography and text articulate coasts in different yet connected ways, I present a study undertaken on the Arctic islands of Jan Mayen, Bjørnøya and Hopen in 2018 (Figure 1). The photographs in figure 2 are part of a larger study that investigates multi-sensory engagement with the material and temporal aspects of these Arctic coasts which are experiencing physical transformations that are linked to climate change.[36] This exercise is a means to activate the concepts that I proposed in the previous section where there is an emphasis on the materiality of the coasts and consideration for their future.

The short descriptions of the photographs use words that are specific to coasts and resist comparisons to land or sea features. It challenges the reader to re-orientate the approach of the coast from the sea rather than the land as a new way to enrich our understanding of coasts.

The top three images in figure 2 were taken from the *volcanic island* of Jan Mayen which lies in the North Atlantic. The *coast* is predominantly rocky, however, along the middle section of the island lie two large *lagoons* – one to the east and one to the west of the island. These *lagoons* contain extensive areas of *black volcanic sand*. When the *waves* crash on these *shores* they appear a brilliant white against the dark volumes of the *sand.* Large circular shapes with different gradients of *sand* and *foam* define these patterns as is evident in image 2c resulting in a temporary *beach* feature called *swash marks*. Historically, *ice floes* frequented the *coast* of Jan Mayen and offered some protection from *wave* erosion but that is no longer the case. As a result, the island has become increasingly vulnerable to *coastal erosion* where many of its heritage sites are severely threatened. In addition, and like many *coasts* around the world, there has been a massive increase in the

amount of *plastic debris* reaching these *shores,* requiring regular and extensive clean-up operations.

The three photographs in the middle section of figure 2 are from the island of Bjørnøya which is located in the Barents Sea. Photograph 2d shows the small concrete *harbour* adjoining the existing rocky *shoreline.* Cement, reinforcement bars and wood were imported onto the *island* for its construction. The *harbour,* like the adjacent rocky formation, is slowly eroding with every severe storm passing by the *island.* The centre photograph, 2e, illustrates the dark sediments from *seaweed* being pushed and pulled along the strand by the workings of the *tide*. And finally, photograph 2f shows a mix of materials that are found on most small *sandy beaches* to the north of the island. As the *tides* retreat it leaves behind bleached wooden logs scattered on the *shores* interspersed with *plastic debris*. Like the island of Jan Mayen, the residents on the *island* undertake regular beach cleaning exercises to reduce plastic debris which is detrimental to the rich birdlife on the island.

The bottom row of photographs is from the island of Hopen. The isolated *island* also lies in the Barents Sea and to the south-east of the Svalbard *archipelago*. Small and narrow *pebble beaches* are to be found along the periphery of this narrow island. From the air, the simple meeting of *sea* and pebbles create very diverse patterns and textures along this *littoral edge*. Large intrusions created by the *sea*, as illustrated in photograph 2g, contrast with the light feathery trails created by the *tidal backwash* as is illustrated in 2h. *Seaweed* is not an abundant material on this *island* but it makes a stark appearance on the lightly coloured gravel when it aligns with the *coast* depending on the mood of the *tide* as illustrated in 2i.

Collectively the nine photographs and descriptions illustrate how the sea encounters the shores of these islands in very different ways. Each image elicits different forms and textures that provide clues on how the sea meets the land and what materials predominate. There is a sense of porosity between land and sea where exchanges take place Although these materials vary in shape, form and composition they are all governed by the forces of the wind, waves, currents tides and anthropogenic agencies. From these descriptions, words associated with coasts start to emerge. The words, highlighted in bold text, identify the materials from which the different coasts are composed and the site-specific processes and agencies at play. In consideration of the two concepts that were proposed earlier, the photographs and description demonstrate the messiness along these littoral edges. However, each material captured in the photographs plays a performative role in how the coast is conditioned. Closely observing these materials and understanding the sea, air and land processes that shift and shape them is, I believe, a step closer in a new way of *knowing* our coasts and accepting change.

In this article, I set out to challenge the terrestrial leanings of words and descriptions that tend to be assigned to coastal environments. The reasons to highlight this misfit of words and descriptions relate to a sense of urgency that is being experienced in many coastal environments around the world due to climate crises. Coasts which were once considered robust and stable are being re-conditioned to be more fluid and unpredictable environments. To confront such change I argue that a re-orientation of how designers approach coasts is needed and one that shifts our perspective towards the sea in order to develop new terminology, knowledge and understanding of coasts. This

way of thinking embraces the materiality and temporalities specific to a site which led to the proposal of two concepts.

The first concept which I term *re-materialising our relationship with the coast* refers to the materiality of coasts as porous and elastic intermediary spaces where human and non-human participants engage. It allows for a dialogue to be established and disrupts the notion that the land must retain its solid edge to the sea. Connected to this term I have coined a second concept called *Re-conditioning our approach to coastal change*. This serves to articulate the dynamic and multi-temporal complexities of coastal environments with particular emphasis on unpredictable futures. Collectively these two concepts may be seen as part of a potential wider-emerging discourse on coastal studies where architects and landscape architects need to confront the increasingly transitory and multi-temporal consequences of climate change.

To articulate these concepts further I used photographic and descriptive modes of enquiry and applied them to three Arctic coastal sites. This demonstrated the material richness of each site that is constantly undergoing multi-temporal processes. This applied knowledge is necessary for design disciplines to test theoretical propositions. I offered one such method to explore these concepts whilst exploring coast-specific words. However, I suggest that further interrogation of these concepts has the potential to expand new meanings that we can attach to other coastal sites.

Figure 1
Island Locations

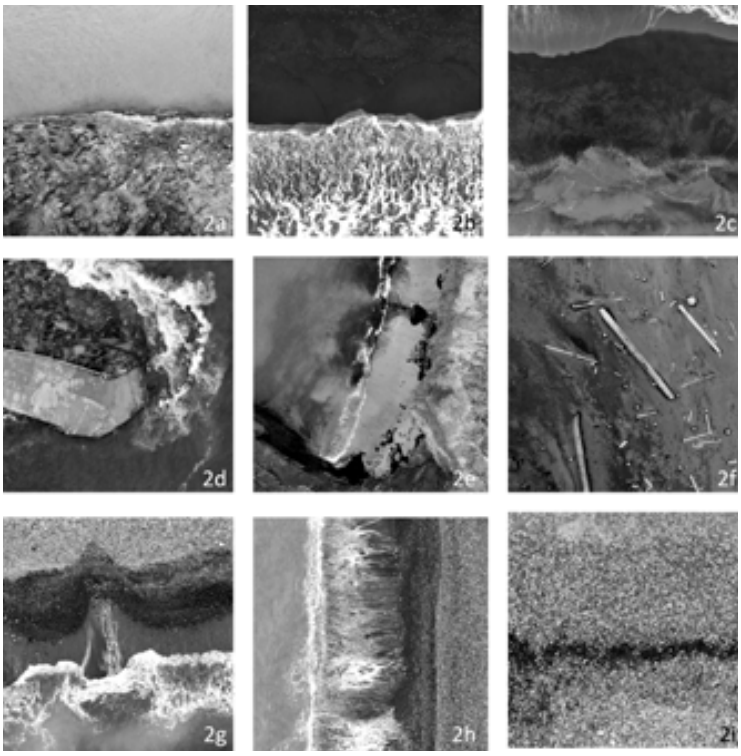

Figure 2
Nine Coasts

Notes

1 M. Oppenheimer and B. Glavovic, 'Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities' *Intergovernmental Panel on Climate Change Special Report*, [website], 2019, https://www.ipcc.ch/srocc/,(accessed 16 February 2020); and C. Mooney and B. Dennis, 'New U.N. climate report: Monumental change already here for world's oceans and frozen regions', *Washington Post*, [website], 2019,https://www.washingtonpost.com/climate-environment/2019/09/25/new-un-climate-report-massive-change-already-here-worlds-oceans-frozen-regions/,(accessed 16 February 2020).

2 MoMA, Rising Currents: Projects for New York's Waterfront, [website], 2010, https://www.moma.org/calendar/exhibitions/1028, (accessed 27 February 2020); Boston Living with Water, [website], 2015, https://www.bostonlivingwithwater.org/, (accessed 27 February 2020); Lines light installation demonstrates the "catastrophic impact" of rising sea-levels, [website], 2019, https://www.dezeen.com/2019/03/18/lines-pekka-niittyvirta-timo-aha-light-installation/ (accessed 27 February 2020).

3 Open Call: WARMING Competition, [website], 2019 https://www.archdaily.com/934227/open-call-warming-competition (accessed 28 February 2020).

4 R. Carlson, *The Edge of the Sea*, Boston and New York, Mariner Book, 1998, p. 1.

5 K. Peters and P. Steinberg, 'Toward a Wet Ontology', *Harvard Design Magazine*, vol. 39, 2014, pp. 124-129.

6 F. Nansen, *Hunting and Adventure in the Arctic*, London, J. M. Dent & Sons, 1925, p. 18.

7 Ibid. p. 382.

8 D. Leatherbarrow, 'Is Landscape architecture?', in G. Doherty and C. Waldheim, C (eds.), *Is Landscape…? Essays on the Identity of Landscape*, London and New York, Routledge, 2016, p. 329.

9 R. Muir, 'Conceptualising Landscape', *Landscapes*, vol.1, no. 1, 2000, p. 5.

10 O.G.S. Crawford, *Archaeology in the Field*, London, Phoenix House, 1953.

11 O. Aldred, 'Time for Fluent Landscapes' in *Conversations with Landscape*, K. Benediktsson and K. Lund (eds.) Farnham, Surrey, Ashgate Publishing Limited. 2010 p. 70.

12 C. Girot, 'A return to terrain', C. in Girot and I. Hurkxkens (eds.) *Field Instruments of Design*, Zürich, gta Verlag, 2015.

13 C. Girot, cited in S. Herrington, *Landscape Theory in Design*, London and New York, Routledge, 2017, p. 262.

14 C. Girot, 'The elegance of topology' in C. Girot, A. Freytag,, A. Kirchengast and D. Richter (eds.) *Topology*, Berlin, Jovis Verlag GMBH, 2013.

15 J. Wylie, *Landscape*. London and New York, Routledge, 2007, p. 204.

16 J. Anderson, 'Relational Places: the surfed wave as assemblage and convergence', *Environment and Planning D: Society and Space*, vol. 30, no.4, 2012, p. 572.

17 A. Ryan, '*Where Land meets Sea: Coastal explorations of landscape, representation and spatial experience'*, London and New York, Routledge, 2012, p. 27.

18 P. Vannini and J. Taggart, 'The Day We Drove on the Ocean (and Lived to Tell the Tale About It): Of Deltas, Ice Roads, Waterscapes and Other Meshworks' in J. Anderson and K. Peters (eds) *Water worlds: human geographies of the ocean*, Farham, Ashgate, 2014, pp. 89-10

19 A. Mathur and D. Da Cunha (eds), *Design in the Terrain of Water*, Philadelphia, Applied Research + Design Publishing; University of Pennsylvania School of Design, 2014, p. 4.

20 T. Robinson, *Setting Foot on the Shores of Connemara and other Writings*, Dublin, The Lilliput Press, 2007, p.15.

21 Ibid. p. 15.

22 Scape landscape architects [website], 2007, https://www.scapestudio.com/projects/, (accessed 28 February 2020).

23 C. Reed and N. Lister, *Projective Ecologies,* Cambridge, Massachusetts; New York, Harvard University Graduate School of Design ; Actar Publishers, 2014.

24 B. Cantrell and J. Holzman, *Responsive Landscapes: Strategies for Responsive Technologies in Landscape Architecture*, New York, Routledge, 2015.

25 D. Lambert, L. Martins and M. Ogborn, 'Currents, visions and voyages: historical geographies of the sea', *Journal of Historical Geography*, vol. 32, no.3, 2006, p. 486.

26 M.N. Pearson, 'Littoral Society: The case for the coast', *The Great Circle*, vol. 7, no. 1, 1985, pp. 1-8.

27 S. Goldenberg, America's first climate refugees: How climate change eats the Alaskan coast, *The Guardian*, [website], 2013. Available at: https://www.

theguardian.com/environment/interactive/2013/may/13/newtok-alaska-climate-change-refugees, (accessed 19 November 2020). Of additional interest is a report on adaptive responses to climate change and concerns relating to stress and anxiety in the Alaskan village of Kivalina: M.Brubaker, J. Berner, R. Chavan & J. Warren. 2011. Climate change and health effects in Northwest Alaska, *Global Health Action,* Vol. 4, no. 1, pp. 8445-8451.

28 E. Grosz (ed.), *Becoming: Explorations in Time, Memory, and Futures*, Ithaca and London, Cornell University Press, 1999.

29 M. Nuttall,. (2010). Anticipation, Climate Change, and Movement in Greenland. *Études/Inuit/Studies*, 34 (1), p. 23.

30 Ibid. p. 24.

31 Þ. Pétursdóttir, 'Anticipated futures? Knowing the heritage of drift matter', *International Journal of Heritage Studies*, 2019, p. 5.

32 A. Foxley, *Distance & Engagement: Walking, thinking and making landscape*, Baden, Lars Müller Publishers. 2010, p. 277.

33 J. Wolff, 'Lexicon as Theory: Some definitions at the edge of San Francisco Bay' in C. Girot, S. Ahn, I. Fehlmann and L. Mehling (eds.) *Delta Dialogues,* Zürich, gta Verlag 2017, p.15.

34 J. Ottosson. 2001. 'The Importance of Nature in Coping with a Crisis: A photographic essay', *Landscape Research*, 26(2), p. 171.

35 H. Ruthrof, *The Body in Language*. London: Cassell, 2000.

36 E. Tynan, 'Arctic Islands, Archival Exposures', *Shima*. Vol.14, no.1, 2020, pp. 67-89.

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What time is this coast? Temporal encounters in the Arctic

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ABSTRACT
While the discipline of landscape architecture is regarded as engaging closely with time, the temporal span that it works within is, more often than not, very narrow. In this article, I draw on three concepts of time that allow experiential engagement with the material and immaterial agencies of an Arctic coastal site to emerge. Conceptually, I refer to descriptive insights from literary figures on time and coastal landscapes along with landscape theorists. As an initial site reading, I apply, explore and review these concepts via a time-centred analysis of a frozen shore. *In-situ* techniques using photography and fieldnote taking are used to identify different temporalities. I proceed to modelmaking in a studio setting to further explore the processes, states and conditions that were observed on site. I propose that the application of these time concepts provides a framework for landscape architects to articulate observations and understanding of temporal encounters within and beyond this Arctic coast.

KEYWORD
time, arctic, materiality, coast, fieldwork

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Introduction

Time is at the heart of landscape architecture and yet the way in which we, as landscape architects, study and engage with it is quite limited. The scale of time affecting landscape is enormous_from geological timescales that occur over aeons to the more instantaneous phenomena such as weather conditions. Through practice and research, landscape architects engage with diverse landscape typologies where time manifests in different ways. In woodlands, for example, time is most apparent through seasonal change, whereas in a stone quarry residual geological time dominates. In addition, landscape architects must increasingly engage with forecasted trends and unpredictable events and crises concerning our climate and environment. This has spurred much discussion on the current proposed geological era and concept of the Anthropocene and what it represents.[1] Cultural geographer David Matless observes that the

Anthropocene is 'unique in being epochally prospective as well as retrospective [and] raises complex temporalities, with past, present and future'.[2]

My aim in this exploratory study is to work towards unfolding manifestations and markers of time along an Arctic coast through different modes of design enquiry and to explore the potential of additional temporal concepts in coastal contexts. The title of this article refers to the book *What Time Is This Place?* by renowned planner and author Kevin Lynch.[3] In his book, Lynch explores the physical, biological, sociological and psychological dimensions of time pertaining to urban environments. My response in devising the title 'What time is this coast?' is to explore the potential of temporal concepts in coastal contexts. My approach is to propose three broad concepts of time_*durée*, multiplicity and flow_that I have found useful in articulating the temporalities of an Arctic coastal environment. These may also offer a reflective perspective useful to the profession of landscape architecture.

I present these concepts in literature that relate to time and landscape and situate them through practice in my landscape architecture research. My research is located on the island of Bjørnøya in the Norwegian Arctic, where I explore how these northerly regions exude unique temporal fluctuations. Methodologically, the study is located within the early stages of encountering and apprehending a site and engaging with its temporal character. As a heuristically driven method, the study is articulated by way of onsite experience, fieldnotes and photography together with modelmaking that encompasses time as material. The specificity of the studied site is uncovered primarily through close engagement with its material and immaterial qualities. As a designer-researcher I explore and present the ways I encounter, study, read, interpret and communicate the intricacies and complexities of time.

The article is divided into three main sections. The first outlines a theoretical foundation where I briefly attend to core concepts of time_such as linear and cyclical time_that are often referred to in the reading of a landscape. Here, I argue that these concepts fall short in addressing the complexities and multiplicities of time. Consequently, I take reference from disciplines outside of landscape architecture for alternative ways on how to approach multiple dimensions of time through different landscapes and conditions. As a whole, I move from more general conceptions of time and apply them specifically to my practices of enquiry on site and in the studio. The concepts I address concern matters of duration and extent of time (*durée*); the ways time is realized through configuration, experience and expression (multiplicities); and dynamic-, process- and continuity-related aspects of the temporal (flow).

Taking the Arctic island coast of Bjørnøya as an example, I proceed in the second section to a situated, experimental and personal journey of observations where I uncover different readings of time through a close engagement with the material and immaterial aspects that I encountered during my fourth visit to the island. This is done primarily through photography and descriptive writing to uncover the rich presence and complexities of temporalities that are site-specific.

In the third section, I shift from the on-site fieldwork to a studio setting to further distil the information and knowledge gathered along the coastal site. Here, questions arise on how to develop the acquired new knowledge of the processes, states and conditions that were recorded and experienced on site. To address this, modelmaking is enacted to help articulate the temporal where the explicit and latent qualities and conditions of the coast are given space to emerge.

Finally, I assess the diversities of time that were observed and experienced during on-site fieldwork and further developed in the studio. The time-centred analysis demonstrates that time manifests in the material and immaterial agencies on the site through various processes and states that are constantly playing out at different tempi. To respond more effectively to environments undergoing rapid and wide-reaching change, I argue that, in the theory and practice of landscape architecture during the initial site readings, better awareness of concepts of time could be explored more thoroughly.

On time in landscape architecture

Framing concepts of time, site and landscape

Ethnographer and filmmaker Phillip Vannini draws attention to the fact that the concept of *sense of place*, which is commonly referred to in landscape studies, is more widely known than the concept of *sense of time*.[4] This aligns with an increasing body of texts from within the discipline of landscape architecture urging for more attention to be given to the subject of time. Landscape architects Günther Vogt and Noël van Dooren have objected to what they regard as the persistent dominance of space over time in the discipline.[5] What is also increasingly evident in the discipline is a sense of reflection and critique on the way in which landscape architects have conventionally addressed time with notions of linear and cyclical time.[6] While these concepts are very logical, easily understood and widely accepted, they are incomplete and, as I argue, the development of other conceptualizations of time in landscape architecture is needed.

Urban environments have received notable attention from researchers

studying the connections between time, place and people. *In What Time Is This Place?* Lynch urges an examination of and reflection on the continually changing and reciprocal relationship of time between people and place. Although he offers ways to evaluate time in urban environments, through different categorizations, there is not a specific conceptual framing for his readers to work within. Sociologist Michael Young, meanwhile, writes about the rhythms of people in society referring to the concepts of linear and cyclical time.[7] Other works dedicated to conceptualizations of time outside of landscape and environmental studies that deserve mentioning include *Three Concepts of Time* by chemist and scientific philosopher Kenneth Denbigh.[8] The three concepts presented are the time of conscious awareness, the time of theoretical physics, and the time of thermodynamics and the life sciences. Other examples of conceptualizations of time include the works of philosopher Paul Ricœur and literary theorist Gérard Genette in which they discuss time and narrative.[9]

When attempting to read a site, some recent contributions in landscape architecture extend understandings of linear, cyclical and event-driven notions of time. One important example is Anita Berrizbeitia's study of Charles Eliot's Metropolitan Park System in Boston.[10] Her study highlights the geologic as a temporal manifestation that brings deep time to the present and consequently plays an integral role in the spatial composition on a city scale. In Jackie Bowring and Simon Swaffield's study of the 2011 earthquakes in Christchurch, New Zealand, there is particular attention given to the episodic and event-driven notion of time of the earthquakes.[11] The authors confront uncertain, unsettling and indeterminable disruptions through suggestions of anticipatory design considerations. These examples are reminders of how time manifests differently and how landscape architects interpret such diversity. I see there being two potentially fruitful aspects to consider further. First, emphasizing the experiential aspects of time during the early stages of the design process in landscape architecture. Secondly, exploring how non-human components and agencies of the landscape relate to humans and their influence on a local and even global level.

Concerning this study of coastal environments in the Arctic, I draw on three conceptualizations of time. These concepts were introduced in the early twentieth century by two philosophers, Henri Bergson and Alfred North Whitehead. Their work has experienced a revival in recent times across disciplines, including that of landscape architecture.[12] The appeal of these philosophers is their emphasis on the emergent, dynamic and continual elaboration of how time unfolds. I adopt some of Bergson and Whitehead's accounts of time as a resource and framework in extending

and interrogating conceptualizations of time used in landscape architecture and, particularly, at the initial stages of the design process when the designer becomes familiar with a site.

The first concept of *durée* or duration by Bergson has often been employed across many disciplines to articulate the experiential and subjective dimensions of time.[13] An important contribution of Bergson is the qualitative dimension of time that he proposes, which offers alternatives to the more restrictive cyclical and linear time concepts. In his book *Creative Evolution* (1911), Bergson describes his concept of *durée* as 'no longer something thought, it is something lived'.[14] Within Bergson's lived duration, Robert Hassan and Ronald Purser explain that 'the temporality of experience, intuition, memory and consciousness is evoked'.[15] Bergson also claimed that 'in reality there is no one rhythm of duration; it is possible to imagine many different rhythms'.[16]

This underpins the second integral notion of time, which is the existence of temporal multiplicities. The concept of multiplicities of time relates to the coexistence of different temporalities that play out at different tempi and have capacities to converge, entangle, overlap and unfold. Architect Jeremy Till asserts that in 'its *multiplicity*, time presents a diversity that architecture has to accept_the linear, the cyclical, the personal, the instant explosion of the event, the *longue durée*_and, in order to do that, has to relinquish its mythology of stability and strength'.[17] The novel encounter of a site asks us to consider its multitemporal character and the diverse materialities through which it is expressed.

Finally, Whitehead, who was influenced by Bergson, saw the world as dynamic and emerging. He insisted that everything is in a process of becoming rather than *is* or *has been*, which introduces an ontology of time that is concerned with the processual flow of time.[18] These flows extend between human and non-human, allowing dynamic relations to emerge.[19] This enforces the incomplete and ever-changing dynamics of a landscape as well as the continuous flow of time. Geographer Tom Roberts adds that 'materiality is inseparable from the processes through which particular entities become what they are'.[20] This gives vitality, in particular, to the non-human agencies that are part of every environment, while recognizing that nothing is fixed or finalized.

Collectively, the three accounts of time_duration, multiplicity and flow_give attention to the dynamism of a site as well as accounting for how the designer attunes and relates to such specificities of a site. The concepts expose the complexities, multiplicities and specificities of time that may be understood as timescales. Bethany Wiggin et al. refer to this as 'composed of jostling and unstable temporalities, defined by processes

of assembling and unravelling, ruptures and contingency'.[21] However, to ground these concepts, I will examine a range of texts that offer interpretations of time through close observations and engagement with different coastal landscapes, thus providing examples that could inspire immersive practices in landscape architecture, particularly during initial site visits.

The ebb and flow of coastal time

One of the most unique attributes of a coastal environment is the intangible tension between the rootedness of the land and the fluidity of the sea. A coast presents a thickened zone of time dynamics. By this, I mean a complex intertwining of different and multiple timeframes. These range from the ephemeral occurrences of the wind moving across a shore to the cyclical rhythms of the tide and onto the deep time of the tiny grains of sand and rocks. Landscape architect Catherine Heatherington describes the densities of time along a beach, where there are 'obvious cyclical, diurnal and annual changes wrought by the tides, weather and seasons. These can be predictable but often are not.'[22] She considers the various temporalities of the beach materials scattered and sculpted by the workings of the sea and the stories and memories that are intertwined along this continually changing coast. Architect and cultural geographer Anna Ryan gives an account of the rich experiential dimensions of a coast that are 'integrally bound up with the physicality of the sea. . . . There is ever a sense of ongoing motion. In this, a sense of time, or more precisely, the blurring of time, is a perceivable quality of the coast.'[23] Heatherington's and Ryan's coastal descriptions foreground the relations between humans and non-humans where the dense complexities of time are exchanged. Together, multiplicities of time are exposed.

Extending the experiential dimensions between people and coast, writer Robert Macfarlane recounts a visit to the Scottish island of Eilean an Taighe. He recalls that 'as the sun finally fell, I lay on the machair, hands behind my head. Time, briefly, felt not absent . . . but rather multiplied in its forms'.[24] Macfarlane does not explicitly dissect the temporality of his material and immaterial encounters, but rather immerses his body and thoughts as part of a human/non-human assemblage. In his work, we are given insights into the essence of a particular landscape and time that is wholly dependent on its conditions and states as well as the mood of Macfarlane himself. Moving to a more inhabited experience of the coast, a noteworthy example can be found in the memoirs of British film director, stage designer and artist Derek Jarman. Jarman develops an intimate relation to his garden situated in the 'stony desert' of Dungeness in southern England.[25] Month by month he

provides a detailed account of his garden and the harsh dry, salty, windy conditions that he has to contend with for his plants to survive. Contrasting sharply to the seasonal and ephemeral dimensions of his garden is the nearby nuclear power plant, which he compares to a beached ocean liner. Jarman exudes the concepts of Bergson's *durée* and Whitehead's processual time through his countless hours of gardening, which he says are 'without past or future, beginning or end',[26] while we also learn about the very specific human and non-human dynamics of this small stretch of coast.

Time and timelessness in the Arctic

A latitudinal shift to the far reaches of the northern hemisphere reveals more complexities of time unfolding along coastal environments. In the context of these regions of the Arctic, often referred to as the High Arctic, the temporal dimensions stretch to their extremities. Although there are large temperature variations in these regions, it is light that is arguably the most extreme condition experienced. Polar nights and the midnight sun produce prolonged periods of night and day that lead to a feeling of temporal disorientation. Science writer Katie Weeman describes the adjustment of time for researchers working on the icebreaker ship *RV Polarstern*, which spent months drifting in the Arctic sea ice in 2020. In the depths of the dark polar nights, she writes that ' "time" is just an operational ritual, intended to create the illusion of regularity' and 'the only thing that truly reminds the team that time still ticks forward is data collection'.[27] Here we can see that the clock transforms into a time compass that helps its temporary inhabitants find their bearings.

A historical account from 1934 shares Weeman's description of sensing a loss in time during the dark winter months. Christiane Ritter, an Austrian artist, spent one year living on the northern coast of the Svalbard archipelago with her husband. As Ritter experiences the Arctic tilting away from the sun in early winter, she remarks that 'it is precisely at this time that a decisive change takes place in the human mood . . . when men slowly lose all sense of fixed points, of impulses from the external world'.[28] In addition, the shore adjacent to Ritter's tiny cabin undergoes extreme material changes over the year. Ritter describes how the shore changes, not only in its physical appearance but in the way it differs aurally over the seasons. The varying states of water have a dominant role in the conditioning of Arctic coasts as well as their influence on how people interact and engage with coasts. During my early spring visit, which will be described and illustrated in the following sections, Bjørnøya's coast was transformed into a frozen theatre of ice and snow.

Site: Engaging with time along a frozen coast

Bergson and Whitehead's three concepts relating to time help to establish a theoretical framing for the following two sections. I begin to apply these concepts of time in practice to a specific coastal context through a site reading in the form of analysis. This is done without a design brief or an intention to develop a design from this site. Instead, it sets out to demonstrate how attunement to different temporalities can inform a more enriched knowledge of a site. When I refer to *site*, I borrow landscape architect Ellen Braae's confirmation that a 'site is more than a geometric or objective phenomenon defined by space and time; it is constructed by bodily experience and the emotions and memories it evokes. It is also multi-scalar phenomena'.[29] In this part of the study, I will place emphasis on diverse temporal phenomena that were experienced and recorded along Bjørnøya's coast.

Arrival on the icy shores of Bjørnøya

Bjørnøya is a small island located in the Barents Sea and lies approximately 450 km north of mainland Norway (Fig. 1). The only residents on the island are those working at the meteorological station located along the north coast (Fig. 2). The staff of nine people, employed by the Norwegian Meteorological Institute, work six-month rotations on the island. Bjørnøya has a rich history of temporary visitors and residents, such as hunters, miners and geologists, that dates back to the late sixteenth century.[30] Today, however, the only ongoing activity is dedicated to meteorological observations with some scientific fieldwork, such as ornithological research, conducted in the summer months.

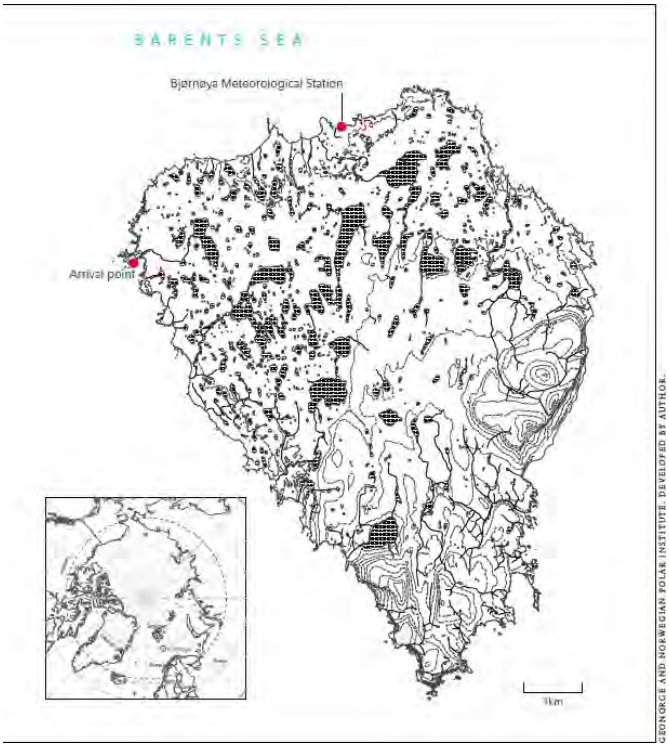


Figure 1 A topographical map of Bjørnøya indicating the location of the meteorological station and the small inlet to the northwest of the island where I arrived. Inset shows Arctic location 74°30'N 19°E

Figure 2 A view towards Bjørnøya's meteorological station from the harbour. Packed sea ice filled the harbour area during my visit to the island.

I arrived on the island of Bjørnøya in March 2019 for a five-day field visit preceded by a two-day voyage with the Norwegian Coastguard. This was my fourth visit to the island but my first time experiencing freezing conditions there. The final hours of the trip involved navigating a frill of sea ice that had accumulated around the island's north coast. The materiality of the sea surface transitioned from dark open water to a greasy, soupy consistency interspersed with angular fragments of solid ice and on to compact agglomerations of pancake sea ice around the coast (Fig. 3). These compositions in their varying states effused multiple durative qualities. The icebreaking vessel eventually found an open lead to the northwest of the island, where we disembarked. On shore, the traces of the tide were displayed as frozen striations along the beach, a suspended *durée* of sorts, marking out the coastal zone through the transformation from fluid to frozen fixity (Fig. 4). We then made our way to the meteorological station by snow scooter and thereby progressed from ocean, via frozen coast to solid land (Fig. 5).

Figure 3 Changing sea ice conditions on our approach to Bjørnøya.

Figure 4 Arriving on the shores of Bjørnøya, assisted by the Norwegian Coastguard.

Figure 5 An aerial view of the north coast of Bjørnøya, with the meteorological station in the background.

The main purpose of my fieldwork research was to explore the material and temporal multiplicities of the island's varied coast as well as a continuation of research on Arctic coastal environments.[31] I combined fieldnotes with photography as a mode of fieldwork enquiry. Fieldwork notes were taken on site as a subjective reading of the coast and also taken at the end of each day as a reflective practice. Photographs were taken with the specific purpose of documenting different materials in varying states and conditions. My approach to photography was to express a durational sensibility where different processes effusing movement were observed. In his *Seascape* series, photographer Hiroshi Sugimuto refers to 'time exposure'. Mirjam Wittmann explains that: 'Although a photograph captures a single moment of time and fixes it on paper, Sugimoto reinforces time as duration and makes you feel as if time stands still and moves on at the same time.'[32] Geoffrey Batchen addresses this further by pointing out that: 'To look at a photograph is therefore to experience a temporal movement back and forth between past and present; it is to witness the passing of time in general.'[33] Photographer and landscape architect Anne C. Godfrey remarks that both photographs and photographer change over time, allowing us to see things that we may not have seen before.[34]

Time exposures

I conducted my fieldwork on the shore along Kvalrossfjære (Walrus beach), which lies less than 1 km to the west of Bjørnøya's meteorological station (Fig. 6). Arriving on this desolate, wind-swept beach somewhat mirrored a photograph frozen in time, as if durative qualities of the material were paused, temporarily. This initially gave me a sense of timelessness, but as I moved through the site this perception faded. Concerning the concept of *durée*, patterns exposed on the materials displayed traces of different movements, such as the scouring power of the wind and the dripping of seawater from the receding tide brought to a standstill by freezing temperatures. The overarching advantage of having a frozen environment to work in meant that many processes such as shifting snow and sand, as well as the ebb and flow of the sea, were more or less fixed during this study. This dramatic change in state, from liquid to frozen, allowed for a very different interaction with this environment, where there was no barrier between walking on land or sea. Although the surface was accessible throughout, the frozen textures, patterns and materials on the land and sea differed enormously (Fig. 7).

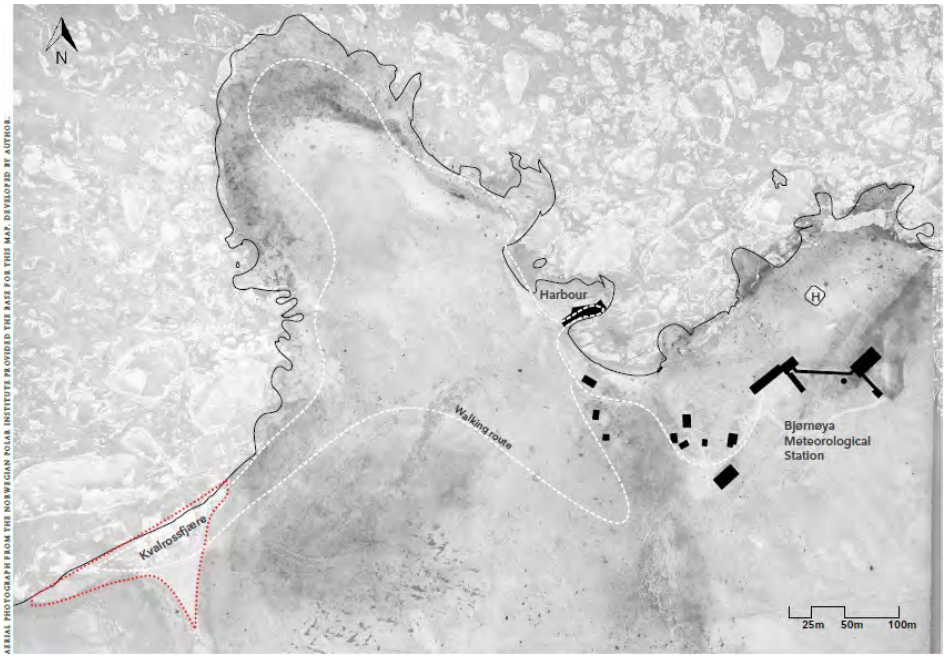


Figure 6 Map indicating the location of Kvalrossfjære, Bjørnøya's meteorological station and the route taken to and from the site. Adapted by the author to illustrate the frozen nature of this coast during the fieldwork.

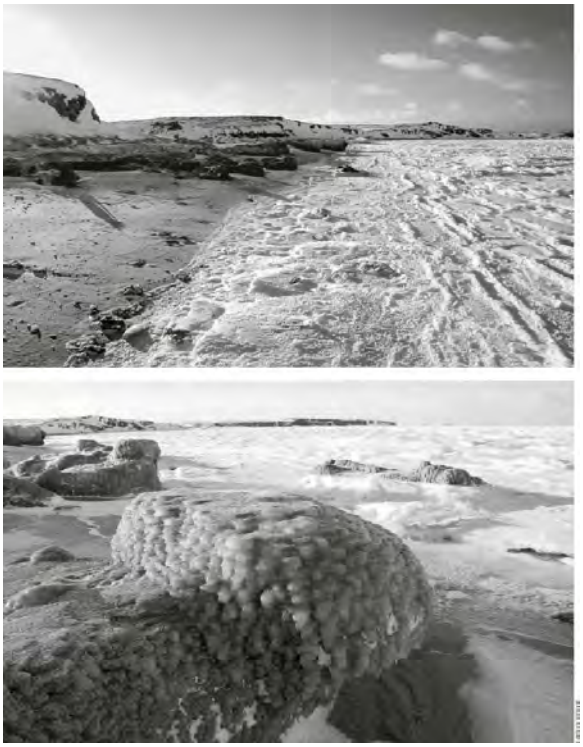
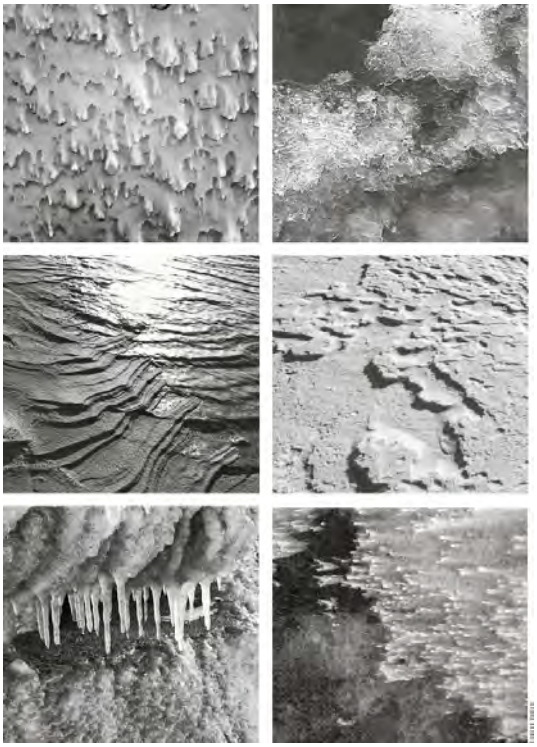


Figure 7 A distinct line separates the darkened beach and the tidal extent of the sea (top). The sea has transformed into a wrinkled icy surface. The boulders on the beach (bottom) were barely recognizable as lithic, resembling gelatinized organisms that had washed ashore.

In Figure 8 a selection of close-up encounters with different materials along the shore is illustrated. These photographs were chosen to illustrate how time manifests in the materials through varying conditions, states and processes. These, however, are incomplete on their own and should be read in conjunction with the following fieldnote descriptions that expand the visual and situated account of what was experienced on the site.



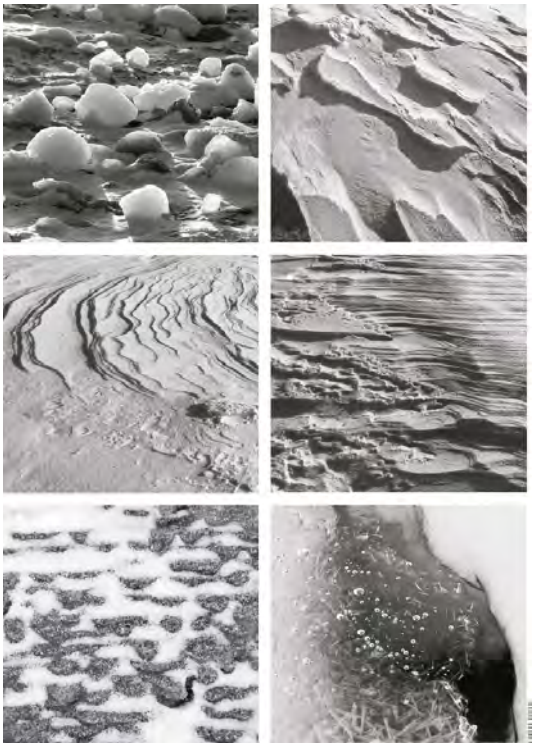


Figure 8. Material encounters shaped and formed by the different conditions, states and processes working through the site.

Time along this frozen shore performs in different and multiple ways. The low temperatures freeze the lapping tidal movements of the salty water, leaving behind a myriad of static tricklings and foldings. Although the sea is frozen it is not immune to the movements of the tide. I can hear the slow, heaving, creaking movements of the ice being disrupted by the tidal pull and push. The wind shifts the ancient sand and the recent snow simultaneously across the beach. The sun casts long shadows, accentuating and enlivening the topography and materials. The moving, thinking and interacting with these coastal materials show that time is most apparent in the processes in, through and of the site. The changing states of water influence the formation and appearance of the materials in different ways. For example, the sea ice is composed of tight-knit miniature islands of hardened ice (known as pancake ice) that sit in a gloop of slushy seawater. The snow, meanwhile, displays a lightness in which the wind carries it with ease across the shore. All the while this frozen scene maintains a vulnerability that could disintegrate very quickly

by a rise in temperature.

In discussing Whitehead's work, geographer David Harvey remarks that 'each process produces its own space and time'.[35] This felt explicitly true along this shoreline during my time there. The photographs in Figure 8 convey different forms of movement that give insights into how different processes, such as freezing temperatures, sunlight and wind, interact with the materials differently. Collectively these photographs, along with my fieldnote descriptions, illustrate Bergson and Whitehead's concepts where multiple durations of time_from my walking, standing, crouching movements to the spontaneous gusts of wind crossing the shore and onto the deep-time geologies of the sand grains_are all in a continual type of performance. After conducting fieldwork on Bjørnøya, I returned to my studio to assess the knowledge relating to time that I had gained from the coastal site.

Studio: Processing the field experience

Modelmaking, thinking, knowing

The findings from my on-site fieldwork helped determine my temporal pursuits. I began to understand how time manifests differently in the materials I photographed and described. In terms of flow and time, the changing states of water, in the form of ice and snow, and how light and wind played with these materials became the most intriguing strands of research to pursue. I proceeded to work with different materials that were capable of changing between liquid and solid states through physical modelmaking.

Simon Swaffield and Elen Deming refer to the work of Stephen Ervin, who distinguishes between models for representations and process models that 'act'.[36] In landscape architecture, it is more usual to create models as a spatial tool, but I was using them for a temporal enquiry that engaged with processes relating to the materials used. Landscape architect Günther Vogt adopts diverse modelling techniques throughout the design process, and states: 'Using a model as design tool is obviously far more exciting than using it to represent something . . . It preserves an openness that allows us to alter it again and this creates room for interpretations and discussions.'[37] Similarly, I was not looking for completeness or perfection, but rather for experiments with which to discover new ways to articulate the different processes that emerge when a material morphs from a liquid to a solid state. As a designer, I needed to engage productively with the dimensions of time, especially process time, flow and the mediation, capture and projection of *durée*.

Keeping this in mind, I chose two different materials, wax and plaster,

for this modelling process. An appealing quality of these materials is the flexibility to work when they are both in liquid and solid states. Rather than mimic textures, the exercise was to engage with on-site processes documented in my fieldnotes and photographs that permeated different watery states that shaped the materials. These included the wind shifting light, dry snow onto icy surfaces, the diverse frozen dripping patterns on surfaces of varying angles, the wind sculpting miniature snowy terraces on sloping terrain, and the presence of light accentuating all of these frozen patterns. I employed such processes in modelmaking that experimented with liquid, semiliquid and solid states.

Candle wax (100 per cent paraffin) is a very flexible material to use for modelmaking; it has the capacity to change from a solid to a liquid state and vice versa. The process of working with wax is dependent on temperature, resulting in different physical and aesthetic outcomes (Figs. 9, 10 & 11). The second part of the modelmaking process involved working with synthetic plaster. This material was used, like wax, for its liquid/solid capacity. The main advantage I found in working with plaster was the amount of precision it allowed (Fig. 12). For sculpting, I used tools that were already part of my working environment, such as a metal ruler and various craft knives. I manipulated both materials in different ways to see how they reacted.

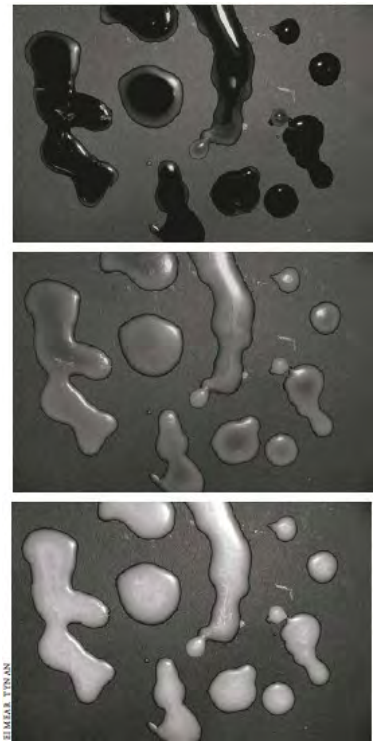


Figure 9 The basic process of the warm, fluid and transparent drops of wax transforming to cool, solid forms placed on a black card background.

Figure 10 The workspace for modelmaking using wax.

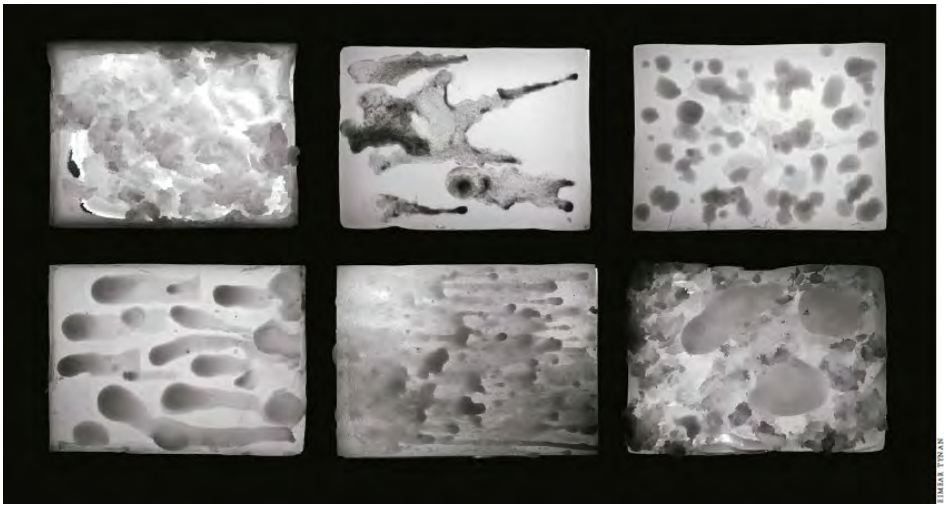


Figure 11 The final part of this wax modelmaking involved placing a light underneath the models, revealing a range of delicate textures. Some of these correspond to patterns observed on site such as a myriad of ‘tricklings and foldings’. The top left

model, for example, resembles a slushy concoction of ice while the wax version was stirred while in a semi-molten state. The middle, right and bottom left photographs were experiments in allowing molten wax, to drip at different angles onto solid wax corresponding to some on-site photographs and fieldnotes that described frozen droplets.

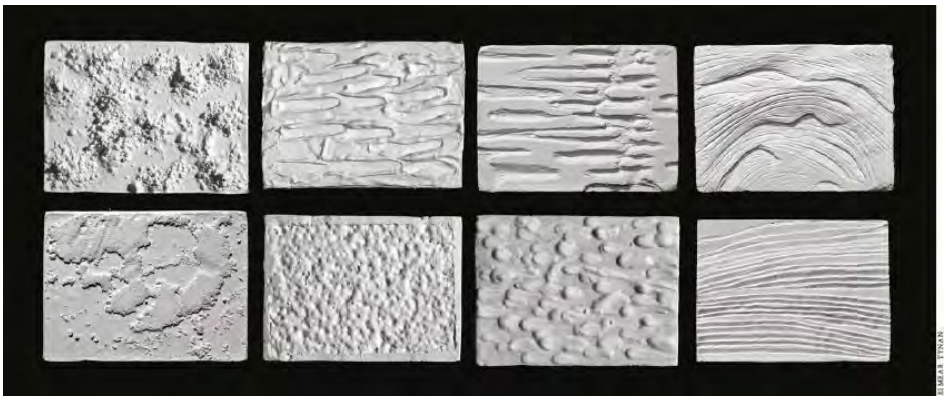


Figure 12 Plaster models provided an alternative mode of working with liquid/solid materials. Referring to my fieldnotes, I observed deposits of shifting sand and snow that translated into adding dry clay powder onto dampened models such as in the top left and second from bottom left photographs. I also carved meandering lines along the surface of some models (such as the bottom right image) as I imagined the wind sculpting frozen accumulations of snow on the beach.

For example, I tilted the angle of the moulds differently at varying stages of drying and this created wavelike patterns or, at a more acute angle, a dripping appearance. I also introduced wind (using a hairdryer), which I expected to result in wavelets on the surface but this did not materialize. Further, I was curious to see how the hardened or dry versions of these materials interacted with the liquid versions. This created an interesting dynamic where the lighter, dry material would sit or sink slightly in the liquid. In the wax experiments this resulted in a softer, fused appearance, whereas with plaster a clearer distinction was maintained. Lighting also became a very important addition to this process as it accentuated the finely textured details of the models (Figs. 11 & 13).

Figure 13 The addition of lighting at an oblique angle accentuated the forms of the models, reminiscent of the low-set sun in Bjørnøya interacting with the ice and snow on Kvalrossfjære.

Tempo-materiality of modelmaking

Modelmaking using different materials required time and patience to know when to intervene and when to step back, which led to a new understanding of each material's individual characteristics, behaviours and qualities. The diverse consistencies and fluidities of the materials were strongly tied with time and the duration of their liquid/solid states. Different textures developed depending on the different states and conditions of the materials. Employing a tangible approach opened up a wealth of miniature processes that were entombed in the materials. In many instances, what I expected and what I experienced were different. There were limitations on how the materials could be shaped and sculpted depending on the temperature, drying conditions and density (concerning plaster and water proportions) and this helped in making decisions on how and when to manipulate them. All of these models were photographed to document the different processes that emerged from this experimentation. It may be argued that this has resulted in a static representation of a fluid and temporal process. My intention is that the idea of 'time exposure' borrowed from photographer Hiroshi Sugimuto is transferable to these models where tempo-material dialogues are exposed.

The studio process generated manifestations and understandings of time that were different to those experienced on the shore. Along Bjørnøya's coast, the icemaking process inherited fluctuating and multiple dimensions of time that were influenced by the freezing temperatures, the wind and the rhythmic movements of the sea. The duration of these freezing temperatures was only a matter of days. The tidal flows remained incessant while the sun was on its daily trajectory towards its twenty-four-hour presence. My indoor working environment, meanwhile, was laboratorylike in comparison, in that conditions were considerably more stable and the processes simplified.

Modelmaking emphasized the idea of working with time, not just the durational time I spent on making the models, but the time that the material needed to create different formations. Interacting with two different materials underpinned Whitehead's concept of the processual flow of time. The wax and the plaster cultivated different qualities as they transformed from liquid into solid states. In terms of process time, this may be seen as a matter of continuity in that the model evinced an unfinished, emergent quality. Temporally, when light was added, the models also took on a continuous sense of animation and movement. In so doing, emphasis was given to the finer qualities of the materials and the processes that were likely to have shaped them. Modelmaking exuded many different expressions of time that were dependent on the transitioning qualities, states and conditions of the materials. Relations emerged and retreated as the modelmaking materials interacted with water, temperature and light. It also, unexpectedly, reconnected my memories and experience to the site itself. It was through making connections between sites_in the form of *in-situ* readings and studio readings, in the form of modelmaking_that I gained new insights and knowledge specific to this coast.

Discussion

This exploration of the temporalities of Arctic coasts raises three main aspects for discussion. First, dynamic environments such as coasts cannot be expressed sufficiently with conventional concepts of time such as linear and cyclical time. Additional concepts are needed to incorporate the durative, multiple and flowing nature of time. Collectively they help towards an improved articulation of temporalities in our environments. Second, I have tried to draw attention to the material and immaterial agencies and processes shaping Bjørnøya's coast while engaging with the experiential dimensions of the site. This is an effort to strengthen relations between me as a designer and the site's non-human components. Third, engaging with the materials along Kvalrossfjære on Bjørnøya helped to

develop site-specific readings of the shore. This involved a consideration of the origins of materials before they become a part of the site and what agencies inside or outside the site condition the materiality. This attunement to the dynamics embedded in the materials was maintained between site and studio environments.

Conclusion

My time-centred analysis has helped to explore a number of interrelated questions such as why materials appear the way they do and what processes they have undergone to become what they are. The three temporal concepts_*durée*, multiplicity and flow_have the capacity to articulate spontaneity and unpredictable phenomena that are particularly relevant to contemporary landscape architecture where we must increasingly confront unexpected changes and crises to our environments on local and global scales. The practice of making and working with models to distil and push my temporal enquiries led to new curiosities about the intangible processes of changing temperature and light that operate on different tempi but interact so strongly with materials that are of their own temporal constructs.

Attention and attunement to time in this coastal site were also central to the enquiry. As landscape architect Elizabeth Meyer aptly states: 'Capturing, distilling, and condensing a site's temporal qualities is another way that site-readings lead to site-markings.'[38] Attending to and engaging with time during the initial encounter with a site has much potential to feed into an enriched and better-informed design process.

Notes

1. For example: Anita Berrizbeitia, 'Criticism in the Age of Global Disruption', *Journal of Landscape Architecture* 13/3 (2018), 24–27; Dirk Sijmons, 'In the Anthropocene, Site Matters in Four Ways', in: Andrea Kahn and Carol J. Burns (eds.), *Site Matters* (London: Routledge, 2021), 110–130.
2. David Matless, 'Next the Sea: Eccles and the Anthroposcenic', *Journal of Historical Geography* 62 (2018), 71–84.
3. Kevin Lynch, *What Time Is This Place?* (Cambridge, MA: MIT Press, 1972).
4. Phillip Vannini, 'In Time, Out of Time: Rhythmanalyzing Ferry Mobilities', *Time & Society* 21/2 (2012), 241–269: 243.
5. Günther Vogt, 'Forward', in: Alice Foxley (ed.), *Distance and Engagement* (Baden: Lars Müller Publishers, 2010); Noël van Dooren, 'Time for Time', *LA+ Interdisciplinary Journal of Landscape Architecture* 8 (2018).
6. In addition to linear and cyclical time the following authors discuss other accounts of time: Barbara Bender, 'Time and Landscape', *Current Anthropology* 43 (2002), 103–112; Jeremy Till, *Architecture Depends* (Cambridge, MA: MIT Press, 2009), 93–94.
7. Michael Young, *The Metronomic Society* (London: Thames and Hudson, 1988).

8. Kenneth Denbigh, *Three Concepts of Time* (Berlin-Heidelberg: Springer, 1981).
9. Paul Ricœur, 'Narrative Time', *Critical Inquiry* 7/1(1980), 169–90; Gérard Genette, *Narrative Discourse* (New York: Cornell University Press, 1980).
10. Anita Berrizbeitia, 'Between Deep and Ephemeral Time: Representations of Geology and Temporality in Charles Eliot's Metropolitan Park System, Boston (1892–1893)', *Studies in the History of Gardens & Designed Landscapes* 34/1 (2014), 38–51.
11. Jacky Bowring and Simon Swaffield, 'Shifting Landscapes In-Between Times', *Harvard Magazine* 36 (2013), 96–104.
12. For example: Bergson is referred to in the introductory chapter of: Jon May and Nigel Thrift (eds.), *Timespace* (London: Routledge, 2001), 1–46. In landscape architecture: Rod Barnett, *Emergence in Landscape Architecture* (London: Routledge, 2013).
13. For example: Peter Merriman, 'Human Geography without Time-Space', *Transactions of the Institute of British Geographers* 37/1 (2012), 13–27; Marian Macken and Fiona Harrisson, 'Performing Drawing in Time', *LA+ Interdisciplinary Journal of Landscape Architecture* 8 (2018), 44–49.
14. Henri Bergson, *Creative Evolution*, translated by A. Mitchell (Mineola: Dover Publications. 1988 [1911]), 10.
15. Robert Hassan and Ronald Purser, *24/7: Time and Temporality in the Network Society* (Stanford: Stanford University Press, 2007), 1–21: 5.
16. Henri Bergson, *Matter and Memory*, translated by N. M. Paul and W. S. Palmer (New York: Zone Books, 1991 [1896]), 207.
17. Jeremy Till, *Architecture Depends* (Cambridge, MA: MIT Press, 2009), 95.
18. Alfred North Whitehead, *Process and Reality* (New York: Harper & Row, 1929).
19. Tim Edensor, *Geographies of Rhythm: Nature, Place, Mobilities and Bodies* (Farnham: Ashgate Publishing, 2012).
20. Tom Roberts, 'From Things to Events: Whitehead and the Materiality of Process', *Environment and Planning D: Society and Space* 32 (2014), 968–983: 971.
21. Bethany Wiggin, Carolyn Fornoff and Patricia Eunji Kim (eds.), *Timescales* (Minneapolis: University of Minnesota Press, 2020), xiii.
22. Catherine Heatherington (ed.). *Revealing Change in Cultural Landscapes* (London: Routledge, 2021), 2.
23. Anna Ryan, *Where Land Meets Sea* (Abington: Ashgate Publishing, 2012), 12–13.
24. Robert Macfarlane, *The Old Ways* (London: Penguin Books, 2012), 112.
25. Derek Jarman, *Modern Nature* (Minneapolis: University of Minnesota Press, 1991), 3.
26. Ibid., 30.
27. Katie Weeman, 'Time Has No Meaning at the North Pole' (13 March 2020), available online at: blogs.scientificamerican.com/observations/time-has-no-meaning-at-the-north-pole/, accessed 31 March 2020.
28. Christiane Ritter, *A Woman in the Polar Night*, translated by Jane Degras (London: Pushkin Press, 2019 [1954]), 113.
29. Ellen Braae, 'Approaching the "As Found"', in: Christophe Girot et al. (eds.), *Delta Dialogues* (Zurich: gta Verlag, 2017), 46–59:54.
30. Dag Hagenæs-Kjelldahl, *Bear Island: The Story of an Isolated Arctic Island* (Whitby: IK Foundation and Company, 2006).
31. Eimear Tynan, 'Arctic Islands, Archival Exposures', *Shima* 14/1 (2020), 67–89.

32. Mirjam Wittmann, 'Time, Extended: Hiroshi Sugimoto with Gilles Deleuze', *Image & Narrative* 10/1 (2009), 176–189: 186.
33. Geoffrey Batchen, 'Life and Death', in: Amelia Groom (ed.) *Time* (London: Whitechapel Gallery/ Cambridge, MA: MIT Press, 2013), 49.
34. Anne C. Godfrey, *Active Landscape Photography* (London: Routledge, 2020).
35. David Harvey, 'The Social Construction of Space and Time: A Relational Theory', *Geographical Review of Japan* 67/2 (1994), 126–135: 129.
36. Simon Swaffied and Elen Deming, 'Research Strategies in Landscape Architecture: Mapping the Terrain', *Journal of Landscape Architecture* 6/1 (2011), 34–45: 37.
37. Rebecca Bornhauser and Thomas Kissling (eds.), *Landscape as a Cabinet of Curiosities* (Baden: Lars Müller Publishers), 103.
38. Elizabeth Meyer, 'Site Citations: The Grounds of Modern Landscape Architecture', in: Kahn and Burns, *Site Matters*, op. cit. (note 1), 51.

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