



# **The Changing Perspectives of Ice in International Relations**

*Prospect of an International Ice Regime in the High Arctic*

**Kamil Łukasz Kluczyński**

**Final thesis for MA-degree in Environment and Natural Resources**

**School of Social Sciences**

**June 2014**



**HÁSKÓLI ÍSLANDS**

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Supervisor: Silja Bára Ómarsdóttir

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## Útdráttur

Í hinum félagslega heimi alþjóðlegra samskipta hefur Ís ekki fengið verðskuldaða athygli. Í umfjöllun hefur fremur verið einblínt á staðbundin áhrif Íss í stað þess að skoða áhrifin í stærra samhengi. Takmarkaðar sögulegar heimildir gefa vísbendingu um að þessu efni hafi ekki verið veitt nægjanleg athygli á alþjóðavettvangi. Í þessari ritgerð verður leitast við að bæta þar úr. Þá verður einnig gerð tilraun til að ákvarða mikilvægi Íss í núverandi heimi og þá sérstaklega í tengslum við loftlagsbreytingar. Ís hefur hörfað til muna frá lokum litlu Ísaldar og framtíðarspár gera ráð fyrir að Ís muni halda áfram að hörfa. Einnig verður skoðað hvort þessi ápreifanlega breyting á Ís geti myndað pólitískt afl til breytinga. Er hægt að mynda bandalag ríkja sem einbeitir sér að verndun Íss á norðurslóðum? Ís er áhrifspáttur í sambandi við loftlagsbreytingar þó ekki sé vitað með hvaða hætti þau áhrif eru. Þó tengis Íss við loftlagsbreytingar séu þekkt hefur enn ekki tekist að útskýra nægjanlega vel í hverju sú tenging er fólgin. Komið hefur í ljós að myndun bandalags um verndun Íss er takmörkum háð: misskilin hreyfilögmál Ís, sjálfsákvörðunarréttur norðurheimskautsríkja yfir landsvæðum sínum og hörfun Íspekju.

## **Abstract**

Ice is an underrepresented element in the social world of international relations. Literature to a large extent continues to focus its examination of ice in the local perspective. Limited historical sources demonstrate these perspectives to be rich in range but that connection has failed to evolve beyond those perceptions into the international arena. This thesis has attempted to bridge that gap. It has also attempted to determine the relevance of ice in the current social world, especially in relation to climate change. Ice has dramatically retreated since the end of the Little Age Ice and future projections expect exacerbation. Whether this tangible change can gather political muscle for action will also be explored in this thesis. Can there be formation of a regime exclusively on ice in the Arctic? While ice has proven to be an irreplaceable indicator for climate change, its mechanisms in connection with the changing climate still fail to be understood. Adaptation of an ice regime has proved to be difficult for the Arctic for few reasons: misunderstood ice dynamics, sovereignty of Arctic states, and the retreat of ice cover.

## Preface

This is a 30 ECTS thesis for the Environment and Natural Resources Master of Arts Program at University of Iceland (Háskóli Íslands). Graduation upon completion of this will be from the Political Science Department of Háskóli Íslands. Advisor for this thesis was Silja Bára Ómarsdóttir in the spring semester of 2014.

The two people that I would like to thank wholeheartedly for supporting, inspiring, and motivating me throughout my entire academic life are my parents. Without them, none of my life defining accomplishments could have ever been possible. Therefore, I dedicate this thesis to both of them as they have undeniably helped me to find my place in the world. Thank you to the both of you.

Enough thanks cannot be given to Iceland and its people. The openness, encouragement, and great humor of the Icelandic people have allowed me to feel at home on this island for the past few years. Iceland's beauty is unique and unparalleled as it has allowed and guided me to find my passion in life, glaciers.

I would like to thank Silja for her patience, motivation, and support throughout the entire thesis, I could have not asked for a better advisor.

To the rest of my family, thank you for all your love and support. Also to all of my dear friends, Brynja, Lára, Michael, Niklas, Vladimir, Dominika, and Daði, I could have not completed this program without you and finally to all of my fellow glacier guides, you have helped make my job a passion.

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## Introduction

As a kid the stories of Arctic explorers' journeys into unknown dumbfounded me. The greats like Sir Ernest Shackleton, Sir Scott Perry, and Roald Amundsen displayed incredible perseverance, determination, skill, and strength in their feats. As explorers they entered regions of which was little known previously and pushed ahead despite the odds against them. Through this drive they accomplished extraordinary feats traversing the harshest, most unforgiving, and isolated terrain in the world. Their navigation across the endless white deserts of the Polar Regions is legendary and inspirational. It is these legendary stories of valor that ultimately lead to my curiosity in the Arctic and Antarctic regions and that fascination has persisted in me ever since I was child. It has been my longing since I can remember to contribute in my own way to the tradition of polar exploration and this thesis is the product of that desire.

Naturally then I have had my sights on the Polar Regions ever since I read these tales. Throughout my adolescence this natural longing has developed in me to explore these regions for myself. As I grew up, however, one aspect of the polar world seemed to captivate me. Whilst I looked at and dreamed of these regions from a distance, the ice of glaciers grasped my undivided attention and never let go of it. The beauty and magnificence of that ice was unparalleled in my eyes. As I spent my whole life further south the novelty of them only bolstered my imagination. Its uniqueness, purity, mysteriousness, peacefulness, and serenity bewildered me. You could not escape glacial ice in the Polar Regions as it defined the landscape. It was ubiquitous and omnipresent as life adjusted around it. Ice was what made the poles exceptional.

This was the picture that I had drawn for myself, the picture of an inexperienced observer from afar. Glaciers were such an abstract novelty to me as growing up in New York City the reality around me was much different. The height of city infrastructure, the noise of vehicles, and the smell of emissions, these were part of my reality. Growing up in numerous cities throughout my life this defined my landscape as I had experienced ice during cold winters but never on the scale of a glacier. I had heard of fragility and retreat of the glaciers but never had the opportunity to experience it for myself. As I began to listen to stories of their disappearance, glaciers seemed to go through a process of personification. With the rise of the climate change and global warming debates glaciers all of a sudden appeared as fragile as endangered species. They were slowly melting away and I found myself frustrated that I wasn't there to experience it.

Two decades later I have found myself in the high arctic in Iceland. It didn't take me long after my arrival in the country to have my first encounter with a glacier. Within a couple of months I was fortunate enough to experience the grandiosity of a glacier for the first time in my life. Sólheimajökull along the southern coast of Iceland became that first experience. I was stricken speechless by its magnificence and immensity. I had built up pictures in my mind as to what I might expect but my imagination proved to be inadequate. Looking at one in a photo and then standing in front of it attested immensely to the disparity of perspective. I had not experienced anything like it previously in my life; by standing in front of it I could not help but be overcome with a feeling of inferiority as it

towered over me and dwarfed my body. As I stared at the calm blue color of the ice, impressed by its grandeur I also found in it peace and tranquility. I had finally found my passion in life.

About a year into my studies in Iceland I was given the unique opportunity to experience glaciers on a frequent basis, by becoming a glacier guide on the very glacier that I first laid my eyes on. For the past two years I have been working as a glacier guide there, walking up and down its ice weekly and experiencing all the various faces the glacier is willing to show me. Traversing it in a downpour of rain, a blizzard of snow, and with an open blue sky, I have experienced how it forms, advances, retreats and breaks away under its own weight. I have explored its insides through moulins and crevasses, as well as what lies underneath on its bedrock and along its moraines. I have seen its curves as well as its cracks. These sides have all combined to show me the incredible balance it harnesses, its power to carve out a landscape and potentially cause immense destruction and peril yet at the same time show its gentleness and beauty. I am sure I have only scratched the surface as there is still much more that I may learn from it.

Other than my personal experiences with the ice, guiding has given me something much more valuable and priceless. It has with these walks given me the privilege of experiencing the first time contacts with glaciers of countless unique individuals from across the world and learning from their reactions. Looking at their many distinctive reactions has allowed me to better understand their experiences through my own time with the ice. By comparing their experiences with my own, these exchanges have inspired the topic of this thesis. This paper is my pursuit to understand the social side of ice, discovering and more importantly grasping ice's place in the social world.

After a while I began to see a pattern in my clients' reactions during my tours. As we moved across the ice I would cover many different topics on the glacier. I would look into its formation, physical features, place in the surrounding landscape, history, and future. I would also cover its change through topics such as climate change and its consequences. Jumping between these topics as an introduction to the glacier I discovered that some features in the ice generated more emotion than others, that some topics generated more interest than others, thus prompting further questions. The greatest concerns and emotions generated, it seemed, revolved around the gradual retreat and abrupt disappearance of ice.

As I have regularly ascended and descended ice for the past two years, I have slowly begun to understand and comprehend these raised concerns. There was a very substantial change happening beneath my feet. To someone who had just spent a few hours on the ice it would seem trivial, but as I have seen seasons pass by the change has been significant. Over only two years I was looking at a much glacier different than the one I had once seen for the first time. With the summer season approaching, the ice will begin its retreat and in a year's time I will again find myself standing in front a different glacier as increasing amounts of melt begin to make their way down the ice.

It is not difficult anymore to see that glaciers are changing. Each year and season brings on new challenges for the guides. It has been increasingly more difficult and problematic for us to even access the ice. The ice has retreated so much into the steep valleys from which it came that finding a way to even take the first steps onto the ice is an adventure in itself. Glaciers are so dynamic that its

conditions today does not in any way guarantee that those same conditions will be there for the next hours, let alone tomorrow.

During tours I have relayed this fact, pointing out where the glacier used to once be, where we were once able to access the ice but no longer. That trend is heading in a wrong direction and with these tours I have been able to educate and expose people to these changes. Changes to the ice are real and through such reality checks I have noticed people's appreciation. Their faces utter the words without having to speak, these changes are not welcome. They tell me that they appreciate and grasp what is happening in front of them. Within the next few years they also comprehend that most likely with this rate of melt, the coming decade because of the changing climate will render these glaciers inaccessible.

I come into regular contact with the Svínafellsjökull and Sólheimajökull glaciers along the south coast of Iceland, as this is where my company operates. The Svínafell glacier, an outlet glacier from Vatnajökull, in the southeast is already on the verge of inaccessibility. Last summer was the first time we had to build a bridge from the cliffs of the adjacent Hafrafell mountainside to access the glacier. This was the first time since the company was founded twenty years ago that such a project had to be undertaken in order to get onto the ice. Previous years required no such tasks as we could comfortably walk onto the ice without any considerable danger. That reality has changed. The coming summer will pose new and further challenges to get onto the ice as a scouting party has already given us a grim scenario of the current conditions there. It will be a substantial and dangerous undertaking to continue these tours.

These tours have shown me that ice does matter and that glaciers do matter. It ignites curiosity and emotion. This was the case for me a few years ago and it is the case for many of my clients as I look at their facial expressions. Therefore, it has been even more incredible to see and experience that I was not alone in this. Support is widespread around the world in my experience to see that these unique features of nature do not disappear completely. Ice is no longer an abstract, it is something utterly tangible. Here is where I think glacial ice plays a key role in the social world of a changing climate. It is something that you can see, smell, and touch. In the current global warming debate they are an excellent indicator for climate change. Carbon dioxide and methane are not something the average person can easily see and detect. Only through thoroughly researched experimentation will it become tangible on paper but those gases will never have the ability to leave the lines of a document. Glaciers are much different in this regard. The advancement and retreat of glacial ice can be seen through our own eyes. We can see its calving, break up, and thinning. We can notice change. It is with these realizations that I have become inspired to further inquire into this phenomenon.

My own experiences have therefore through these apprehensions been combined with the experiences of my clients to form the focus of this study. There was no doubt in my mind on the individual awareness of the problem amongst my clients but I found myself asking the question whether that sentiment was extended to their respective governments. Was the connection also there? As I have catered to people from all over the world and combined with my background bachelor's degree in international relations, this question intrigued me. What was the level of urgency

among governments that this change was happening? Change in ice cover has been substantial but has ice itself been made a priority? I already saw that the tangibility of ice was a very useful tool in the debate of climate change, was it also as convincing for governments as it was for their citizens? My mission therefore has been set to understand the place of ice in the international arena of nation-states. I felt it was most appropriate for me to focus on a national perspective of ice.

Governments have a unique place in this debate. As representatives of their people, governments have been imparted with the responsibility of acting on behalf of its citizens. In a world ruled by law these entities have the power to control that lawmaking. They also have the ability to create and initiate new legislation as a regulatory body. Any grassroots movement no matter how loud and popular cannot instigate change without the ultimate backing of its government. Therefore to determine the strength of sentiment towards glaciers and ice in general in the world I felt it was interesting and important to look at it from a governmental perspective. If sentiment of ice is as widespread on the governmental level as it is shared by its citizens, what is the likelihood of forming legislation around that attitude? Governments are not strangers to forming legislation to protect the environment, therefore this question is feasible.

If there is a possibility creating national legislation perhaps it can be extended into the international arena, therefore continuing an international extension of national sentiment. The international community is also no stranger to forming environmental regimes. Some have been successful and others have not but the potential is there. The question arises whether there is a possibility of perhaps forming an international ice regime on par with previous environmental regimes? There has been support for creating and managing the amounts of carbon emissions in a bid to control climate change, perhaps there is a possibility to extend that onto ice fluctuations. Tangibility of glaciers can perhaps come into play here as discussed before. Regimes on climate change have had their own successes and hardships but maybe the images of fluctuating ice possess that extra motivation required to make it a more effective regime. In this way I will be researching the international standing of glacial awareness in the world.

This study aims to inquire into the development of ice in the social context and judge its present state. Has ice developed any particular characteristics throughout history that are still prevalent today? Do any of those characteristics help to promote or inhibit ice in the social context? Climate change has had a drastic impact on ice cover around the world and especially in the Arctic. How is this retreating trend perceived by governments? Since the goal of this study is to establish the prospect of a future ice regime, to what extent ice is promoted and prioritized is a key question. If ice is prioritized in the international governmental sphere, is it prioritized enough to warrant a regime for it? Regimes take many different shapes and sizes, in what context and areas is a regime possible and impossible? These are the questions that I would like addressed for own concerns and the many concerns I have encountered on the glaciers.

This thesis will open with an introduction to ice in the next chapter, history of ice and regime theory. Ice will be explained in the local and international perspectives before later going into theory of international regimes. These perspectives will be drawn from multiple sources of academic study and indigenous folklore. In order to understand ice in an international context a thorough look will be taken

into its origins in local literature. There, the many faces of ice will be explored as ice has come to mean different things at different periods in time. It has been menacing and feared, as man had for a long time not dared to step foot onto it. Sublimity has allowed people to take a step back not in fear but in appreciation of its beauty and grandeur, ice has become the last truly wild wilderness. Science has also found ice to be indispensable in pursue of understanding global climate and ecosystems, ice has held the key to those secrets in its ice cores. All these perspective will be explored and then connected to ice's place in the international social world. Ice history in interstate relations will begin in the golden Age of Polar Exploration where ice proved to be a symbol of power. That will transition into the importance of ice in international science endeavors. History of ice will close off with the renewed exploration of the Arctic for natural resources. The chapter will close off with going into theory of international regimes. Regime theory will explore the effectiveness of regimes in the international arena and illustrate their evolution. Lastly a similar regime will be searched, for which a future regime on ice could possibly mimic.

Methodology will present the parameters of this study. Focus was directed on all Arctic states surrounding the Arctic Ocean. Traditionally the Arctic has encompassed eight states but only six were studied. The deciding parameters rested in a state's exposure to glaciers and sea ice. This parameter therefore omitted two Arctic states, Finland and Sweden. The remaining six, Russia, Canada, the United States, Iceland, Denmark, and Norway, were therefore the focus of this study. Due to the small size of the focus group, a qualitative study was employed to carry out this study. Personal interviews with a set of eight identical questions were carried out with a representative of each Arctic state. The methodology chapter will go over process of determining the parameters for those interviews and the manner in which they were carried out. At the end of the chapter the strengths and limitations of the study will elaborated upon as they will play important roles in directing the progression of the discussion later on.

After establishing the parameters of the study, the analysis chapter will present the results of conducting the interviews. Each of the eight questions will be presented separately along with the summarized and abridged testimonies of all the Arctic representatives in this study. Connections from the responses will be made to ice and what ice means in the context of the question. A few different areas will be explored and therefore a comprehensive study of ice perspectives in the international arena will be covered. An inquiry will be made into the existence or lack thereof an ice regime in the Arctic. That will open the investigation further of whether ice regimes have been static over the past century or have climate changes impacted policy enough to change it. If changes are happening, are they intense enough to warrant alarm from those directly impacted by it, such as indigenous groups? To combat change and engage this question an inquiry will be directed whether governments are doing their part by investing to understand these changes and how they can be managed. In a world struggling economically, however, the retreat of ice is presenting new economic opportunities with the retreat of the ice, how will that affect the mindsets of the Arctic states? In the end the Arctic states were asked to identify the main issues affecting ice, in order to establish the level of ice awareness in governments up north. All these aspects will play into probing the probability of an ice regime for the Arctic.

Uncovering the history of ice has drawn many parallels to ice perception in its present state. A discussion will follow on this topic in the second to last chapter. By combining this history with the testimonies of the interviewed Arctic representatives that connection can be better understood. The state of the ice today is undeniably in withdrawal. The response of nations has been varied and the future holds many questions whether these changes can be managed. Existence of a regime in the Antarctic proves ice can be regulated, at least in an indirect manner. The poles encompass, however, two completely different political situations. Initiating a regime based solely on ice in the Arctic which mimics the agreement at the opposite end of the world is no longer as straightforward as it once was. Politics, like the climate, change presently, have changed in the past, and will change in the future. Entailed in the discussion will be whether an ice regime for the Arctic can find a place in such changing conditions and how it can compete for recognition of its importance.

## History of Ice and Regime Theory

Ice has a rich history in local culture and mindset, researching this topic has revealed that to me. A parallel has somehow, however, failed to be made into the international sphere. The available litany of text is restricted to inquires into local ice perspectives. Any literature, therefore, presented in the international perspective here will be my personal attempt to fill that literacy void. Information presented below will touch different periods in history. To understand the international side of ice, its roots in the local perspective will be explored first. That examination will attempt to discover links to international ice perspectives.

This section of the thesis will present the available literature on ice from a social side. To start off, I will describe ice and define it as it is the focal point of this study. How it is formed, how prevalent it is geographically, its fluctuating climatic trends, and what ice means for the ecosystem and ultimately humanity will be elaborated. After this, I will present the available literature in the local sphere which originates from various indigenous and academic sources. A connection from those sources will be made with the international perspective. International ice history will span the age of polar exploration, the growth of polar research, and the period of resource development in the Polar Regions.

Evolutionary processes of an international environmental regime and its theory will be explored towards the end. The goal of this study is to find out the likelihood of developing an environmental regime around ice, therefore, inquiry into its evolution will help to determine the potential strength of such a regime. After considering the steps, the final section of this chapter will present two existing regimes that are similar in scope, namely the Arctic Council and the Antarctic Treaty System. Reviewing their effectiveness, we will better understand the potential of a successful future regime on ice.

## The Evolution of Ice in Social Studies

### Describing Ice and Why Ice Matters

This paper will be focusing solely on sea ice and glacial ice. Even though these elements only make up a part of the cryosphere, I will not in this paper include conventional ice generally found at lower altitudes from sub-zero temperatures during winter months.<sup>1</sup> This collection includes ice that forms in lakes, streams, rivers and other small bodies of water on various surfaces due to freezing conditions. In this paper, I am referring solely to ice that is found at higher elevations in mountains, glacial ice, and ice found in seas and oceans at extreme degrees of latitude, sea ice. Therefore the cryosphere will refer to both sea ice and glacial ice exclusively. I will explain in further detail the formation process of these two separate ice structures without getting too technical.

Glacial ice can be found in alpine regions. It differs from conventional ice as it forms under thick layers of snow through a process of compression as opposed to simple freezing. Mountains provide three key ingredients for glacial formation at higher altitudes: elevation, temperature, and precipitation (IPCC, 2014). Without the combination of all these elements the formation of a glacier is not probable. Elevation provides gradient, altitude and lowered temperatures as a setting for ice formation. Cold temperatures allow snow to maintain its crystallized form and prevent that snow from melting into water. Precipitation provides the moisture needed to allow for snowfall and therefore its subsequent accumulation. The formation of a glacier begins with the simple phenomenon of snowfall. Ice therefore forms in areas where the winter snowfall exceeds its subsequent summer melt (Eamer, Ahlenius, & Prestrud, 2007). As this snow begins to thicken over time it begins to layer upon itself eventually thickening enough for the freshly fallen snow at the top to begin to generate pressure on the layers underneath. When a critical snow thickness reaches about 30 meters, with a snow density of about 0.85 g/cm<sup>3</sup>, the snow will slowly begin to compress itself into ice effectively forming glacial ice (Orlove, Wiegandt, & Luckman, 2008). With the slope of the mountainside, gravity then forces the thickening glacial ice to creep and move downhill as a result of the weight being generated from the newly formed ice behind the older ice (Eamer et al., 2007). This glacial ice will continue to grow and push out further down slope on the mountainside until it begins to eventually melt in the warmer atmosphere towards the bottom of the mountain.

Glaciers go through a perpetual process of advancement and retreat as their behavior is dictated by seasonal changes. As conditions and therefore temperatures change throughout the year, glaciers often respond to this change in climate with subsequent fluctuations (Zemp & Woerden, 2008). During the winter months the net ice mass of a glacier tends to grow as temperatures drop and especially in Polar Regions as the presence of solar heating from the sun is greatly diminished through shorter days with available sunlight. The summer months therefore on the contrary cause net ice mass loss

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<sup>1</sup> The cryosphere encompasses all liquid water in its frozen state, such as snow, river and lake ice, glaciers, sea ice, ice shelves, ice sheets, ice caps and frozen ground. (IPCC, 2014)

with raised temperatures and in the Polar Regions as a result of longer days with much more solar heating from sunlight.

A glacier is usually broken up into two areas, the ablation zone near the snout or lowest elevated area where the glacier melts and the accumulation zone near the mountain summit where the snow accumulates and forms ice (Eamer et al., 2007; IPCC, 2014). As a glacier flows down into a valley it transfers the accumulated and formed ice to the ablation area where the ice subsequently melts. Separating these two zones is a line of equilibrium that marks zero net accumulation for the ice; this determines the strength of a glacier (Zemp & Woerden, 2008). A healthy glacier is usually defined as a glacier that produces more ice in its accumulation zone than is melted away in its ablation zone in a given year, thus helping it to advance with a positive net mass gain. Oppositely, an unhealthy glacier loses more ice in its ablation zone to melt than it can compensate for with new ice formation in its accumulation zone. This effectively renders it a retreating glacier with a negative net mass gain. A third type of glacier balances the two zones out and the glacier neither advances nor retreats. This is known as a static glacier where the net mass has remained unchanged from the previous year. These factors help to drive the yearly fluctuations of glaciers.

The physical location of each glacier has a unique effect on the state of its ice (Zemp & Woerden, 2008). Glaciers located closer to the equator tend to be located only at high altitudes. Tropical glaciers like the Chacaltaya glacier in Bolivia are located at its snout at an elevation of about 5,500 meters above sea level. The Furtwängler Glacier atop Mount Kilimanjaro in Tanzania is located even higher at almost 6,000 meters. As we move away from the equator and the climate gets colder, mid-latitude glaciers appear whose snouts reach to lower elevations. The Pasterze Glacier in Austria reaches about 1,400 meters in elevation and the Grinnell Glacier in the United States reaches about 2,000 meters. Glaciers in the extreme Polar Regions tend to flow all the way down to sea level where they usually at some point calve into a bigger body of water like a sea or ocean. Vatnajökull in Iceland empties out into the Atlantic Ocean just like the Novaya Zemlya glaciers in northern Russia.

Closer and closer to the poles, the temperatures drop and dictate the elevation of a snow line affecting ice growth. A snow line is a shifting equilibrium line that determines at which elevation there is snowfall and rain (Eamer et al., 2007). The area above this line has subzero temperatures which results in snowfall whereas the area below this line receives warmer temperatures and precipitation falls as rain. In this way, the lower line will translate into more snow accumulation for ice formation. To determine the health and strength of a glacier, the accumulation area ratio is determined. Glaciers with a positive mass balance tend to have about two-thirds of their area above the equilibrium line (Orlove et al., 2008). Anything less that will cause the glacier to retreat.

The thicker ice found floating on a larger body of water is called sea ice. This type of ice comes to the sea in two ways, from alpine glaciers and through its own formation. In Polar Regions, glaciers tend to descend down the slopes of mountainsides until eventually they flow into a larger body of water (Eamer et al., 2007). Since temperatures are not high even to melt the ice completely, it will run down the mountainside until it eventually enters the sea. Due to its low density, the ice will become buoyant once it crosses the grounding line; this is where the sea meets the bedrock. Extension of the tongue delays the calving event as the ice flows further out to sea essentially creating what is known

as an ice shelf (Zemp & Woerden, 2008). As the ice remains buoyant, the sea water will eventually weaken the ice enough to cause the ice shelf to calve into the water. Separation of the ice from the ice shelf will form a block of ice known as an iceberg and with ocean currents make its way out to sea (IPCC, 2014). Ice shelves are only prevalent in northern Canada, Greenland, and Antarctica.

Formation of sea ice occurs only in the extreme polar climates of the north and south. Sea ice formation is prominent in the open ocean waters of both the Arctic Ocean and Antarctic Ocean that surrounds the landmass of Antarctica (IPCC, 2014). Due to the salinity of ocean water, ocean temperatures must reach  $-1.8^{\circ}\text{C}$  before any ice can form. When this occurs, a skim of separate crystals measuring about 2-3 mm in diameter begin float on the surface of the water (NSIDC, 2014). Eventually these fragments begin to collide and group together into frazil or grease ice. Ice tends to form faster in calm seas as opposed to rougher waters where these ice fragments have a difficult time grouping together. In rougher seas the frazil groups into pancake ice, which is thicker, and eventually gives way to a large thickening sheet of ice known as an ice floe (IPCC, 2014). The ice floe eventually turns into an even thicker layer eventually forming a continuous sheet of ice. First year ice or conglomerated pancake ice can grow to a thickness of 1.5 to 2 meters (NSIDC, 2014). Seasonal changes dictate the growth and decline in sea ice but ice that survives the first summer melt season is known as multi-year ice (IPCC, 2014). More than half of the ice in the Arctic Ocean is multi-year ice as it will grow to a maximum thickness of three meters over its lifespan (NSIDC, 2014).

The gradual movement and thawing of sea ice is due to a few processes. Wind currents, due to the rotation of the earth, and ocean currents underneath the ice both play pivotal roles in drifting the sea ice (Eamer et al., 2007). These two forces cause sea ice formed in the interiors of the Arctic Ocean to slowly drift towards the exterior outskirts; sea ice around the Antarctic behaves in a similar fashion. As the ice drifts it will begin to thaw under solar heating. When the sea ice is snow covered, however, the albedo effect will reflect solar rays back into outer space essentially stalling its melt. Due to its white color, snow is able to reflect 90% of solar rays, while bare ice is only able to reflect 50% (NSIDC, 2014). Oceanic temperatures also play a role in progressing sea ice melt through oceanic forcing (Joughin, 2012). The warmer waters will cause the ice to break up into large floes, starting a process of gradually breaking down the ice down into smaller pieces as it travels out to sea.

Ice has a significant presence on the surface of the earth. About one tenth of the entire surface of the planet is permanently covered in ice (Orlove et al., 2008). An overwhelming portion of this ice is located in the extreme latitudes of the Polar Regions. There ice is omnipresent as the Antarctic ice cap alone holds 85% of the world's ice cover, while two-thirds of the remaining 15% is located in the ice cap of Greenland (Orlove et al., 2008). Outside of the Polar Regions ice is less prevalent but significant. The remaining 5% of ice is located in more temperate climates, which translates into an area over 680,000 km<sup>2</sup> (Orlove et al., 2008). Sea ice is also ubiquitous as on average it can cover 15% of the entire area of the world's oceans during the year (NSIDC, 2014). The sea ice in the Arctic Ocean, which this study will partly focus on, alone on average covers approximately 15 million km<sup>2</sup> (NSIDC, 2014; Eamer et al., 2007).

Fluctuation of ice has been a normal seasonal occurrence over both ancient and recent history. Research done through studying ice core records has provided substantial evidence of this. Global

climate tends to go through regular periods of warming and cooling. This was determined through examining the oxygen isotopes within the ice where these past climates can be recreated with considerable accuracy to better understand those changes (Koerner, 1989). Through analysis within the ice layers scientists can determine the temperature, humidity, various gas levels, and precipitation of past climates (Lorius, 1990). In order to expand this climate data, there is a continuing project of retrieving ice cores from glaciers across the world. The two most important areas for ice cores retrieval have been the Antarctic and Greenlandic ice caps. Since the thickness of these ice caps reaches a few kilometers, the climate log reaches quite far back. The 2004 Dome C ice core retrieved from Antarctica shows a climate record going back 740,000 years (Carey, 2007).

Some of these phases have occurred during the existence of humans on earth. The last major ice age was about 21,000 years ago which at its peak covered about a third of the entire globe in ice (Zemp & Woerden, 2008). Since then the climate has progressively gotten warmer. At about 10,000 years ago pronounced warming brought ice cover to about the same extent that existed by the end of the 20<sup>th</sup> century at the end of the Little Ice Age (Zemp & Woerden, 2008). There were also periods where the climate became extraordinarily warm such as during a time known as the Medieval Warm Period between the 10<sup>th</sup> and 13<sup>th</sup> centuries. This rise in temperature helped to drive the settlement of the Arctic's more remote locations, such as Iceland and Greenland. The last recent cooling period was witnessed during the Little Ice Age between that 16<sup>th</sup> to 19<sup>th</sup> centuries. Currently, we are in a warming period. Except for a slight drop in temperatures in the 1970s the earth's atmosphere has been getting warmer since the beginning of the 20<sup>th</sup> century. That current warming trend is having a resounding effect on the distribution of ice cover around the world.

There has been a substantial change to glacial ice in the past century as an overwhelming number of glaciers have been in retreat. This phenomenon was already noticed at the turn of the 20<sup>th</sup> century when scientific observation of glaciers was in its infancy. Alpine glaciers in the Swiss, Italian, and Austrian regions all showed visible retreats (Reid, 1898). Today observation of glaciers and sea ice has extended significantly covering ice worldwide. Detailed information about glacial movements has been made possible through both governmental and academic monitoring. The World Glacier Monitoring Service reports that over the past six decades a cumulative average of ice loss in all glaciers has measured about 20 meters w.e.<sup>2</sup> To put this into better perspective, the global average w.e. is between 100 and 180 meters (Zemp & Woerden, 2008). This shows a dramatic change in the ice cover which is visually evident around the globe. Glacier National Park in the United States has lost three-quarters of the 150 glaciers it had back in 1850 (Carey, 2007). Ice loss is a recurring trend around the world. The biggest glacier in the world, Lambert glacier in Antarctica, has seen an annual net mass loss of 3 km<sup>3</sup> (Rignot, 2002). Central Europe has also reported massive losses. The Sarennes Glacier in France has lost 46.9 meters w.e. since 1945 (Zemp & Woerden, 2008).

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<sup>2</sup> Meters in water equivalent (w.e.) is a method used to measure the total amount of water in glacial ice. If you were to theoretically take the ice and snow and melt it down into liquid water, that accumulation would give you the mass balance of the glacier in meters height in water equivalent. Thickness is determined by dividing the estimated volume by area of the glacier.

Changes particularly in the Arctic have been substantial. Glaciers of the Cumberland Peninsula on Baffin Island in northern Canada have seen an ice loss of 10-20 percent since the Little Ice Age maximum at the turn of the 20<sup>th</sup> century (Zemp & Woerden, 2008). Iceland's highland glacier, Hofsjökull, has lost about 9.8 meters w.e. since 1985 while the Austre Brøggerbreen glacier in Norway has lost 18.8 meters w.e. since 1965 (Zemp & Woerden, 2008). Melt on the Arctic's only ice cap in Greenland has also been considerable. The Greenlandic ice cap has seen, even with conservative measures, annual glacial ice retreat of 50 km<sup>3</sup> along its coastline (Rignot, 2002).

Ice out at sea is also quite visibly in decline. The ice filling the seas and oceans of the Polar Regions has seen a drastic change in the past few decades. Ice shelves work as buttresses controlling the outflow from terrestrial glaciers. A disintegration of an ice shelf results in the subsequent surge of the glacier it was supporting. The largest disintegration ever witnessed was the Larsen B ice shelf on the Antarctic Peninsula. In a span of just five weeks starting on January 31<sup>st</sup>, 2002 about 3,200 km<sup>2</sup> of ice broke away from the Antarctic shore and floated out to sea (Perkins, 2002). This resulted in the subsequent surging of the Drygalski, Boydell, Sjørgen, Bombardier and Edgeworth glaciers (Angelis, 2003). In Antarctic this is growing trend. The Antarctic Peninsula has seen a dramatic disappearance of its ice shelves in recent decades with approximately 6000 km<sup>2</sup> of ice shelf ice being lost per decade (IPCC, 2014).

With regard to sea ice that forms in the chilled waters of the Polar Regions, it too has seen substantial changes. The sea ice around Antarctica has actually grown 1.2 to 1.8% per decade but that cover does, however, vary regionally (IPCC, 2014; Eamer et al., 2007). Some regions along the coast are gaining sea ice while others are losing it. On the contrary the sea ice in the Arctic is drastically retreating. There has been a 3.8% decrease in the extent of the sea ice cover in the Arctic per decade since 1979 (IPCC, 2014). It is also important to note that the thickness of the Arctic sea ice has thinned by 1.8 meters between 1979 and 2008 (IPCC, 2014). These are substantial changes. The Arctic saw its record lowest extent since records started decades ago in the summer of 2012, as it covered only 3.44 million km<sup>2</sup> (IPCC, 2014). That is a substantial change from the previous record set back in 2007 when the sea ice covered 4.22 million km<sup>2</sup> of the Arctic (IPCC, 2014).

Glacial ice and sea ice have therefore changed substantially over the past few decades. The new IPCC report has estimated that over 600 glaciers have disappeared over the last few decades (2014). Reasons behind these changes have been attested to the changing climate. With warmer temperatures and a warmer atmosphere, ice has had a difficult time surviving thus reacting with retreat. Melting of ice has been attested to an estimated rise in mean global temperatures of 0.75°C since the middle of the 19<sup>th</sup> century (Zemp & Woerden, 2008). That rise has been attributed to the rise in man induced greenhouse gases of carbon dioxide and methane (Ramanathan, 2006). These gases help to insulate the atmosphere by trapping heat therefore causing temperatures to subsequently rise. Ice core analysis is able to distinguish between these natural and manmade gases, the amount of the latter has risen (Lorius, 1990). In 2011 the amount of carbon dioxide (CO<sub>2</sub>) concentration in the

atmosphere measured 390.5 ppm (IPCC, 2014).<sup>3</sup> Over the past 400,000 years, the amount of CO<sub>2</sub> concentration has never been greater than 290 ppm (Ramanathan, 2006). This is a very real and worrying trend for future persistence of ice extent.

The future is rather grim as most models have predicted the ice to retreat amid warmer atmosphere (IPCC, 2014). Coupled with a rise in temperatures through continued pumping of greenhouse gases, ice will not be able to recover. According to models, the mean temperatures in the Canadian Arctic are predicted to rise up by 2°C by 2020 and approximately 6°C by 2080 (Prowse, Frugal, Bonsal, & Edwards, 2009). As massive retreat has already been witnessed with a temperature rise of just under a one degree celsius, the prediction of even greater temperatures rises will undeniably bring about greater consequences. Scientists talk about an eventual tipping point that once crossed the changes to ice mass balance in glacial ice would become irreversible (Notz, 2009).

Change in ice cover will have an effect on ecosystems. With the retreat of glaciers and sea ice, what are the consequences for the environment? Glaciers and sea ice do play an integral role in the earth's ecosystem and the absence of them would be significantly noted. Amongst these changes are sea level rise, decrease in solar refraction, and disappearance of watersheds. All of these consequences will have an indirect negative impact on human societies.

Referring to global environmental change the rise of sea levels could prove to be an immense problem for both coastal communities and cities in the future. Global sea levels have risen 15 cm in the 20<sup>th</sup> century, especially in recent decades, and are predicted to speed up by as much as three times that rate for the remainder of the 21<sup>st</sup> century (Orlove et al., 2008). For those living along the coast that means a disappearance of their homes and forced migration. Regarding economic resources retreating ice will affect water resources. Currently ice holds three-quarters of the entire earth's fresh water supply (Zemp & Woerden, 2008). Disappearance would mean major decline in a natural source for drinking water, irrigation, and energy production. Indigenous farmers in Ecuador have already lost their glacial watershed and now rely on expensive irrigation to water their crops (Orlove et al., 2008). Currently the sea ice over the Arctic Ocean is refracting solar heat which effectively protects the ocean underneath the ice from heating. The dark color of open ocean water refracts only about 6% of the solar rays which mean it is retaining about 94% of solar energy (NSIDC, 2014). Swelling of oceans from solar heating is also contributing to sea level rise.

Substantial changes are occurring to the ice and this is in large part due to anthropogenic contribution. How these changes have been perceived in literature throughout history will be explored throughout the subsequent subsections. History has shown that humans are dependent on glaciers both physically through its resources and spiritually through its existence as a symbol. Their disappearance will have a profound effect in both of these areas as human culture adjusts to ice retreat.

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<sup>3</sup> Parts per million (ppm), this means that out of every 1 million molecules in the air approximately 390.5 parts or molecules will compose of carbon dioxide.

## Literature on Local Perspectives on Ice

Throughout history ice has taken on a unique array of many roles in local communities around the world. Glaciers and sea ice are perhaps the most remotely located topographic features on the planet. This isolation has helped to create an aura of mystery around it. Glaciers and sea ice remain to an extent a very abstract novelty dwelling at the ends of the world. This is understandable as most glaciers are found high up in extreme altitudes hidden away on mountain tops. Even if they are found at sea level, the sea ice is then usually tucked away at extreme degrees of latitude towards the poles. For many people around the world, especially those living in mild and tropical climates, ice remains elusive. Cold, wet, and harsh conditions surround it, hardly desirable environments to host large communities of people. Therefore communities that live in these areas tend to be small and sparse retaining the ice for themselves. These conditions have allowed ice to maintain a degree of fascination and novelty around the world.

Historical records and current ongoing experiences with ice have shown that it is deeply entwined with social perceptions. In this subsection I will go into greater detail demonstrating these connections. To understand any relationship of ice with international relations, it is first necessary and key to look into its foundations through local perspectives. In order to cover these diverse perspectives the subsequent paragraphs will encompass five separate ways that ice has been viewed by local communities and people. These topics comprise of ice being seen as menacing, sublime, a wilderness, recreational, and scientific (Carey, 2007).

During my tours I would ask my clients if there was anything that surprised them about the glacier they were seeing for the first time. Usually the most popular answer would be 'I never expected them to be so big.' Since glaciers have remained obscured from view, sighting them for the first time immediately demonstrates how they dominate the landscape. That immensity has given glaciers this menacing quality. Sebastian Münster described his encounter with ice in 1546 while traveling through the Swiss Alps:

"I came to an immense mass of ice. As far as I could judge it was about two or three pike lengths thick, and as wide as the range of a strong bow. Its length stretched indefinitely upwards, so that you could not see its end. To anyone looking at it it was a terrifying spectacle, its horror enhanced by one or two blocks the size of a house which had detached themselves from the main mass." (Carey, 2007)

It is only within the last few centuries that glaciers have even become accessible, not because of the inability to travel to them but because of the change in perception. Originally, the common perception in general of glaciers and ice was quite negative. Ice was death's representation in the landscape (Poulsen, ed., 2013). It was a cold, isolated, and lifeless place. Especially before mountaineering and polar exploration ever developed, traveling into the unknown ice only inspired

fear. Traveling north in latitude and climbing up in altitude usually brought forth people, settlements, and terrain that seemed to be odd and uncivilized (Carey, 2007).

With the growth of glaciers during the Little Ice Age, those backward people did indeed have a reason for fear. As mean annual temperatures were lower by 1-2°C than they are today, the snow line dropped by 200-300 meters (Grove, 1987). These were sufficient conditions for the ice to grow substantially which led them to advance into settlements. Glaciers move slowly but when they move, they move with colossal force. It is not surprising then that when they moved into populated, it eventually brought disastrous results. In Iceland, the village of Fjall was founded around AD 990 in the vicinity of Breiðamerkurjökull, an outlet valley glacier of Vatnajökull. This village continued to exist until eventually it had to be abandoned in 1695 with the advance of the ice. By 1709, 'its buildings were under the ice' (Grove, 1987). Continental Europe also had its own problems. The inhabitants of Le Châtelard in French Alps also had to slowly watch as their village was taken apart one house at a time. As the Mer de Glace advanced it took twelve houses with it by 1605 and by 1610 had taken the whole village (Grove, 1987).

Ice out at sea was not any less feared. With the influx of thicker icebergs into the sea due to the Little Ice Age, likewise came the growth in sea ice across the north oceans. Perhaps the most famous example of hazardous sea ice is the sinking of the Titanic in April of 1912. Traveling through the north Atlantic, the bow of the Titanic struck an iceberg in the middle of the night piercing its side eventually causing it to sink to the bottom of the ocean. A picture was taken the morning after the ship sank of that iceberg, a visible red line going across the surface of the ice (Poulsen, ed., 2013). The iceberg caused the death of 1,513 people that night as the iceberg was said to have been 100 meters in diameter and 30 meters wide, ice of which however the witnesses saw a only a small glimpse as typically around 85% of an iceberg is hidden underneath the water (Poulsen, ed., 2013) (Litell, 1960). The might of the 'unsinkable' Titanic seemed to be no match for the power of the ice.

The mysteriousness and magnificence of ice also put ice and glaciers into more of a sublime perspective. Ice soon became an inspiration for religion, poetry, photography, painting and other types of art. For isolated indigenous communities that lived in the vicinity of ice, ice took on a divine quality. In art both sides of ice, the ferocious and gentle sides, were an excellent testament to how ice eventually took on a more romantic quality.

By examining indigenous communities like the Inuit a deep connection with ice surfaces. Cultures of the native peoples of the Arctic have developed in harmony with ice for thousands of years. Ice to these communities is not just part of their landscape, it encompasses their landscape. It sustains their way of life and provides their fare. Whether the ice chooses to sustain to these communities depends on how it is treated. Considering that glaciers are virtually frozen reservoirs of fresh water, to any indigenous community this is an essential source of life. It will determine their access to water. Any change in the ice therefore has a substantial effect on the community. Due to this, ice has taken on a godlike quality and is venerated by these communities.

These godlike and therefore humanlike qualities attributed to ice can be understood when we note its behavior. As ice fluctuates advancing forward and retreating back, it 'moves'. Not only does it move but that motion is perceived with the naked eye, it is tangible. This sense of motion allows the

ice to in a way become alive and be seen as a living organism. Glaciers especially are sentient being in native stories. According to folklore these glaciers listen and if they don't like what they hear they will not hesitate to surge (Harris, 2005/06). Glacial movements and great catastrophes are told through native folklore. For the Inuit inhabiting the Yukon region in western Canada, the Lowell glacier was that shrine. Their oral tradition describes an event called the Deluge or great flood which only a handful of people survived in the end. As told by Mrs. Kitty Smith:

“Once long ago some Tlingit people...came inland to the Yukon. En route they met an Athapaskan shaman who was old and balding. One young Tlingit boy began to make fun of the shaman joking that his head looked like a stump where gophers play. A Yakatat man tried to stop the boy but the damage had been done. That summer, the shaman travelled to the Lowell Glacier. He sat looking at the glacier...Using his power, he caused the glacier to surge across the river bed until it reached Goatherd Mountain on the opposite bank. A lake built up behind the ice barrier covering the land. When the lake was ‘full’, the shaman broke the dam and the water swept downstream. People camped at the junction of the Alsek and Tatshenshini rivers were all drowned.”  
(Cruikshank, 1981)

This shows the indigenous deep connection with glaciers and also at the same time the state of awe that ice holds these communities in. Such amazement could also be noted in the evolution of ice in art. Ice in painting was portrayed on the one hand as perilous and dark encompassed by destruction but it was also portrayed in a more romantic way with warm scarlet colored backgrounds in a serene landscape (Poulsen, ed., 2013). One has to only look at photographs of beautiful and individually unique symmetric crystals in snow to understand the sublimity of ice (Poulsen, ed., 2013). Ice also made its way into poetry as John Muir express, “But glaciers, dear friend—ice is only another form of terrestrial love” (Carey, 2007).

Muir's passion for the ice introduced another side, its perception as the last remaining true wilderness. Since conditions were not suitable for human habitation, at least not permanent settlement, ice remained the last untouched wilderness. Glacial ice and sea ice were seen as the only places to resist the expansion of the industrialized and overconsuming world (Carey, 2007). The landscape was raw and unchallengeable to human intrusion. That has of course changed with anthropogenic driven climate change but the landscape still remains ‘void’ of a permanent human presence. Referring to the wilderness, polar explorers such as Herbert G. Ponting and Scott Peary titled their books *The Great White South* and *Northward over the Great Ice* respectively (Skinner, 1929). This connected the ice with an untamed emptiness that was both enigmatic and unique. As Robert McGhee wrote:

“Stories, the true and the false, have gradually accumulated to form the vision of a distant and fantastic Arctic as seen through the window of Western culture...The Arctic is not so

much a region as a dream: the dream of a unique, unattainable and compellingly attractive world. It is the last imaginary place.” (Poulsen, ed., 2013)

As the eventual curtain of malevolence began to lift around ice, glaciers and sea ice began to be perceived as a recreational opportunity. Ice still carried that aura of difficulty and harshness. Instead of being scared away by these qualities, however, this time it was precisely for those reasons that ice now became desirable. All of a sudden the concealed crevasses, bottomless moulins, vast ice falls, endless seracs, questionable snow bridges and potential avalanches all became a temptation too good to resist. It became a place to prove yourself against the most dangerous and treacherous conditions. Those were forbidden spaces that needed to be ‘conquered’ by man (Carey, 2007). Glaciers were the last remaining unexplored areas on the planet, this drive for adventure and perseverance against the odds was irresistible. It was a place that few went into and sometimes only a few returned from.

Ice has thus become a place for sport. Since sport is associated with tourism, local communities around glaciers and sea ice have benefitted from this newfound economic resource. There are numerous glacier ski resorts throughout the Alps, such as on the Le Grand Motte in France and the Stubai Glacier in Austria (Daily Telegraph, 2009). Because of glaciers, skiing is a year round sport. Other sports like snowboarding, mountaineering, ice climbing, and cross country skiing also encompass activities on glaciers. Hiking or trekking in the mountainsides along glaciers was also another possibility to enjoy ice without having to actually step onto them. But that newfound economic resource might soon become a pastime. Glaciers are retreating and this reduction threatens the income of these communities. There is current research that suggests that due to the continuing large influx of greenhouse gases into the atmosphere, any future glaciation could be postponed by ten or even hundreds of thousands of years (Orlove et al., 2008). That means ice will not grow beyond today’s maximum extents, the only change that will happen is their slow regression. That would limit tourism for local communities.

Mountaineering and alpinism in particular has flourished with the change in ice perception. The sport has grown tremendously since the first ascent of Mount Blanc in 1786 (Carey, 2007). Today they are both practiced globally but they have, however, not come without obstacles. They continue to be very challenging and dangerous sports. The Himalayan region, in northern India, Nepal, Pakistan, and southwestern China, today is the center of modern mountaineering. Mount Everest, the highest mountain in the world bordering China and Nepal, has attracted many mountaineers to its slopes. Each has been keen on taking the challenge to stand on its summit. In April of 2014 twelve local guides trekking up Everest through the Khumbu Icefall, a dangerous area of the Khumbu glacier infested with crevasses and seracs, lost their lives in a sudden avalanche (BBC, 2014). Without warning, immense pieces of ice toppled in a matter of seconds. Even though it is immensely dangerous, local Sherpa guides travel many times up and down the mountain preparing ropes for clients as this is the best form of employment for them. Therefore even though perspectives on ice have warmed to glaciers, their treacherous side will never disappear.

Ice did not just become a curiosity for sport but eventually grabbed the attention of scientists. Glaciers and sea ice were for a long time severely understudied, no one was keen to venture up to them or even to 'disturb' them. That all changed with the Enlightenment. As the Scientific Revolution began to challenge the validity of Biblical teachings, the field of glaciology was founded in the middle of the 19<sup>th</sup> century by a Swiss scientist, Louis Agassiz (Carey, 2007). Three initial areas of glacial study were focused on, its geomorphology, mechanics, and past glaciations, measuring internal movement, effects on landscapes, and ice ages respectively. Since then the field of glaciology has significantly contributed to the area of paleoclimates and has helped climatologists to better understand the current trend of climate change.

Glaciology now encompasses the study of ice in glaciers worldwide and provides a better understanding of glacial dynamics. Due to the remoteness of glaciers, data collection is not always easy. Scientists still have to endure the same harsh conditions. Any scientist spending a season on the Antarctic or Greenlandic ice cap can attest to this. Temperatures have been recorded as low as -87°C in the interiors of Antarctica (Nelson, 1968). With this kind of exposure scientists risk any unprotected skin becoming frostbitten within minutes. In Antarctica especially help is far away as the area is sometimes completely isolated from any populated areas for thousands of kilometers in any direction.

A cornerstone in studying glaciers has centered on data collection through ice core retrieval. Ice is not easily accessible and that has pushed scientists to their limits. Some have gone deep into interiors of ice caps while others have climbed to mountain summits to collect their data. A perfect testimony to this is Lonnie Thompson, the pioneer of alpine ice coring (Carey, 2007). Ice core samples from large ice caps, such as the Antarctic and Greenlandic caps, store ancient climate records but lack accountability for regional variation in other parts of the world. By retrieving ice core samples from alpine glaciers, these gaps are filled. Lonnie Thompson camped out in 1993 on Peru's Mt. Huascarán for 53 straight days above 6,000 meters to obtain such ice records (Carey, 2007). By 'listening' to the glacier through the data, he says, "...glaciers are telling us something" (Monastersky, 1992).

Looking over the way local communities perceived ice has given a curious insight into the relationship between the two. It is fair to say that ice holds many different faces. To some it is a threat while to others an opportunity. Yet to others it is dark, dangerous, and a complete abstract while still to others it is beautiful, enigmatic, and tangible. The versatility of how ice is perceived is therefore unique. These local perceptions thus form a solid base from which to study ice in an international context. The subsequent subsection will look into the social aspect of ice on a global scale.

## Ice in International Relations

To a large extent international relations through ice have grown along similar lines to local perceptions. Initially ice was a completely unknown landscape of the world. It inspired fear and anxiety for national states just like it had for individuals. Therefore looking into perceptions of ice we

can draw a parallel from local perspectives and connect them to an international context. However, there are unique aspects in international relations that go beyond what anyone at a local level could perceive. This subsection will discuss that relationship. While the links with local perspectives will be made, new areas exclusive to relations between states will be explored. In this subsection we will look at the development of ice in the international arena by examining its evolution. Perspectives will start with the age of polar exploration, and move into the transition towards research, and finish off with the developing trend in natural resource development.

Identity is a strong concept in international relations. State governments are representatives of the citizens that inhabit their territories and the topography that makes up their landscape. Therefore national identity is a distinguishing feature in the international arena and ice does play a role as a national symbol. Those living in the vicinity of glaciers, especially capital cities, perceive ice as their unique connection with the land. At the center of the coat of arms for the Republic of Armenia is Mount Ararat. Covering Mount Ararat is a massive glacierized peak which is usually clearly visible from the capital, Yerevan. That glacier serves as a symbol of greatness and the indomitable will to survive (Orlove et al., 2008). For the Armenian nation, it arouses a sense of strength and perseverance.

Within the Arctic that national identity is much more widespread. A prime example of this is perhaps the island of Iceland. Ice is already embedded within the name of the state. The amount of glaciers in the country is substantial as two-thirds of the glacierized area within Europe is in Iceland (Orlove et al., 2008). Through its panoramas it is known as the 'land of ice and fire' (Oslund, 2002). The white color on the cross also represents ice on the country's flag. Greenland's flag also connects the white color with the presence of ubiquitous ice on the island through sea ice, glaciers, and icebergs. Therefore just as some local indigenous communities were connected with the ice that parallel can also be extended to national populations.

## **Age of Arctic Exploration**

History's largest imperial empires have long pushed into the unknown, thereby slowly filling the cartographical gaps around the world. Terrestrial and marine powerhouses continued their perpetual challenge of each other by traveling farther and conquering further. These embedded mindsets of expansion eventually gave way to the golden Age of Arctic Exploration. Europe possessed some of the greatest marine empires in the world that history had ever witnessed. These states have had long traditions of exploration and occupation throughout the past millennia. Eventually those expansive traditions would turn their sights on the Polar Regions. These regions still remained completely unknown and undiscovered. They were the last black spaces on world maps.

Motivation to extend into these areas was driven by two factors, economic and national pride. When Columbus sailed west in search of a shorter route to the India at the turn of the 16<sup>th</sup> century, he came up short when he discovered the West Indies. Since then that dream inspired explorers over the next few centuries to keep searching for that route. When the route could not be found east and

west maybe north would bode better, Europe turned northward to the frozen sea. Explorers searched for the two mythic shortcuts to Asia, the Northeast Passage and the Northwest Passage. Ice all of a sudden became a venue for these international ambitions through these expeditions. The British parliament offered a prize to any person that could find a route through the ice (Poulsen, ed., 2013). National pride and reputation were on the line for these marine empires and the spoils would go to the victor that would find it first. In the end the timing proved to be disastrous. Searching occurred for these passages occurred during the Little Ice Age as the ice grew. It wouldn't be until the turn of the 20<sup>th</sup> century that the two passages would finally be traversed, the Norwegian Roald Amundsen the Northwest Passage from 1903-06 and the Swede Adolf Nordenskjöld the Northeast Passage a few years prior (Poulsen, ed., 2013). Even after breaking through, the passages were still not remotely economically viable enough as the unpredictability of the Arctic ice brought too much risk.

Nevertheless, it is important to note the feelings towards the ice as a symbol. It was perceived as a harsh and inhospitable place. This is a perception that was extended from local perspectives as ice continued to possess this menacing quality. That quality was absolutely extended onto the national mindset and therefore prevalent in governmental perceptions. People believed, "the Arctic to be ice-bound and desolate...heading forever into a blizzard" (Skinner, 1929). However, no longer was it just a local mindset but now also a national one. The ice presented an insurmountable challenge and those that even attempted this were already considered heroes (Skinner, 1929). In a way therefore the practice of polar exploration became a romantic or sublime idea. Ice and a world encompassed completely by ice were such utterly intangible and exotic concepts that not even the wildest imagination could grasp.

It is interesting therefore to look at ice from a wider international audience. Ice for a long time was and to an extent today still is borderless. This certainly is the case for Antarctica today as no one nation possesses it but merely claims it (ATS). The Polar Regions are international ground (Debenham, 1921). When the polar explorers pushed north and then later south they entered free space, the last unclaimed land. This was a chance at a new potential land grab. Sea ice over the North Pole still remains until today in international 'waters.' During the age of exploration it was a chance for these states to display a new kind of strength, in ice. Ice was unforgiving, harsh, deadly, insurmountable, and endless. Only the strongest states could challenge it and success would mean infamy for conquering the ice world.

Looking closer at these expeditions, you begin to see a pattern. For a large part the expeditions sent north were supported by national governments (Daly, 1877). Since it was a matter of national pride governments did not want to miss out on this opportunity. Looking through the list of expeditions, you notice the name of the explorer followed by more importantly which nation's expedition he was leading. There would be Roald Amundsen who would lead the Norwegian Expedition, the American Expedition would be led by Robert E. Peary, Vilhjalmur Stefansson the Canadian Expedition, or John Franklin the British Expedition (Poulsen, ed., 2013; Debenham, 1921). Through these expeditions it was a chance for the smaller nations to gain recognition in the international sphere. This was certainly the case for Norway with Fridtjof Nansen when he "put Norway on the map" coming home to a heroes' welcome (Poulsen, ed., 2013).

This competitiveness reached its climax with the race for the poles. The North Pole and South Pole held another level of fascination for government. Pushing for the farthest north and farthest south was just a relay race to see which person could take the baton farther. Those that set the new furthest north and furthest south were already received as heroes but the one who would be able to make it all the way to the ends of the earth would come home to euphoria as a god (Poulsen, ed., 2013). Frederick Cook and Scott Peary, both Americans, would push for the North Pole. Originally fearing the Norwegian Nansen was his competition, Peary appealed to the national American public for funding as Americans felt, “the stars and stripes were to be planted at the Pole; anything else would be unnatural” (Poulsen, ed., 2013). Both would later claim success reaching the North Pole but neither was able to convince the public of their feats as even today there is general agreement neither of them made it (Poulsen, ed., 2013). The South Pole saw a race between the Norwegian Expedition led by Roald Amundsen and the British Expedition Robert Scott in 1911. Amundsen, who originally prepared an attempt on the North Pole but changed his plans once he heard it was ‘reached,’ would stand on the South Pole first (Young, 1913). The Norwegian simplicity of skiing to the Pole beat out the British tradition of manhaulage by just one month. Upon reaching the Pole second, a member of Scott’s party wrote:

“Well here I really am and very glad to be here too. It is a bleak spot—what a place to strive so hard to reach...It is sad that we have been for stalled by the Norwegians, but I am glad that we have done it by good British manhaulage. That is the traditional British sledging method and this is the greatest journey done by man...” (Preston, 1999)

Sadly the manhauling tradition would lead not only to defeat for Scott and his men but also to their death as they would starve in their tents just eleven miles from the last food depot. Even though Scott would not be able to return to euphoria as Amundsen did, his demise would be deemed by his countrymen as a ‘glorious death’ (Debenham, 1921).

Glory, strength, perseverance, and heroicism were the words that drove interest in ice throughout this period of history. At the time ice was the ultimate challenge for states. That mindset hasn’t completely gone away as even today the novelty of the farthest north has not yet worn off. The Chinese research ship *Xuě Lóng*, or Snow Dragon, has recently attempted unsuccessfully to break through the ice by ship to the North Pole (Pettersen, "Chinese icebreaker," 2012). Thus the ice continues to challenge states. Even though new exploration has been carried out for scientific purposes, it hasn’t kept states from proving themselves with a ‘challenge.’ Polar Regions therefore continue to be an area of mystery in the unknown. Ambiguity still surrounds ice as some glacial dynamics continue to elude scientists. The way ice has transitioned from being a conquerable wilderness to a misunderstood wilderness will be covered in the next subsection.

## Transition into Ice Research

Once the conquering of the poles was complete, the hostilities began to slowly die down. Uncertainty prevailed of what was next for the poles. That doubt eventually dispersed as the age of exploration slowly transitioned into scientific research. Scientific research in the Polar Regions was in a way nothing new. As these expeditions pushed for the poles, the members of the expeditions would in the mean time keep detailed scientific observations of their surroundings. The research was being done, however, it absolutely overshadowed by the push for the poles (Debenham, 1921). It was thereafter questionable if any scientific research would continue. As scientific research in the past depended on these polar expeditions to conduct their studies, there was worry what would happen now that the poles had been reached. There was concern if scientific research alone warranted enough priority for polar expeditions. Fortunately for science the Polar Regions still carried an aura of mystery and romanticism around it. With that sentiment the world began to look at the Polar Regions as virgin territory for scientific research.

Science became a new area of competition as ice now received international scientific interest. Local perspectives which denoted ice as important for scientific purposes were now superseded onto a national level. Glacier science now had political and nationalistic implications (Carey, 2007). Again, it is important to note that ice in the Polar Regions at the turn of the 20<sup>th</sup> century was still unmarked territory. What is even more interesting is that because of science it stayed borderless. In 1959, eventually after tensions were beginning to flare on growing national territorial claims to Antarctic, an international treaty was signed between individual governments designating Antarctica as a place exclusively for purposes of scientific study (Beck, 1986). Article IV of the Antarctic Treaty does not allow for any rights of sovereignty over any Antarctic territory (ATS, 2011). The treaty also stipulates that the ice will remain borderless as long as the treaty is in force, effectively creating a 'global commons' (Wijkman, 1982). For the Arctic such a treaty does not exist.

Ice in the international scientific context has really grown. At the turn of the 20<sup>th</sup> century ice in this sense ice was still underrepresented in the international community. No international body existed solely for collection of data on ice and direct cooperation between international states. It took some initiation from the Norwegian and Swiss governments, where extensive monitoring showed the importance of glaciers to national identity there, to create the International Glacier Commission in 1894 (Orlove et al., 2008). This commission would be further promoted by Norway, which was renowned for the accomplishments of Nansen crossing Greenland and Amundsen reaching the South Pole, until it would be expanded into the World Glacier Monitoring Service in 1986 (Orlove et al., 2008). In 1914, the International Ice Patrol would be formed to monitor hazardous sea ice for ships floating in the Atlantic after the disaster of the Titanic two years prior (Litell, 1960). Today many national governments independently monitor their own ice.

The importance of ice in international relations has perhaps reached its height with the formation of the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2014). Ice cores from ice caps and alpine glaciers have taken on an immense priority in international science. They have given greater insight into what is essentially causing them to disappear, climate change. Since the IPCC is seen as

the premier report on climate change, ice has been an irreplaceable high confident climate indicator that reacts almost exclusively to climate forcing (Zemp and Woerden, 2008). In a way ice has driven the IPCC reports as its most important source for data.

Alarm and certainly awareness has grown in the international mindset. Since ice cores hold ancient climate records a sense of urgency has developed to retrieve them before they melt away (Thompson, 2009). The local perspective of sublimity can be seen here in an international context. Ice has therefore become novel and romantic to a more general public as well. Since ice fluctuations can be perceived with the naked eye, which has created a feeling of deep sentiment towards ice. The same sentiment and reaction you would attach to a dying organism. Ice has essentially drawn the same emotions on par with endangered species like polar bears and whales (Carey, 2007).

There has been an international response to these ice changes. In 2013, together with the World Meteorological Organization and World Bank, the Icelandic organization Vox Naturae organized the first United Nations meeting exclusively on ice and snow (Vox, 2013). The meeting was organized to address the future impact of retreating ice and snow cover that would inevitably ensue in communities around the world. Another objective during the meeting was the launch of an Ice Circle Initiative. As an objective the initiative seeks to propel the declining cryosphere agenda into mainstream policymaking (Vox, 2013). A campaign by the initiative also aims to designate 2016 as the International Year of Ice and Snow. The United Nations has also published its own report on ice and snow through the United Nations Developmental Program (Eamer, Ahlenius, & Prestrud, 2007).

More funds have been directed to both understanding further future changes and managing the one that are already present. The Central Asian Republics only make decisions on their water use after looking at glacial projections (Orlove et al., 2008). For these states, water from glaciers is their main watershed. Investment in scientific studies is therefore vital to manage the future. Knowing that there are gaps in understanding glacial and sea ice processes the British government has invested in a new icebreaker exclusively for polar research (Amos, 2014). Preparing for the prospect of disappearing alpine glaciers, Norway also manages carefully their reservoirs that produce their hydroelectric energy (Orlove et al., 2008). Other states such as the Americans, Germans, and Koreans also continue to invest significantly in polar research (Amos, 2014).

These are just a few of the reactions taking place to retreating glaciers. Scientific research has significantly helped communities and states to adapt to the changing climate. Through study, anthropogenic greenhouse gases have been found to be the culprit in glacial retreat. Accordingly, the international community has attempted to respond with appropriate investment and regimes but it seems futile as that sentiment has yet again shifted. Polar scientific research continues to be widespread, however, as the ice has retreated new previously inaccessible areas have become available for exploration. A renewed era of exploration is underway, but this time for natural resources.

## Pursuit of Natural Resources

Since the last maximum extent of ice during the Little Ice Age, ice has substantially retreated. Alpine glaciers have retreated back into valleys and sea ice has retreated back towards the poles. For any economic ambitions that might be held for the Arctic, this has been relatively good news. Areas of the sea that were once completely infested with ice are now open. What once were impassable, the Northwest and Northeast Passages look more and more accessible with every summer that goes by. The sea ice has retreated so much that there has been a renewed rush for natural resource exploration in the Arctic.

Interest in Arctic resource potential seems to center around two resources, oil exploration and shipping. With the sea ice retreating to its lowest extent two years ago these two resources have gained much interest. A new state rush for the North Pole has occurred, however, this time not just to reach it but claim it through its seabed as well. That was clearly demonstrated when Russia planted its flag on the seabed 4,200 meters beneath the North Pole in 2007 with a submarine (Poulsen, ed., 2013). This is just a continuation of seabed claims that almost all Arctic states have made with the United Nations Convention on the Law of the Sea (UNCLOS) in the recent few years, except for the American government since they have not yet ratified UNCLOS. Article 76, paragraph 8 of the treaty stipulates states can apply to extend their nautical limit beyond their territorial waters through UNCLOS (UN, 1982). Although initially rejected due to insufficient evidence, Russia intends to reapply next year as it has announced reinforcing new data (Petterson, "Arctic claim," 2014). There already is a presence of resource development along the shores of the Arctic states, especially in gas and oil (Chance & Andreeva, 1995). These applications to UNCLOS do show that this area is extremely important for these states. The gas company of Shell has been trying to secure the first permits for offshore drilling amid growing concerns of an oil spill around ice (Schmidt, 2011).

With the retreat of ice, the prospect of a shorter shipping route through the Arctic has especially been welcome. The distances via the northern sea route to get from Europe to eastern Asia and western North America are much shorter than the traditional shipping routes. As an example, the distance between Rotterdam, Netherlands and Yokohama, Japan would be cut from 11,200 to 6,500 nautical miles via the Northeast Passage and the distance from Rotterdam to Seattle, USA would be cut down from 9,000 to 7,000 nautical miles (Borgerson, 2008; Eamer et al., 2007). An ice free Arctic would expose ocean area over the North Pole, situated in international waters it would provide a direct faster shipping route through the Arctic. As the sea is predicted to open in the near future there has been a call to update current regulations governing the Arctic (Parks, 2010). There is concern that regulation in this region is still underdeveloped.

It is important to note the dichotomy that is now arising. Resource exploration and environmental safeguarding are at odds with one another. There has been support in acknowledging that global climate change is occurring due to anthropogenic contributions from greenhouse gases but at the same time there has been a growth in exploration of the seabed for the very minerals that have caused decreased ice. Inevitably a balance between the two will need to be discussed perhaps

leading to a regime with control and mitigation in the future. Such a possibility will be discussed in the next section.

## Regimes – Evolution, Framework, and Theory

In order to form a regime for ice, it will be important to comprehend its framework. This subsection will explore regime foundations and stages of development. Oran Young's model for creating a regime has been adapted in this paper and will be covered in greater detail. That model will cover three stages, agenda formation, negotiation, and operationalization (Young, 1998). To comprehend development of these stages in the international context, a theoretic outlook will be taken into regime theory.

Initial formation of a regime begins with its agenda. Young (1998) notes that actors and urgency play fundamental roles in developing issues onto a political agenda. In the international arena, actors compromise of states or their representatives but a developed sense of urgency will also warrant immediate action with pressing issues, this could be the case for retreating ice. He emphasized that expenditure of 'political capital' is essential in prioritizing the issue (Young, 1998). In this way, regimes are usually known by their initial promoters, the Arctic Environmental Protection Strategy is known as the Finnish Initiative. As international political agenda is usually overcrowded with other issues, he says, the political will of a representative sometimes may be the key in prioritizing issues. For other nations who themselves have different priorities this is a deciding factor.

At this stage in the process it is important to remain amicable. Even while exerting 'political capital,' it is important to maintain a fluid and open atmosphere so the right actors and players can join the cause. To represent environmental issues thoroughly, the representation of indigenous communities is warranted. The Arctic Council has involved indigenous communities in their meetings by making them Permanent Participants (Bloom, 1999). Young (1998) notes that those that make it past this stage usually carry a higher success rate of seeing the regime through.

Negotiation, as the next stage, brings together actors into the practice of bargaining on the contours of a binding agreement. As actors do not always have the same goals in mind, initial negotiations are to be kept general. Young (1998) emphasizes to keep in mind that regimes are not always legally binding as soft law is more effective at times.<sup>4</sup> It is not uncommon that soft law arrangements have been notably successful as general agreements through ministerial declarations bypass the institutionalization phase of the provisions (Young, 1998). Institutional bargaining during negotiation is a mixed-motive process as regime formation does not always present a case for international cooperation (Young, 1998). If negotiation remains open, creativeness in this stage will allow exploration of possibilities. Nevertheless, eventual agreement only sets the regime in motion

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<sup>4</sup> Soft law, in its broadest sense, can be described as the voluntary commitment of governmental institutions to a cause without engaging in a legally binding agreement with formal restrictions. (Robilant, 2006).

which tends to evolve over time on its own (Young, 1998). By acting as a form of social practice the regime will eventually further develop the issue it is addressing.

General consensus is most desirable during negotiation as opposed to forming a winning coalition or a 'coalition of the whole' (Young, 1998). Comprising of only a handful of Arctic states, it is important everyone receives bargaining leverage. Young (1998) says, by doing this the regime will hopefully gain momentum in the future on its own as participants slowly develop a 'substantive content.' Governments tend to adopt causes but as they represent interest groups within their administrations, the phenomenon of 'two-level games' makes this difficult (Young, 1998). This slows down the negotiation process causing the government to negotiate in an inconsistent manner. In the end, political entrepreneurial skills determine the closing phases of the negotiation process. As the regime's text is finalized, bargaining leverage and skills settle previously disagreed provisions (Young, 1998). When a consensus has been reached, the regime opens for signature.

Entering operationalization of the international regime, this final stage seeks support both internationally and nationally. Young (1998) states internationally while ratification is processed some states might opt to behave as if the agreement was already in effect. To support its development establishment of a necessary transitory apparatus, such as management and administration, will keep the regime up to date. Since dimensions vary from regime to regime, specifics of apparatus management must be determined. In the mean time a preparatory committee will be organized to keep focus on the issue until sufficient states ratifications make it a permanently functioning regime. Nationally speaking the agreed upon regime needs to be translated from theoretic components on paper to functioning regulations within individual state jurisdictions (Young, 1998). This conversion must cover the actions of both private sectors, such as corporations and private businesses, as well as governmental agencies, such as ministries. Young (1998) notes that, in the domestic sphere states ratify regimes differently. Operationalization in this respect is not as straightforward as it may seem as political dynamic is different from previous stages. Taking the American case, Congress tends to be much more assertive (Young, 1998). The practicality of soft law therefore omits these ratification hindrances. However, once the conditions of the international regime have transitioned into practice domestically, the process of regime formation is effectively over (Young, 1998).

To understand the role of international regimes in interstate politics a subsequent inquiry into its theory will be made. An international regime is defined as, "a set of principles, rules, norms, and decision-making procedures that govern the behavior of states and drive the expectations of participants in a particular area" (Axelrod, VanDeveer, & Downie, 2011). Prevalence of regimes in the international arena has been attested to their ample flexibility. Regime success rests in its initial stages of formation that provide an open and accommodating environment. This non-binding atmosphere has thus allowed various players from different schools of thought to come to the discussion table willingly. In this regard, regime theory encompasses the necessary philosophy to attempt institutionalization of ice within the Arctic. "...Regime theory has not only been shaped by liberalism and especially neoliberalism, but also by realism and neorealism" (Karns & Mingst, 2010). International history of ice has shown cases of competition and cooperation within the Arctic and thus a flexible approach is required.

Regime theory finds its roots in the liberal school of thought. Since Grotius, liberalism has taught that rule of law prevails in international relations (Karns & Mingst, 2010). Liberalism also teaches that human nature is essentially good and socially progressing therefore even in an anarchic world of sovereign interstate relations structured cooperation is still possible (Karns & Mingst, 2010; Drezner, 2009). In this respect, forming an interstate environmental regime is feasible as well. Environmental regimes abide by three environmental regime principles: “no significant harm, good neighbor cooperation, and intergenerational equity” (Karns & Mingst, 2010). All three of these principles escape the need and establishment of a legally binding agenda. Instead they offer conceptual advantages of implementing soft law. Effectiveness of soft law has shown to matter in interstate relations as a behavioral motivator for compliance (Huang, 2002).

Difficulty of adapting legally binding measures arises when realist players enter the discussion. According to realist theory, states are the primary actors in the international arena and any attempt to govern it collectively in an anarchic system is futile (Karns & Mingst, 2010). States in the international setting are there exclusively to further their own national interests and self-interest (Axelrod et al., 2011). To realists therefore requests to form regimes with hard law or legally binding compliance are unwelcome. States are not keen on giving up their sovereign rights to a supranational organization (Kamieniecki, 1993). Soft law in regime theory therefore has a significant advantage as it does not entail a legally binding agenda. It has been shown that realism can work together with regime theory to form an international organization (Buzan, 1993).

For the Arctic, regime theory could play a positive role in building an ice regime for the region. History of ice has demonstrated the existence of both schools of thought. Liberalism could be seen in the age of scientific cooperation with the development of the Antarctic Treaty System. Even with complete anarchy on the ice a regional consensus-based agreement was reached by sovereign states. The influence of realism, however, of course cannot be underplayed. The age of polar exploration and the recent interest in resource development show that states continue to hoard national interests and this affects their behavior in the international arena. Nevertheless through codification of norms and principles soft law has often proven to precede hard law in the future (Karns & Mingst, 2010).

## **Looking for a Similar Model – Building a New Regime on Ice**

In this subsection similar models will be presented that could perhaps be used as examples for creating a similar regime on ice. Looking for a similar model, however, it will be important to first go over the effectiveness of regimes in general. The process of regime formation goes through stages but the effectiveness of it depends on other factors. A few of these factors will be discussed initially before searching for a model. Regime parallels with ice will be drawn through the Arctic Council and Antarctic Treaty System models. An overview of the regime will be explored as well as its effectiveness thereafter.

There is a significant role for international regimes to play in the international arena. Studies have shown that these regimes are effective in addressing the original issues that they were set to take up, 'regimes do matter in international society' (Miles et al., 2002). Two dependant factors were indentified in the success of a regime, the institutional capacity and the knowledge base (Miles et al., 2002). Especially in benign and mixed problems, such as ozone layer depletion and low-level radioactive waste, there were positives outcomes through regimes with strong institutional capacities. A sound scientific knowledge base was however essential in all of the studied regimes. Importance of scientific knowledge has been also supported by other studies (Soroos, 1997). These two components play a significant role therefore.

Negative factors, however, do exist that tend to undermine regimes. The most important negative influence is the sovereignty of independent states (Kamieniecki, 1993). If regimes request states to give up some of their sovereign rights, the success of the regime is likely to tarnish. This could be witnessed during the formation of UNCLOS when an independent body with supranational authority was proposed (Young, 1998). Current affairs have a substantial influential on the formation of a regime in its time as well. Therefore determination of one formula for regime success and recreation of a successful regime is not assured in a different time period (Miles et al., 2002). Regimes are dependent on the time period in which they are created and any new factor that might arise then.

Although not a legal regime, the workings of the Arctic Council are significant and worth mentioning here. Since 1998, the Arctic Council is the only major international organization in the Arctic that encompasses all eight Arctic states (Bloom, 1999). It is a high level forum seeking political commitment, albeit not legal binding commitments, from the individual Arctic nations on a variety of Arctic issues. The workings of this council demonstrate the potential of soft law in the international regime context. Primary objectives of the council are environmental protection and sustainable development. To address these areas, an open platform has provided the Arctic states to air any grievances (Bloom, 1999). All decisions within the council are made through consensus, as enshrined in the Ottawa Declaration, which applies to all subsidiary bodies of the council as well. Rules of Procedure stipulate that proposals are compiled and then presented to Ministers at biennial meeting for approval. In the end approval by Ministers is, however, rather a recommendation as these documents have no legally binding power.

The Arctic Council doesn't focus on any one particular issue but its framework has allowed it to address effectively any issue that affects the Arctic. Any attempt to form a regime on ice in the Arctic will therefore most likely go through the Arctic Council and for this reason it was important to explore it. The success of this council has ridden on its informality or non-binding agenda. Such a framework has worked well for the council to identify issues quickly and prioritize urgencies to be placed on the council agenda before offering them for debate (Young, 2012). Introducing an ice regime into a non-binding atmosphere such as this, might perhaps allow it to become prioritized quicker before expanding on its own.

There is no comprehensive international agreement exclusively on ice but the closest such arrangement is in enshrined in the Antarctic Treaty System. In 1959, the Antarctic Treaty System was signed amid growing sovereignty tensions on the Antarctic continent. It was setup as a binding

agreement for all of the original twelve members and the new members entering thereafter. This treaty designates Antarctica as an area for peaceful and scientific purposes exclusively, preventing all military activity and any national annexation of its territory (ATS, 2011). Under this treaty, administration of the continent does not fall under one binding government but is rather carried out through consensus during Consultative Meetings which occur at least biennially (Beck, 1986). Therefore the ice of Antarctica is 'governed' collectively. During these meetings Consultative Parties with voting power, those who remain active in Antarctic scientific research, govern the continent by adopting recommendations reached by a consensus. Observer status to non-Consultative parties with no voting power is given to states that accept the provisions of the treaty but are not able to participate with their own Antarctic research. These recommendations also create special regimes to address specific arising issues. The Protocol to Environmental Protection, that forbade the commercial drilling for natural resources in Antarctica, was established through a Consultative Meeting in 1998 (Schatz, 1998). A secretariat was also formed to help organize Consultative Meetings and provide a center for information exchange between the members of the Antarctic Treaty System.

Except for a few small areas, the entire continent of Antarctica is overwhelmingly covered by ice. Due to the framework that has developed there, this treaty is significant to this study. Even though the treaty does not explicitly regulate ice in its provisions, the articles within this document indirectly deal with ice in one way or the other. The treaty in general has been remarkably positive since its initiation and has been seen as succeeding in the areas it sought to focus on in its mandate, namely preserving Antarctica as a peaceful place of scientific study (Howkins, 2011). Especially in the field of scientific research the Antarctic Treaty has prioritized ice significantly as evident in the importance of retrieving ice cores and studying glacial dynamics. The Antarctic Treaty helps to show that creation of a regime on ice is possible albeit perhaps indirectly. It is also important to note this agreement is a regional treaty. This regional treaty provides a sound example of collective governance of ice, similar to what will be sought after in the Arctic.

## Research and Method

In this chapter of the thesis I will go over the parameters for my conducted research. This will include the process and method used to acquire data for this project, reasons for choosing my interviewees, how I approached them, how the interview was conducted, and how I would be using that information. The questions asked during the interviews will be clarified and the reason behind asking them. In closing I will also cover the strengths and limitations of this study. A completed analysis and synopsis of the interviews will be provided in the next chapter, analysis.

A qualitative method was chosen for this particular study. This method was chosen over others as analyses of a small focus group warranted a particular approach. The purpose of qualitative studies "consist of a set of interpretive, material practices that make the world visible...attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (Creswell, 2007).

By conducting interviews in the first person I felt that I would be able to get more from the interviewees than just policy information on ice. Conducting a qualitative study on a small focus group would allow my research to explore “a deep...emotional understanding of people’s motivations and desires” (Nuttall, Shankar, & Beverland, 2011). Understanding sentiment towards ice was a vital component of this study. Policy information was an essential component of this study but the details, such as body language, immediate knowledge of the topic, and sensitivity on the issue were also highly valued. These additional elements would help me to judge the level of awareness on ice and its priority in the policymaking of each Arctic state.

The scope of the study focused exclusively on the countries within the Arctic region. Focus was further diluted by concentrating solely on countries with direct contact to alpine glaciers and sea ice. In order to satisfy these parameters therefore, the Arctic states of the Republic of Finland and the Kingdom of Sweden were omitted from this study. Countries fulfilling these requirements include the governments of the United States of America, Canada, Iceland, the Kingdom of Denmark, the Kingdom of Norway, and the Russian Federation. Interviews were held with all but one of the focused upon Arctic states, the Russian Federation. A more detailed list of the interviewed Arctic states is presented in Appendix I.

Arranging interviews with these states followed a certain criteria. Since traveling to each Arctic state for face to face interviews presented financial and geographical difficulties, the embassies of each Arctic state in Reykjavík, Iceland were instead drawn on; naturally the head government of Iceland was pursued on its home territory. For Iceland, a representative from either the Ministry for the Environment and Natural Resources or Ministry of Foreign Affairs was requested. The latter subsequently provided me with an interviewee. The capabilities and size of each Arctic state’s embassy varied in the Icelandic capital and thus the positions of interviewees differed. Initially the heads of each political or public affairs office were sought after. Two embassies, the Danish and American Embassies, were able to provide me with such representatives. The Canadian and Norwegian Embassies expressed their limited capabilities in Reykjavík and thus referred me to their respective head governments outside of Iceland. An interviewee from the Ministry of Climate and Environment was arranged through the Norwegian Embassy and an interviewee from the Canadian Ice Service was arranged through the Canadian Embassy. The Embassy of the Russian Federation was not able to accommodate me with an interviewee.

Capability to follow criteria for the interviews with the representatives of each Arctic state varied as well. Requesting a face to face interview was prioritized in my requests as it was important to this qualitative study. Three out of my five interviews were held face to face, namely with the American and Danish Embassies as well as the Icelandic government. The remaining two interviews required another method as the interviewees were located outside of Iceland. Initially the preferred method would have been through a Skype conference call, in order to also study body language, but this was not possible. A telephone interview therefore was arranged with the Norwegian representative. The Canadian representative was not able to speak with me through the phone and consequently as a last option the final interview was conducted through email correspondence.

Once the interviews were arranged another criteria was established to direct the interviews. Prior to the start of interviewing, the representatives received a background introduction to the thesis topic. Next, the original intention was to not to expose the interviewees to the questions beforehand. As the interviews carried on, this condition proved to become difficult. For those representatives residing outside of Iceland, the questions were sent to them beforehand. Three interviewees were exposed to the questions just before the start of the interview, the Danish, American, and Icelandic representatives. The remaining two, Norwegian and Canadian representatives, requested the questions before the interview and therefore obtained them beforehand.

During the interview a set of eight identical questions was posed to each Arctic representative. Each interviewee was asked, without establishing any limitations to time and focus, the listed questions. Their subsequent elaboration on each question was therefore not limited in way as answers did occasionally cross over into topics of later and previous questions. This approach was pursued to gain a large amount of information about subsequent Arctic ice policies as well as to allow the representatives to connect various aspects of ice together by themselves. A list of the questions is presented in Appendix II.

Below, each of the eight questions will be explained and the reasons and behind them. Opening the interview was the question whether the respective Arctic state currently had a policy on ice. This inquiry sought to find out if such a policy already existed in the framework of the Arctic states. If it existed, it was important to determine where and to what degree was it prioritized. Ice has proven to have a role in state agenda building, such as operating on ice in Antarctica, but it has been engaged by policymaking mostly indirectly. This question was designed to uncover if glacial and sea ice existed in a policy built exclusively and directly for ice.

The next question asked if this policy had changed over the past century. This question was asked generally as it was not certain if each state would possess an ice regime. If it did not, the representative would be able to talk about the historical evolution of their Arctic Policy. A one hundred year time period was given to cover the time since the end of the Age of Polar Exploration. During this time a slow transition was taken into international scientific cooperation. This was important to observe from the interviewees to denote whether Arctic Policy had developed along with it.

Climate change has caused the ice to retreat and in the next question the representatives were asked whether that change has had an influence on policy development. Since the decline of the Little Ice Age, the change in ice cover has been drastic. Social history of ice has demonstrated that these changes have not gone unnoticed. The inquiry here is to examine if these fluctuations have affected the evolution of Arctic Policy over that time period. Policy that does react to ice changes will perhaps continue to evolve into a possible ice regime. If a decisive influence from ice is demonstrated, that could prove to be beneficial in the future.

As the climate changes it is expected to have a profound impact on indigenous communities. The next question asks whether any concerns are being raised from their local populations. A deep connection with the ice for indigenous groups like the Inuit has been demonstrated through literature. Ice is a part of their everyday life and change is affecting their culture. Dissatisfaction with the changing trend should provide a grassroots base for action from indigenous groups. This question

was designed to see if the central government has noticed this distress and whether it is responding accordingly with action of its own.

Scientific research towards ice has grown substantially. In this question the Arctic states will be inspected whether they have joined that movement and to what degree is the government involved in understanding climate change. Antarctic ice has brought together an incredible degree of international cooperation. This question was designed to perceive if that investment will continue. Ice cores are incredibly valuable to climate science but also difficult to extract. Commitment from these states through investments is vital to prolonging the presence of science on the ice.

With the retreat of the Arctic sea ice, new areas never before accessible have now begun to open. Here the Arctic states were asked whether this decrease in ice cover offered any new opportunities for their domestic economies. History has shown that there has been an increasing presence of resource exploration along the seabed of the Arctic Ocean. This question was designed to learn which area of economic opportunity was most prominent to the Arctic governments. It is an interesting question to pose just after asking about scientific commitments as oil exploration projects are prominent in the Arctic for the very mineral that has been connected to causing the current climate trend and subsequent ice loss.

After building on the various influences from ice on the Arctic states, the representatives were asked in the second to last question whether the formation of an ice regime was possible for the Arctic. The existence of an indirect ice regime in the Antarctic shows formation of a regime on the same scale is possible, but the question is if it perhaps fit for the Arctic. This question was designed to find out if the representatives considered such a regime to be possible and on what scale would it exist. Which areas would the regime be capable of covering? Their testimony would help to answer the main theme of this thesis.

The last question entailed what the interviewees thought most connected or impacted the current trend of ice retreat. Climate change has been connected to the retreat of ice scientifically but it has also gained prominence in the general public. This question was designed to denote the level of awareness amongst governmental officials and to also to observe how deep their knowledge was in the area. Since oil exploration and climate science research are interconnected, it will be interesting to understand how much that connection is driving policymaking. In other words, are policymakers knowingly engaging in oil extraction even though they recognize that that activity is helping to negatively influence the current trend in decreasing ice mass?

Limitations to this study extended to the sample of interviewed states. The first obvious limitation in this study was the absence of the testimony from the Russian Federation. As Russia encompasses the largest share of the Arctic territory, their inclusion in this study would have provided a holistic and complete analysis of the Arctic states. Nevertheless, this study sampled five out of the six Arctic states it sought to include and therefore results can be regarded as very positive and comprehensive. The second limitation to this study was in the inconsistency of interviewees from different branches of government. A parallel comparison of one position across along Arctic states would have been preferred instead the positions of the Arctic representatives spanned foreign affairs, environmental departments, and embassy personnel. Therefore it will not be possible to draw such a connection

between officials in the same positions in corresponding Arctic states. Such a study would have had preference but as stated earlier due to geographical and financial limitations this was not possible.

Strengths, however, in this study could also be drawn from its inherent weakness. Although the comparison of one position was not possible, a broader more encompassing contrast could be made. Governments compose of many branches with areas of expertise in various disciplines and this study was able to capture that. By gathering testimonies from different areas of governance, a wider and more comprehensive level of governmental awareness and knowledge in ice could be judged. It is of course important to acknowledge that interviewing a branch in one Arctic state carries the likelihood that the same perspectives on ice will not be shared by their respective counterpart in another Arctic government. This exception will be considered in the discussion chapter of this thesis later on.

## Analysis

In this analysis section, I will go over the results from my conducted interviews. Each subsection below will encompass one asked or omitted question during the interviews. I will start out with a small introduction to the question. After that I will give a small synopsis covering the initial answers of the officials. These will be in the form of whether the officials gave a positive or negative response to the question. The paragraphs after will cover more detailed and elaborated information from the official stating why they did or did not agree with the question asked. The subsection will end with a summary of each question.

After looking over each official's answer, the detailed paragraphs will then look into patterns that have developed during the interviews. Initial answers of agreement or disagreement were then supported or not supported by each official's subsequent elaboration on the subject. The topics covered in these elaborations were used to find parallels in each subsection. I have picked out the most important topics from each official's answer and presented them in the subsections below. As I sought for the officials to elaborate on each question as much as possible, some of the answers did cover topics in other questions. Other than on one occasion I did not use information from previous or later answers to answer the respective question in each subsection. The final paragraph in each subsection will therefore contain the summary of each question and demonstrate those connections found amongst the answers of all officials from every nation.

## Policy on ice

Officials here were asked whether their respective governments had a policy exclusively on ice. All interviewees did respond with some form of yes to this question, thus confirming my expectations. The answers were split into two factions, those that acknowledged a partial policy specific to ice and

those that admitted that their policy on ice was only part of a bigger policy, in this case each nation's Arctic Policy.

A yes that qualified as a confirmation to the existence of a policy on ice came only one respondent, the government of Norway. The Norwegian official answered, "Yes, I would say we have one." He did continue in the next sentence saying that, "ice is many different things but we at least have a policy with regard to the Arctic sea ice." While this response did acknowledge that there was a policy exclusively on sea ice, it did not seem to include glacial ice. Therefore it did not encompass all ice specifically ice found in alpine glaciers. Especially by stating that 'ice is many different things' it appeared that ice was not centralized into one policy rather spread out into others. Therefore there is a lack of an all-encompassing policy on all types of ice and this is deemed as a partial confirmation of a policy on ice.

The remaining respondents in the other group acknowledged the presence of ice in policymaking but admitted that this did not amount to one specific policy. Opening lines to the question were answered in a more extended and elaborated way than in the first group. Analyzing the context of those few lines found that ice was not being prioritized enough to warrant a policy exclusively for it but was prominent in other areas. The Canadian official stated, "While the Canadian Government has no official policy on 'ice', we do have some mandated activities." He spoke of Canada's responsibilities under an international organization like the International Maritime Organization to participate in its 'Safety of Life at Sea Convention.' This program requires Canada to monitor a specially allocated area in the Arctic and issue metrological and navigation related information for that area. The Arctic was split up into five separate zones where every Arctic country participates in this gathering of information. Here ice essentially has some kind of a policy in the international arena as countries are required to interact through it.

An answer from the Icelandic official also acknowledged the broad scope of ice in policymaking. The official explained, "The Ministry of Foreign Affairs doesn't have a special policy regarding ice. But ice is obviously a big thing in our Arctic Policy as it is indirectly and directly connected to ice." This type of response was received throughout the second group. Ice did not according to these responses seem to have an exclusive priority in policy-making. In other words, it did not encompass enough ground to warrant a policy of its own but rather was an ingredient in much larger and general policies.

The American official expressed, "I can't for sure say that we have a policy specific to ice but we have a lot of policies that in one way or another relate to ice. The most obvious one is the Arctic Policy that we have." Reference to Arctic Policy to look for ice policy was the most popular answer throughout this group. Ice seemed to define and drive their policies for the Arctic but was not the sole subject dictating policymaking for this region.

Overwhelmingly the respondents continued to point towards their Arctic policies to find ice. The Danish official supported this saying, "I think so because Denmark has published policy for the Arctic area." Again here it refers to a policy for the entire Arctic area as opposed to policy specifically pertaining to ice. Therefore there cannot be confirmation of an ice policy for the nations of Denmark, the United States, Canada, and Iceland. There can however be confirmation of acknowledgment that

ice is at least on the agenda and part of a bigger and more encompassing policy, namely the Arctic Policy.

Ice seems to be to an extent a universal entity in the Arctic Policies of the Arctic states. The American interviewee expressed, “there are many pieces of the US Arctic Policy that are either directly or indirectly related to ice so you won’t find a section of our Arctic Policy that says ‘here is our policy on ice,’ but many parts of the Arctic Policy are in one way or the other ice related.” These pieces connected ice to research, security, shipping, business, and oil exploration amongst the interviewee nations. For the Icelandic government ice was a matter of showcasing the Icelandic nation through its nature. The Icelandic interviewee expressed that, “In our Arctic Policy we talk about resources and we talk about glaciologists...Many experts come here to Iceland to do research on glaciers here in Iceland. That is a showcase for us talking about how we witness the changes that are happening in the Arctic and around the world.” So ice in this sense does seem to have a ubiquitous and significant presence in policymaking for these nations.

Climate change was connected to ice in all interviews in some way. The Danish official referred to this by saying that their policy for the Arctic does, “...cover how the changes in climates and...the ice are developing.” In an indirect way therefore ice is being connected to the changing climate. Referring to the Arctic, “how it will develop in the future, there is a great interest around all of this,” the Norwegian government expressed, “it is important for the global climate system which is after all the most important thing here.” Therefore although there is obviously no single policy on ice alone for the Arctic states, it is very much entwined in the polar policies for the respective nations and does have higher priority in these policies as an indicator for the changing climate.

These answers seemed to be a positive indicator for the importance of ice. None of the interviewees answered with a simple no. Despite acknowledging the absence of an all-encompassing policy, ice was immediately connected to their Arctic Policies indicating its significant presence there. In that they demonstrated the versatility of applying ice into a wide range of topics. Therefore, the answers to this question give positive feedback in the matter of ice being seen as a force in policymaking.

## **Policy change over the past century**

In this subsection the officials were asked to discuss the changes that their policies on ice have undergone over the past century. Policy change over the past century was a common agreement in all of the responses to this question. The policies of each state had progressed along its own development but all answered with a yes. Elaborations on those developments were found to be diverse.

The Danish, American, Norwegian, and Icelandic officials answered directly yes. Elaborating on this agreement The American official stated that, “our Arctic Policy has changed over that time.” Again it is important to note here that policy on ice is being spoken through the Arctic Policy. The chronology

of these policy changes seem to revolve to a large extent around the emergence and growth of climate change. Continuing from the first question where I inquired about ice policy where the concept of climate change was slightly mentioned, it gained much more prominence in this question. The Icelandic official supported this by saying, "I think it has changed because more focus has been put on the issue now." 'The issue' the official is referring to points to climate change. In the next few sentences the official would speak about the IPCC and that, "more experts are talking about the issue." This shows that climate change is dictating and driving the recent direction of Arctic Policy amongst some of the Arctic states.

Therefore the timeline of change in policymaking in the Arctic policies of the respective interviewed states has seemed to take on importance only in the last few decades or so. This is the time period where global climate change and global warming have been given a higher priority. Denmark's official expressed that, "it has been in the recent 10 to 20 years that my government is aware that there are changes in the Arctic area and especially in the last decade where there has been very much discussion concerning global warming." This denotes the growing awareness and appreciation that global warming demands a raised level of debate and action. He emphasized that, "it is a subject the government in Denmark is taking seriously." Denmark's seriousness is supported by the hosting of the Copenhagen Summit. In 2009, Denmark hosted the United Nations Climate Change Conference there. The Norwegian official's testimony also spoke of "a very strong focus on climate and retreat of the sea ice for the last 15 years or so." Initially the change in policy was slow but a significant difference could be seen with later and updated versions of the Arctic Policy. The American official drew this out clearly saying, "When we look at the 1994 policy and we compare it to the 2009 policy, the most notable difference between those two is that by 2009 the effects of climate change are becoming quite clear and the fact that you have a retreat of sea ice in the Arctic permeates through that policy..." This timeframe looks like it will be extended as climate change progresses and is projected to exacerbate in the coming future. He continued by saying, "the retreat of the sea ice is continuing and that as we look ahead as we project ahead through the course of the 21<sup>st</sup> century we can anticipate that the sea ice will continue to retreat." That retreat is becoming alarming. The Canadian official expressed, "...the federal government has invested in climate change adaptation activities to understand climate-driven ecological changes in Canada's North and examine the impacts and risks of climate change on community wellbeing."

A key theme resounding through these answers is the importance of ice in witnessing climate change, specifically sea ice. Action on Arctic Policy change seems to have been driven through direct observance of ice fluctuations in the Polar Regions. In this way ice seems to be an accepted and irreplaceable indicator for climate change. This in turn seems to drive Arctic Policy for this region. Iceland's official expressed this connection saying, "If the policy has changed I think looking at the ice has had some effects on how the Icelandic government has approached the issue." Therefore as Arctic Policy is in part driven by climate change, the climate change debate is driven by ice fluctuation. Observing this ice fluctuation refers in particular to the retreating of sea ice in the Arctic Ocean. As a result, sea ice changes seem to be prominent in the minds of these officials. The American official mentioned this about the evolution of his nation's Arctic Policy expressing, "the fact that you have real

changes that were not yet visible back in 1994, you have those real visible changes taking place by the time you have articulated the policy in 2009 is a clear reaction to the fact that ice is retreating.” This is strong evidence to support that ice does have a level of priority in policymaking.

It is also important to outline the margins of this change. Initial engagement for these states in the Arctic for was a matter of practicality. The Norwegian official explained the purpose of the Arctic at the beginning of the 20<sup>th</sup> century, “at that time, all the focus on the Arctic Ocean and ice infested waters was on exploitation and exploration.” He then outlined that as overexploitation of the natural resources of the Arctic in the midst of the two world wars were coming to light, the Norwegian government began adapting a series of conservation measures to protect the Arctic. This change points to the gradual realization over time of the fragility of the Arctic environment. The recent awareness of global climate change seems to only be an extension of that transition. Adaptive measures had to be taken in order to engage this transition. In Canada, the government has looked into such changes through its ‘Northern Strategy.’ The Canadian official expressed, “...the federal government has invested in climate change adaptation activities to understand climate-driven ecological changes in Canada’s North and examine the impacts and risks of climate change on community wellbeing.” Therefore ice is also connected to the fragility of a changing environment. Ice is the indicator for this transition.

As a result these interviews have shown that ice is a prominent entity in Arctic Policy, especially when pertaining to global climate change. Changes in sea ice are being detected in research and this seems to help in its promotion to higher levels of priority. Projected future decreases in ice and sea ice only seem to further promote the importance of ice in the environment. This importance will be crucial when adaptive measures will have to be taken to counter future changes. With further promotion ice will become an indispensable entity in future policymaking.

## **Effect of retreating ice on policy**

The officials were asked whether the presence of retreating ice had an effect on their policy. Since their states were located in the Arctic, climate change and fluctuating ice showed a presence in their respective environments and must therefore play a role in their policymaking. All the officials from the Arctic states agreed that ice fluctuations had affected the progression of their policymaking. The Danish and Icelandic governments expressed to me during the interviews that this was an issue without boundaries and affected the entire region as a whole. It was absolutely not only an international matter to engage with but one which was in their immediate regional vicinity in the Arctic. The Danish official answered when asked question four, “I believe not only for Denmark but for all Arctic states in general.” This perhaps referred to that ice was a driving force internationally not only domestically. Arising from this retreat was an array of potential international troubles, such as future boundary disputes in policymaking. Concerned with designation of zones and establishment of lines which still seem to be blurred, the Danish official continued by saying that, “They are now discussing how they can split the area and how the borders are between the countries also in the Arctic area,”

presumably speaking of the coordinated actions of all the Arctic nations through the Arctic Council which was mentioned later on in the interview. By observing the ice, the Icelandic official expressed that all glaciers were in the spotlight not just domestic glaciers, "I think when you think of this it's not just looking at the glaciers here in Iceland. You also have our neighbors here in Greenland." In this regard, ice seemed to again play an important role as the indicator and something to look at in regard to the changing climate. As the landscape continues to change rapidly in the future, it seems ice will continue to drive further policy modifications.

The Norwegian, American, and Canadian governments referred more to their domestic fluctuations but were also looking at ice for those changes. All three spoke of major changes in ice extents happening in their own territorial waters. The Norwegian official pointed out that, "...the Barents Sea is the part of the Arctic where the sea ice has retreated most, both in winter and in summer." This change he continued expressing, "...has resulted in much more resources going into monitoring research and trying to find out where the sea ice is heading, the projections for future sea ice trends." Through these changes, ice has become a focus point for change in policy. Adapting for those changes has become evident and noteworthy for the Canadians. The Canadian minister shared this concern referring back to his country's plan he said, "The Northern Strategy was established to meet the challenges and opportunities faced in the North, including a changing ice regime." Ice we see here is therefore something that requires upkeep through policymaking.

Reasons for such monitoring were emphasized by the American official where he spoke of dramatic changes in coastal landscapes in Alaska where, "As the ice cover has declined we've have much more open sea area in those areas and with the open seas of course you have wind...so those communities in the past that when a winter storm came through, they never had to worry about waves. Now those communities are actually dealing with waves and the erosion that comes with those waves." Planning as an aspect of policy change due to these ice fluctuations was an emphasis of the American official. Reacting to these changes has become a reality where he expresses, "We can definitely see that reactions are taking place in the terms of planning and we also have to consider disaster planning and disaster response." He mentioned to me that the American government was now not only emphasizing planning but has already also issued a strategy to see those changes through. The Department of Defense branch of the United States government he stated had a strategy to coordinate search and rescue operations specific to ice in the state of Alaska.

The capacity in which ice affects policy therefore spans into a few different topics. Amongst them search and rescue and shipping seemed most important and were given high priority. These two topics in one way or another do cross international boundaries. As ice fluctuates it does prove to be an obstacle and ultimately a potential hazard. The Icelandic official posed the question, "Cruise ships [are] coming more and more to Iceland, sailing between Iceland, Greenland, and further north. What are the capabilities should something happen here in Iceland and in the other regions?" Search and rescue would be vital in this scenario. Monitoring ice, as the Norwegian official suggested, is a necessary and mandatory adaptation to policy. Combined with search and rescue operations like that of the United States, the Arctic region becomes an area of concerted international action. The ice in

Arctic is therefore put up for debate and in a way drives policymaking in an international arena and involves all of the Arctic states.

Ice again in these testimonies is seen vitally important as an outstanding entity. It is driving policy change solely due to fluctuations in its cover. These fluctuations are affecting the coastal communities of each nation and hence require action from national governmental bodies. When the American official spoke of some Alaskan communities having to relocate because of their deteriorating and disappearing coastlines he emphasized ice's role in this, saying, "That's largely because of retreating ice." Ice is a driving factor. This emphasis on ice was also expressed by the Norwegian official saying, "This of course has opened new opportunities which is driving policy development with regard to activities in or close to the ice edge or ice infested waters and under challenges related to management and risk related activities. This is in a sense how changes have driven policy." Iceland's official further expressed this importance saying that an, "obvious point to discuss is the receding ice in the Arctic Ocean because there are environmental, economical, search and rescue, and security issues there...it affects how we approach our Arctic Policy." The testimonies to this question therefore help to provide tangible evidence that ice is a driving force in policymaking.

## Concerns from local communities

As climate change progress changes local environments, the officials were asked in this question whether any concerns were being raised from their local communities. All the officials responded with a yes to this question. Concerns that environmental changes were happening amongst their local communities were recognized by all of the Arctic states.

It should be noted here, however, the difference between the unique territorial make-up among the interviewed states. Due to the varying location and size of each nation, their concept of a local community affected by ice was dissimilar. Iceland is the only country of the five addressed here whose territory lies entirely in the Arctic. Therefore, when answering this question Iceland referred to local communities as populated areas throughout the entire island and therefore encompassed its entire territorial possessions. The other four nations are much larger in size and therefore have only a portion of their territory affected by these changes. This also means that not all of the population is affected by the retreat of ice. Denmark referred to their local communities by referencing those that inhabit the autonomous country of the Danish Kingdom in Greenland. Norway likewise referred to their local community as that population living on the unincorporated but administered by Norway archipelago of Svalbard. The Norwegian official made this distinction by saying, "With regard to ice or sea ice of course you don't have any sea ice on mainland Norway. This is only the local communities on Svalbard which are affected directly by changes in sea ice." The northern American state of Alaska was referred to as a local community affected by these changes for the United States government. The Canadian official referred to the Inuit in the high Arctic northern communities as the local communities affected by ice changes. For these latter four nations their more populated regions and

also their capitals therefore lie much further south with large oceans, seas, or landmasses separating them. This creates an interesting disparity in perspective between these nations.

There were a few different points of concern raised by the communities of these nations. It was important to see that both local communities and their respective local governments were raising awareness about the issue. The Danish official expressed this when answering this question, "Yes, I believe that local authorities in Greenland are concerned and also [local] people." Local populations are therefore voicing their displeasure that ice retreat is altering their environments and changing their way of life. This phenomenon is a reality in these communities and as the government is also contributing its voice, it seems support is not only at a local level but also at a governmental level as well. This therefore suggests that there is grounds and motivation for action in policymaking towards ice fluctuations. The American official also supports this contributing that, "...the state of Alaska has also articulated policies related to the Arctic." A support base therefore exists all the way from a grassroots level to a local state level. Ice is on the agenda here.

As local communities are heavily dependent on the state of the ocean to maintain their way of life, it came as no surprise that most nations mentioned trends in their marine environments. The biggest concern pertained to the changing state of fisheries. The Danish official elaborated on these concerns regarding, "...what you would call natural resources as fish and wildlife, the fishermen are following very closely how the fish is moving." As fishing is usually the biggest source of income for coastal communities, it seemed natural that the greatest concern was voiced here. Iceland's official reiterated this concern saying, "That's one of the issues that affects the whole community especially the ones that are dependent on the fisheries." By referring to the 'whole community' here, it suggests the entire population of Iceland is being affected here. Unlike the other Arctic territories such as Greenland, Alaska, or Svalbard who receive help from their federal governments further, Iceland does not have federal government in the more temperate south. Should any dramatic changes due to climate change affect the state of Iceland's fisheries in the future it would not be able to turn to a larger federal government for relief.

Transportation was another area that seemed to raise concern. The Norwegian official expressed referring to Svalbard, "The issues there are first of all from a question of transportation and then tourism. The skidoo driving during springtime, where opportunities to do skidoo driving on the frozen fjords, are not available anymore." The retreat of the sea ice is essentially cutting off communities from one another, communities that were once accessible during the dark winter months and subsequent spring months but no longer. He emphasized that change, "in particular this year when there is almost no ice in the fjords whatsoever." As access is limited to different areas of the archipelago, this in turn seems to be also affecting tourism. "These are societies which are either based on tourism, research, or mining," he noted. Although he mentioned that for mining activities it might actually make transportation easier he expressed that, "It limits the opportunities for tourism there." Retreat of ice cover is therefore having a substantial impact on the everyday people living and working in these areas.

For the Canadian north those communities have also noticed a big change in their livelihoods. The Canadian official emphasized, "Inuit and other northern communities have noted changes in weather,

ice and wildlife patterns in recent years.” Since in this area polar bear and seal hunting are traditional lines of work, change in ice would significantly change that. He spoke of the Canadian government taking a considerable interest in these communities by working with them. Talking about cooperation he explained, “The federal government works with the territorial governments, national Aboriginal organizations, and other Aboriginal organizations to understand and incorporate their perspectives, including Aboriginal Traditional Knowledge, into decision-making.” With this approach he explained that the government could then work better with the local communities when preparing them for future changes. Expanding on this he noted, “In the Arctic Council, for example, the Permanent Participants have noted that things are changing, and have highlighted the importance of adaptation. The Arctic Council has initiated a project on ‘Adaptation Actions for a Changing Arctic’, and it addresses Arctic change.” Change in ice cover is therefore already a reality for these communities and it seems the international body of the Arctic Council is already aware of that.

Ice is therefore an omnipresent necessity in the lives of these local communities. Retreat of sea ice is causing a substantial change to their way of life. While the communities living further south from the Arctic in Norway, the United States, Canada, and Denmark do not feel this change, those directly affected in the Arctic absolutely do. The American official expressed this impact saying, “You see really a primary concern in the state of Alaska’s policies that they are concerned that local communities are feeling really direct impacts and coupled with the change in the sea ice is also melting permafrost. When you put those two things together it is causing some real problems for coastal communities.” Concern to address these issues at least has a solid foundation of support from the local communities in these regions. The difficulty it seems is therefore adapting the local concerns raised among these communities that sea ice is changing their environments and thrusting them onto a national level. At a national level they may not be perhaps as vital. These interviews have proven to me that these respective governments are aware of the raised concerns from their local communities. The question is now how much of a priority does ice have at a national level to warrant action for it in future policymaking.

## **Government investment in understanding climate changes**

In order to see if these states were interested in understanding these changes, the officials were asked whether their government was investing into this area. Investment could cover their respective government investing in time, financial support, and other resources related to this. All the interviewees answered with a yes to this question. Their answers included words like considerable, absolutely, and a lot. Such words help to show the urgency of the issue and also substantial support towards it. The Icelandic official emphasized with, “Absolutely the government is investing in that.” Such answers help to suggest keen support from national governmental bodies towards researching and understanding ice. Through such investments ice would stay to an extent in the spotlight. For a bigger country like the United States it was interesting to see that it was coming from both levels of government as the American official expressed that, “...both on the state and the federal level there’s

a lot of investment being made.” Dedicated investment perhaps means that focus will remain on the ice from not only the local population but also the geographically separated federal government. The Norwegian official also expressed, “Yes we are doing considerable investments...” These statements at least help to acknowledge the importance of ice which deem it a valuable entity to understand and to invest in with public funds.

Investments in ice were financed for a range of reasons. For the Danish, scientific research was an important investment where the official expressed that, “the universities in Denmark especially Copenhagen University [are] making research in Greenland, both concerning the climate and...exploring the ice cap by drilling through the ice cap and seeing how the climate has changed for many years.” Scientific research as an investment therefore focused on understanding the ice. This was being done through hard ice data collected from the Greenlandic ice cap. That was later being correlated with the changing climate. He also mentioned that there was investment coming from Denmark’s Polar Institute into polar areas.

For the American government investment in ice was steered towards two areas. The American official spoke of investment being done, “in terms of the climate science and understanding what’s happening in climate and how the changes in the climate get translated into changes in glacier dynamics and changes in sea ice investment.” Like the Danish, investment was being aimed towards understanding ice and climate change but investment also encompassed another area for the United States. Investment for the American official also meant, “Investing in trying to make communities more resilient so that they can actually withstand the changes that are happening...that includes things like some of these communities that are being relocated, it’s a huge investment to relocate an entire community and all the infrastructure of that community.” It is important to note here that investment is therefore not only aimed at understanding changes in the ice and climate but also contemplating and preparing for its disastrous effects. That is already a reality for the American government as they already have had to relocate some of these communities.

Norway’s approach to areas worth investing in was a bit more practical. Amongst others for the Norwegian government, investment was directed towards supporting fishing fleets. The Norwegian official expressed that investment was being directed towards not only, “research, monitoring, and assessment but also in meteorology to try to make short term forecasts for sea ice concerning the fishing fleets and such things.” Researching ice therefore does not only have a value for understanding climate change but has also more of a directly practical side. As research in climate change will help to understand the future of warming effects, it will at the same time serve as a monitoring system for fishing fleets. Practicality of this kind of investment will mean that ice or at least sea ice will receive ongoing attention and study.

The Icelandic official again spoke of Iceland being an important center of study through such investments. That official spoke of, “the Ministry of Foreign Affairs is contributing a lot...in financial support for advancing scientific knowledge here in Iceland and scientific cooperation domestically but also internationally.” Experts coming from all over Europe were mentioned as far away as India to study the ice in Icelandic glaciers. Advancing this research was emphasized in the Icelandic policy for the Arctic as the official stated, “We are trying to advance [cooperation] and that is one of the

fundamental issues and foundations in the Arctic environmental policy, the increase and advance of resource capabilities and the research being done in Iceland and abroad.” The Icelandic official then expressed, “On the effects of climate change, ice is obviously one of them.” Through this testimony ice is a focal point for a wider international inquiry again showing that ice transcends national borders. Research in understanding and monitoring ice is an international curiosity and is therefore not only reserved to interest from local countries in the Arctic.

For Canada investment was being directed towards the future. The Canadian official spoke frequently about adaptation measures. Investments were directed to better understand trends to be able to better adapt. He expressed to me, “From an international perspective, Canada is engaged in the Arctic Council’s project on ‘Adaptation Actions for a Changing Arctic’...this is geared towards understanding the changes that are occurring in the Arctic and will give Arctic states better ideas for how they can be addressed.” With this it seems that Canada is already at an understanding that the ice will change in the future. Considerable investment has gone into this as he emphasized that, “In November 2011, Canada announced a \$148.8 million investment over five years (2011-2016) for the continued support of federal adaptation programs. This funding will allow the Government of Canada to provide credible, scientifically-sound information to support adaptation planning and decision-making.” Although prevention of activities contributing to ice decline through federal programs might perhaps be on the Canadian’s agenda, it was not mentioned in this interview. This might suggest that Canada is not holding any reservations to the trend of retreat in ice cover.

A key point to take from these answers is the interconnectivity that direct investment in ice has with national policies for the Arctic. There is financial support being generated from each of these individual countries to understand ice and its mechanisms both in sea ice and glacial ice. The Icelandic official ended by saying in reference to investment, “It’s a big part of our Arctic Policy, you can see it there.” Ice through these investments is being connected through nationally supported scientific research to the changing climate and its future. That can be seen through the practicality of monitoring ice for fishing activities and the possible future implications of changing conditions for that occupation. All the interviewed officials gave at least a level of priority to ice through their individual investments. The Norwegian official emphasized this importance in investment in his closing remark saying, “There’s a whole lot, quite a lot of resources, an increasing amount of resources going into this.”

## **New economic opportunities as the ice retreats**

As the trend of retreating ice continues, the officials were asked whether they saw any new economic opportunities for their respective states in the future with the disappearance of the ice. In this question all the respondents answered with a yes. Change in sea ice they have expressed has already brought them and will potentially bring them further economic opportunities in the future. The makeup of these opportunities spread out over a few different topics. Each state expanded on

particular topics that affected them most but one topic was present in all of the testimonies, the exploration for oil.

Denmark referred to the changes happening in Greenland. The Danish official expressed, "...there are resources of oil, very big resources in the northeastern part of Greenland and it would be possible to explore it...But I don't think any steps have been made to explore this area, not northeastern Greenland." Sea ice is still covering that section and therefore blocking the northeastern part of Greenland but future retreat could change that. Ice here therefore seems to be seen as a barrier or hurdle for economic development. He spoke a little about oil exploration already happening in western Greenland around the capital saying, "They have for some years been doing it around Nuuk...but without results." Oil exploration nevertheless seems to be an omnipresent economic opportunity for not only Denmark but also the other Arctic nations.

American interests in the Arctic spanned a couple of different topics. The official opened the question by talking about shipping in the Arctic. He referred me to the 'landmark' Arctic Marine Assessment Report released by the Arctic Council. In the report, he said, "A big part of [it] was looking at what are the economic opportunities down the road in terms of how shipping would increase as sea ice retreats." By looking at all types of ships in the Arctic, particularly cargo ships and fishing vessels, the report spoke about the expansion of shipping over the general Arctic area. With regard to Arctic cargo shipping, the Arctic Ocean offered the opportunity of cutting down travel significantly from the north Atlantic to East Asia and vice versa. That sea route has the economic benefit of requiring less travel time and therefore demanding fewer resources with fewer costs. Saving money does not however omit the challenges associated by traveling this route. The American official expressed that, "Even if we talk about an area being ice-free you still have the possibility of ice bergs or large chunks of floating sea ice." Therefore the sea is full of hazards both from the sea ice and the glaciers emptying out into it. Ice it seems is being perceived here both as an opportunity but at the same time as a very real danger, taking on a double meaning. Travel in the Arctic because of fluctuating ice cover is therefore very questionable both in present and future endeavors.

This risky reality permeated into his second potential economic opportunity with retreat of the ice. When speaking about oil exploration, he expressed that, "...of course there's the oil exploration and it is seen as an economic opportunity but it's also seen as something that is a very risky thing to do in a rather harsh environment." Again, the harshness of this climate presents an area full of loose sea ice floating around and creates an impression of unpredictability. He gave me as an example oil exploration that had been already turned down due to these conditions saying, "you can take a look in the US, in Alaska you've had most notably Shell who's looking to get permits to operate offshore in Alaska and thus far they have not been able to do the drilling that they were expected to do because of calamities and environmental concerns in terms of what happens to these drilling wells when sea ice forms and starts moving it is a very powerful thing." He told me about the program called the Protection of the Arctic Marine Environment directed by the Arctic Council who was basing their assessment on the findings developed in the Arctic Marine Assessment Report. That report helped to turn down Shell, as oil exploration was deemed too risky in such an environment. He proposed the hypothetical situation of, "...concerns of how do you clean up an oil spill in icy waters. It is a whole

different dynamic than cleaning up an oil spill let's say off the Gulf of Mexico, so again you have the economic opportunity but then you have a lot of risks in cross associated, they have to be balanced." It is interesting again to see ice being presented here as on the one hand being beneficial in the future with its retreat in ice cover but also on the hand as a complete hazard which the whole notion of oil exploration and shipping depends on.

For Iceland the opportunities were many. The Icelandic official started off with mentioning shipping, saying that, "Shipping I think is one of the many opportunities that many companies are looking at." He spoke of Iceland's geographical location in the Arctic as a big advantage. As the only country completely situated in the Arctic he spoke of it being a hub for transportation. Shipping according to him has gone through a rapid change and Iceland is in a great position to take advantage of that in the future. He stated, "Shipping today in the Arctic Ocean is quite limited but is expanding each year, increasing by fifty percent each year for the last three years so quite big numbers in a short period of time." With the proposed construction of a mega port in the northeast of Iceland, this could play well into Iceland's odds. The hazards of polar travel with loose ice will however persist as he admitted there are also challenges. He also spoke of oil exploration in the vicinity of this proposed port expressing that, "We have possibilities of finding oil in our northeast part of Iceland that might be materializing the next couple of decades, that's a possibility." This potential oil territory lies further south compared to the other Arctic countries and might possibly open up earlier than its northern counterparts.

Iceland's geographical location also offered another economic opportunity in the eyes of the Icelandic official, that of his own people. As all of Iceland lies within the Arctic, he says, "...the business community here in Iceland is quite used to the harsh conditions, working in the Arctic. Companies here, fishermen, construction companies, big companies, they are used to the weather here and the harsh conditions. That's something that is sought after in other countries. That's maybe one of the reasons why many Icelandic companies have been doing well in Greenland, for example." With the retreat of the ice it seems it will continue to offer further opportunities for the Icelandic people. It was interesting to see local experiences with ice added into this mix here. Ice in this environment is perceived as a hardship which not every nation can cope with as well and that in itself makes ice a unique reality.

Norway also covered a few different topics. The Norwegian official started off by mentioning that changes have already happened to fishing there. He stated, "Fishing is now possible further north. The retreat of the ice is followed by warmer waters...so in the old days you mostly fished shrimps on Svalbard, now you also fish a lot of cod and haddock up there so there are more fish." Warmer waters have brought a larger variety of fishing possibilities but have also pushed back the marginal sea ice. This retreat has also offered other opportunities for the Norwegians. He expressed, "There has been an expansion of the cruise tours from Svalbard which have been driven also by the changing sea ice conditions because in particular around the eastern side of Svalbard the waters are much more accessible now than they were ten years ago." Countering the rapid disappearance of skidoo tourism in the previous question, disappearance of sea ice has instead given access to remote parts of Svalbard for tourism. Retreat is therefore offering new opportunities in tourism for Norway.

Shipping in tourism is not the only benefit as he points out that, "It's also of course shipping in general in the Arctic is increasing which is driven also by two factors actually, the retreat of the sea ice, it's the rising prices for minerals and energy...You also see the beginning of transpolar shipping across the northern sea route which is passing through the coast of Norway." This shipping will again have to navigate through areas of ice infested waters and cope with its dangers. That goes also into the most popular opportunity in the Arctic as he closes the question mentioning, "...retreating sea ice provides the opportunities for oil and gas activities."

Canada also agreed that these changes have brought new opportunities to their economy. He opened the question answering, "It certainly does. In the past 10 years or so, as the navigation season...we've seen ships sailing to the north earlier and staying later." All countries seem to agree that sea ice retreat is bringing positive changes for their economies. The Canadian official translated this into meaning that the isolated communities inhabiting Canada's vast northeastern Arctic territories will not have to wait as long to be resupplied. He notes that there has been a growing demand for these resupply shipments recently. Regardless of the current changes he expressed, "While economic activity would have been accelerating anyway, given the sheer amount of resources in the north, changing ice cover and meteorological patterns mean acceleration to that change." It seems here that ice is rather just a welcome surprise as the Canadian government would have pushed to explore their northern territories regardless of the condition of the ice.

It is important to note the two extreme angles which ice is being perceived here. Retreating ice is offering new economic opportunities for all of these nations. New prospects of expanding oil exploration, other resource development, shipping, fishing, and tourism will all be made a possibility with the retreat in ice cover. From this angle ice is being perceived positively. Looking at the other extreme it is a matter if the risks will outweigh the costs. Travel and exploration of this area is getting easier but by no means does that translate into safer. The American official referred to difficulty of insuring these kinds of undertakings. He expressed, "So you can really save significant amounts of money shipping that way but of course there are also a lot of challenges that need be overcome like insurance companies are concerned about the dangers of shipping through the Arctic...insurance companies are still trying to figure out how much to charge ships for operating in the Arctic." From this opposite angle ice is seen as a nuisance and perilous undertaking. Only the future of the condition of the ice will determine if that extreme will soften even though it is important to point out that to the Canadian government it will be developed regardless.

## **Foundation of an international ice regime**

In this subsection the officials were asked if they foresaw the foundation of an international regime to manage fluctuating ice as a possibility or not. The answers to this question varied and there were both agreement to an extent but also disagreement on the topic. There were two categories which I separated the answers into. The first was answered with a form of a yes but with a certain degree of uncertainty. In the second category the respondents answered neither with a yes or no but provided a

clarification to that reaction. These answers helped significantly to put into perspective the probability of creating a regime solely on ice.

Filling the first category solely was Denmark. The Danish official expressed to me that, "It is a very difficult question and I have not contemplated it...I believe it is possible to make." This gives some light to at least pondering this sort of a regime. He also spoke about the Arctic Council having a pivotal role in this sort of future endeavor. He expressed, "the Arctic Council...is expanding [their] activities by having a permanent secretary in Tromsø in Norway so I believe it might be a beginning to something like this." This shows some uncertainty around establishment of this sort of regime but shows that it is perhaps at least a possibility.

The second category included three nations, Canada, Iceland, and Norway. Iceland's government downplayed the initiation of an ice regime saying, "I would say that the policy today is not having a special regime for ice specifically." He let me know that he was trained in social sciences and not in natural sciences. As he was an official in the Ministry of Foreign Affairs it seemed that perhaps this was a topic more appropriately directed towards a different ministry when he answered, "That's probably a question that the natural scientists are better at answering than me." He did contemplate the difficulty in this saying that glaciers are, "...obviously visible tangible for many people but we also have to [understand] what the diminishing retreat of ice means because it can differ in regions between glaciers even. You have short lived climate forces and there are the discussions there of what are the direct and indirect effects of that." This plays into the unpredictability of ice to a certain extent and therefore we see that it is difficult to base a framework on uncertainty. He closed the question by saying that, "At this moment I think we are focusing on a general approach in this. Having a special regime on this is at the moment not a policy."

Norway was interested and acknowledged the probability of an ice regime but only at a national level. The Norwegian official didn't see it as a practical endeavor on an international level. Domestically he expressed, "From a practical point of view and from a national point of view it is possible to manage fluctuating ice." That is not as easy beyond national borders as he said, "In an international context what is possible is always a political question." This indicates that again it is a matter perhaps more appropriately directed towards another ministry of the Norwegian government. He did, however, go into an overview of what to look for in ice stating, "What is fluctuating ice, you have the day to day fluctuations, you have annual fluctuations, you have short term fluctuations in periods of maybe five or ten years which are driven by natural variability and you have the long term trend which is most likely driven by global warming." These were natural behaviors of ice and he explained that to control ice which behaved naturally like this was very difficult. In the sense of looking at movement on and across ice that was different as he said, "I think it is from a management point of view it's possible to make a working regime that addresses these kinds of situations in regard to regulation of activity. I think it is technically possible to do that." As activity in a sense has been correlated to affect natural behaviors of ice the two may perhaps in a way be interconnected. He spoke about the Arctic Council and its subsequent marine organizations which control activity in the Arctic to an extent. As an example he gave regulating the, "standard for what kind of bunker oil you are allowed to throw it in, like how you already have that in Antarctica." He closed off stating that,

“these kinds of limited things can be coordinated internationally but a kind of Arctic sea ice treaty I don’t think is realistic.”

Canada presented a similar argument to that of Norway. The Canadian representative opened the question stating, “If you mean controlling the fluctuation or the change, to my mind that is an impossible task.” Again trying to control natural fluctuations seems unlikely. The only thing that can be done he said is to monitor ice so its fluctuations can be controlled in the sense of making ice more predictable. He expanded on the notion of a regime saying, “Having said that, if you can’t control the ice or weather, then another alternative is to ensure you have adequately prepared routes for shipping to travel.” He named a few branches of the Canadian government that were involved in this undertaking such as Transport Canada, the Canadian Coast Guard, and the Canadian Hydrographic Service. These divisions have, he says, “embarked on an ‘Arctic Routes’ definition program which will look at using scarce resources to more effectively chart and control certain routes used by Arctic shipping.” Therefore while controlling natural variability, as he expressed, is impossible, controlling activity in the region is a more realistic undertaking.

A limitation in this subsection and question was the missing testimony from the American official. It would have been given a greater look into the potency of forming such a regime but nevertheless having had four out of five officials respond provided me with a sound foundation. With the other two categories therefore the possibility of forming a regime on ice can be better understood. It is through these responses that I grasp basing a regime solely to control natural glacial fluctuations is unlikely. Research in natural variability of these processes is ongoing and still not understood or at least not understood enough to create and base a foundation for a regime on ice. What seems to be possible is to control the activity that is occurring on the ice, this includes perhaps shipping, fishing, and resource exploration. As such activities are having a hand in contributing the very gas that is in turn affecting glacial ice, this type of regime can perhaps act as a proxy and work towards actually helping to stabilize ice fluctuation. Responses, however, show clearly that it is a matter that needs collaboration between various branches of government. Different branches provide different areas of expertise, such as scientific vs. policymaking. One thing is also fairly clear; this type of international regime for Arctic will most likely have to emerge through the Arctic Council as I was referenced to it often in the interviews. Nevertheless they show that ice is a prominent entity when it comes to dealing with the Arctic.

## **The issue areas most impacting ice retreat**

In the last question the officials were asked if they could connect certain topics that were mostly affecting retreating ice today. This question was answered in one of two ways. Two of the officials that responded felt they were not experts in the matter enough to answer the question properly but emphasized the importance of the scientific community in understanding this. The remaining three connected ice with trend in climate change but did use caution saying it was complex issue. One of the interviewed officials who felt he was not an expert on the matter was the Danish official. He simply

responded when asked the question, "I don't know. I am not a scientist, I'm sorry." This does put into perspective that the scientific community is not only respected in the matter but also consulted with when it comes to expertise. Since ice is seen as a complex entity it was interesting to see that scientists were also being involved in the policymaking process.

The other official that referred me to a scientist was from Iceland. Since the official was from the Ministry of Foreign Affairs, that official told me, "Working here I think you have to have knowledge in many things but it is not deep everywhere, glaciology is one of them." The official described to me that in international relations it is difficult to be too technical without having the proper experts at the table to consult with. Expanding on this importance the official said, "Obviously when you talk [to] the real experts on this...They will talk about how the oceans are getting warmer, acidification, and etc." Even though he referred me to experts he did elaborate on his limited knowledge on the matter. Elaborating on the general information on the matter the official expressed, "We talk about the warming climate that must be an obvious thing for many people that if you have a hotter atmosphere ice melts faster...climate changes here have been so fast for the last couple of years, double the average than that of the global level." Even with a limited knowledge in the area, the official was able to connect the changing climate and its warming trend to the change of the ice cover in the Arctic. The official closed off by saying, "There are many interconnected dots...it is impossible for me to talk about them here trying to be an expert. In general we talk about these but we need the experts to tell us exactly why." Therefore it seems that ice at least has a substantial level of awareness within this ministry but it cannot be determined if it is yet a high priority.

Remaining in the other group we have the United States, Norway, and Canada. This group did not shy away from connecting this change in ice to climate change as the officials in this group were much more familiar with this issue by working or having worked in the governmental environmental offices of their respective countries. The American official expressed this connection when opening the question by saying, "The biggest issue of course is climate change and greenhouse gas emissions" and continued later stating, "I think it's clear that that's the single biggest issue affecting ice because the change in climate is going to effect the composition of the ice." It seems clear to him that this connection is rather obvious but he did caution me saying that specifics are still not completely understood. He expressed to me, "...one thing that I would caution is that glacier dynamics are really complex and glaciologists are doing a lot of studies." Some of these studies were being conducted out of Iceland by NASA studying the glacial dynamics of both the Icelandic and Greenlandic glaciers. He emphasized, "So the glacier dynamics are a lot more complex than most people tend to appreciate and it's not as easy as saying one degree increase in global temperatures is going to have this direct effect on glaciers because you see some glaciers are reacting more to climate change than others...The dynamics of the Greenland ice sheet are just so incredibly complex and there's new discoveries being made constantly." It important to point out when he says 'most people,' that suggests that expertise is pivotal in understanding ice dynamics. It is also important to pass that information along. However, referring to the importance of understanding these changes he said, "...regardless of what's happening in terms of climate change, we need to have the basic scientific understanding of the glacial dynamics and the sea ice dynamics."

To the Norwegian official it was quite clear what was affecting the ice most. He stated, "It is quite obvious that the things that determine ice is climate change; there is no question about that. The only way we can limit loss of sea ice and limit loss of ice caps is to limit climate change and global emissions of carbon dioxide and other greenhouse gas emissions." He referred me to the finding of the IPCC report. It helped to put into perspective the change that would take place in the future. With a high emissions scenario the Arctic Ocean will eventually be ice free at least throughout the entire summer season. Reiterating the cause of those changes, he repeated, "So climate change is of course the defining issue here." He then ended referencing me to the workings of the Arctic Council. Going over some of the factors that determine climate change he expressed, "...of course local emissions [are] close to the Arctic and in the Arctic from shipping and oil and gas activities, forest fires in the boreal, and so on. Such things are most important and these are things that we try to address to the Arctic Council where we have a task force to make some kind of agreement on limiting this." This helps to convey that there are parts of the government that have more expertise in this issue. These more familiarized ministries could then play an important role as to helping support the development of a regime.

The last country in the group was the government of Canada. The Canadian official answered simply stating, "Climate change." As this was the only interview not done in person or through a direct correspondence, I received a short answer. If the interview was conducted as I had intended it to be I believe that I would have gotten a more elaborated answer like the majority of the interviews. Nevertheless this answer helped to further connect the change in ice cover to the trend of the changing climate.

Limitations to this study in this subsection refer to the diverse composition of the interviewed officials. In the first group, the officials were not in the environmental ministries or scientific agencies of their respective governments and this slightly limited their abilities to answer this question. Even though the first group understood and acknowledged they were experts on the matter, their testimonies were nevertheless important. The Icelandic and Danish officials helped to show that the scientific community was vital in understanding climate change. Their opinions were sought and respected on the matter. From the latter group we see that climate change is playing a crucial role in determining the extent of the seasonal growth and retreat of ice. Even though there is complexity in this phenomenon the overarching cause is the changing climate. With that said, there are general understood and agreed upon causes amongst the scientific community. Those causes are playing a key role in this warming trend. Emissions and greenhouse gases from shipping and other general traffic in the Arctic are contributors to this warming as found out through these interviews.

## Discussion

Ice is as dynamic in the natural sphere as it is in the social sphere. Throughout history it has played many roles and been seen through many perspectives. This has played both to its advantage and disadvantage in the current political arena. Two completely bipolar attitudes have developed from diluting these experiences; that of ice as a powerful element which presents an equally powerful challenge for states to prove themselves and that of a fragile element that holds the key to the unknown. These two perspectives have interplayed with one another in the international social sphere dominated by independent states as ice seems to endure as an enigma completely out of the control of their hands. Therefore formation of a regime solely on ice for the Arctic will likely be a difficult undertaking. The trouble that seems to stand in its way and hinder, lies in the sovereignty of states, the elusive mechanism of glacial dynamics, and the change in ice cover during the current global warming trend.

Its main problem seems to lie in the still misunderstood workings of glacier dynamics. While almost all interviewees acknowledged that climate change was having a profound impact on the drastic change in ice cover, they noted that knowledge in climate and glacier dynamics was insufficient enough to attempt to control those changes. Managing natural fluctuations of ice was deemed impossible. The case for climate change regimes has seemed to be much more straightforward. Anthropogenic emissions of greenhouse gases have been identified as the most influencing culprit in the current global warming trend and have thus subsequently entered regulation. These gases are affecting in part the global retreat in ice cover. That connection has been made but the workings of ice still continue to elude scientists. Therefore in the meantime until these mechanics are discovered and proven scientifically, ice will remain exclusively as an important indicator for the changing climate.

What does seem to be possible is managing activity on the ice. Development of the Antarctic Treaty System has proven that this set up is feasible. A regime in Antarctica has succeeded to manage activity on the surface of the ice, albeit indirectly. Thanks to this treaty it remains as a place exclusively dedicated to scientific research as any viable commercial endeavors on the continent have been shelved. Existence of such an international regime in the Arctic is still lacking. However, national regimes that regulate activity on the ice in the Arctic do exist. This extension has not yet been made into the international area. National regimes might work for the time being, however, as the Arctic Ocean continues to lose ice it will slowly open international waters beyond the reach of Arctic states. That will have to be engaged in the future. This brings me to my next point, the problem of sovereignty.

When the Antarctic Treaty System was set up more than half a century ago it was void of the problem of sovereignty. Reference to sovereignty is not directed at the sovereignty of states but sovereignty of the continent of Antarctica itself. Antarctica was a borderless landmass before the appearance of man and it continues to be borderless after that. Sure there were initial difficulties in developing the treaty amongst rising tensions of claims to the continent, but this was eventually resolved. In the present Arctic it is doubtful that this same experiment would produce the same

results. Existence of such a regime in the Antarctic therefore does not ensure its formation and subsequent existence for the Arctic. Regimes are the product of their historically relevant situations. Conditions surrounding the signing of the treaty were much different than they are today. Antarctica was a borderless piece of ice of practically no use other than for national ambitions. Those ambitions were able to be subdued quickly as no benefit would arise from attaining economically indifferent territory.

The Arctic in many ways therefore is the opposite of the Antarctic. Sea ice in the Arctic Ocean does not cover a landmass but only open water. That water qualifies as international waters under the provisions of the UNCLOS treaty but that is slowly being challenged by the independent Arctic states through its seabed. The landmasses that are present around the North Pole and around the periphery of sea ice extent are part of the territorial integrity of sovereign and independent states. Creating an independent regime to govern this area would infringe on that right. Demonstrated in the realist approach to international relations, states are not keen to give up a part of their sovereign rights to accomplish this. Even in the Arctic Council the framework remains official but unbinding. A hundred years ago a similar regime might have had the same success in the Arctic as the Antarctic Treaty System. The Arctic was largely unknown and essentially 'borderless' in much the same way as Antarctica was during the signing of its treaty. This could have allowed for perfect conditions to set up a similar regime to that of the Antarctic but instead states were occupied by who would make it to the pole first. Nevertheless, what is possible for the Arctic is an unbinding agreement setup through the Arctic Council. Application of soft law in the region through the Arctic Council is the only manner in which ice might have a possibility to be embodied in a regulatory regime. This application could prove to be fruitful as soft law precedes hard law in the international arena.

Another hindrance for an ice regime in the Arctic is the presence state of the sea ice. Climate change in forcing the ice to retreat and this decrease seems to be welcome amongst the Arctic. Although the representatives of the Arctic states acknowledged that climate change is impacting their indigenous communities negatively, the actions of their states have suggested otherwise. Which result will outweigh the other is a conclusion for the future but the economic opportunities that are arising with the retreat of the ice are seen positively by the Arctic governments. Oran Young makes an excellent point when he notes that, with the exception of Iceland, the Arctic politics of the resource rich north are in large part controlled by the politics of their capitals lying much further south (1998). With an economically struggling and debt ridden world, a new source in the north to relieve domestic economies is most welcome.

Ambitions that pushed explorers to reach the North Pole in the name of their home countries are still very much alive and kicking today. When the Russian submarine planted a flag on the seabed of the North Pole back in 2007, that flag did not symbolize science but was imprinted with the tricolor of the Russian flag. Ice still captures the national mindset as ferocious and unforgiving and the testimonies of the Arctic representatives attest to that. It is still an area open for national competition, the ice in a way is being conquered once more but instead this time to see who can tap into its abundant resources first. Particularly with oil projects in the Arctic Ocean, the representatives

expressed that they still approach the ice with caution. In the event of an oil spill in ice infested waters, the cleanup would be next to impossible.

The two perceived sides of ice that have therefore developed with social interaction have now converged, coexisting together in a bipolar world. On the one hand ice is seen as a challenge and a hindrance. With the tensed exploration of the ice at the turn of the 20<sup>th</sup> century, ice presented itself as the premier challenge to test the strength of the defiant pride of Arctic faring states. That has been renewed with a new push for the Arctic as states explore the area for resources. In this renewed period the same characteristics have been used to describe the ice, menacing, powerful, and unforgiving. On the other hand is a softer and more fragile side of ice that is seen as a key to uncovering past environments and secrets of climate mechanisms. This side of the ice sees it as unique, enigmatic, and irreplaceable. As the ice has retreated, urgency has risen and subsequently caused a race to retrieve the many melting ice cores from the countless dying glaciers from around the world. The disappearing ice has been seen in much the same way as an endangered species, a helpless organism dying due the encroaching oil dependent world. Perceptions of ice as the last remaining untouched wilderness are slowly being tamed by the emitting tradition of the industrialized nations. These two sides have come together to form a fascinating and dynamic social world around ice.

## Conclusion

The cool world of ice is slowly beginning to disappear. Ice has proven to be as prevalent in the international arena among states as it has been within the social world of local perspectives. Two dynamic sides of ice have gradually developed and dominate the social world of ice today. International relations continues to be driven by this dichotomy, ice's novelty in its abundance of data for scientific study as well as its fluctuations in ice cover as both a hindrance and prospect for economical development. Change has been noticed by Arctic state governments but action to hinder that retreat has been overshadowed by the new prospect of resource development in region. Studies continue to be carried out, but instead of the initial pretense of racing for the poles, it now seems to fall under the façade of resource development. Through this study, ice does not seem to have enough priority in policymaking to warrant a regime exclusively for it. Such a regime, at least in the near future, is unlikely for the Arctic. This is due to three reasons, the sovereignty of states, the elusive mechanisms of glacial dynamics, and the change in ice cover during the current global warming trend. Nevertheless an expansion of national regimes to manage activity on ice onto the international stage is feasible perhaps further down the road but only through the framework of the Arctic Council. In the mean time the ice will continue to be an indispensable indicator for the changing climate.

An absolute and final conclusion on whether an ice regime is feasible in the Arctic, cannot not be properly understood without a deeper study into the Arctic Council. Therefore it is proposed to carry out a similar study focused exclusively on the Arctic Council and its Ministers. In the meantime

limitations to this study have also opened opportunities for possible further research. Since there is a large gap in the litany of ice in international relations socially, wide arrays of studies can inquiry into this area. In particular, it would be beneficial to conduct a thorough study to understand the connection of ice with national identity. For studying the social side of ice in the international arena this could be groundbreaking. Moving back to the Arctic, a similar study could be carried out which instead focuses on one governmental position across all of the Arctic states. This would give a better insight into understanding how governments through those particular ministries could better interact with one another when dealing with ice.

In general social studies on ice are lacking, especially in the international context. As the ice continues to retreat, the once pristine cultures surrounded by ice are also slowly dying away with it. It is therefore vital to expand into this area as models have shown that time is limited. Future generations will perhaps never be able to appreciate the enchanting lure of beautiful blue, turquoise, and indigo ice. They will not be able to appreciate its magnificence and grandeur in a dwarfed landscape. Most of all, they will not be able to appreciate its passion.

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## **Appendix I**

List of each Arctic state and the respective office interviewed:

### **Kingdom of Denmark**

Deputy Consul

Embassy of the Kingdom of Denmark in Reykjavík, Iceland

March 17, 2014 at 15.00 GMT

Personal interview

### **United States of America**

Public Affairs Officer

Embassy of the United States of America in Reykjavík, Iceland

March 21, 2014 at 11.30 GMT

Personal interview

### **Iceland**

Ministry of Foreign Affairs

April 3, 2014 at 14.00 GMT

Person interview

### **Kingdom of Norway**

Director

Norwegian Ministry for Climate and Environment

April 8, 2014 at 13.30 GMT

Phone interview

### **Canada**

Canadian Ice Service

Metrological Service of Canada

April 16, 2014

Email correspondence

## Appendix II

List of questions asked during interviews with each representative of the Arctic states:

1. Does the government of (Arctic state) have a policy on ice?
2. If yes, how has it changed over the past century?
3. As an Arctic state your country is connected to the changing climate and as a result in fluctuating ice. Has the retreat of ice affected policy?
4. Are concerns being raised from local communities that their environment is changing?
5. Is your government investing in understanding these changes and how they can be managed?
6. Does the change in ice cover offer any new economic opportunities?
7. Do you think the foundation of an international regime to manage fluctuating ice is possible?
8. What issue areas have the most impact on ice retreat?