

# Shipping and Arctic communities

An empirical study of local adaptive capacity

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Julia Olsen

FACULTY OF SOCIAL SCIENCES



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PhD in Sociology  
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In memory of Else-Marie Olsen (1952-2016)  
Thank you for bringing your light to the World  
and showing magic in simple things.

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Bodø, 2020

*Julia Olsen*

## **ABSTRACT**

This dissertation examines how shipping development in the Barents area affects coastal communities. Arctic shipping, which comprises all types of vessels operating in the Arctic waters, has historically been covering transportation and supply needs. The recent Arctic shipping growth has been influenced by the interplay of multiple changes in the socio-economic, geopolitical, environmental, and climatic conditions. This increase brings new risks and opportunities to the region and have many cascading impacts on coastal communities. To understand this connection, this case study inquiry employs a community-based approach and an analytical framework of adaptation and adaptive capacity. The empirical results derive from qualitative interviews with stakeholders and residents in two island communities: Longyearbyen on the Svalbard Archipelago and Solovetsky in Northern Russia.

The results of the study are disseminated in four interrelated scientific papers. They identify the impacts of shipping growth, illuminate the aspects of adaptive capacity and adaptive responses, analyze the way the framework is applied in the Russian context and describe the framework development by the Arctic scholars. My findings indicate that the perceptions of impacts of shipping development are context dependent, as the same type of impact may receive different interpretations. The aspects that shape local adaptive capacity and adaptive responses, such as the natural environment, infrastructure, local values, economic resources and community agency, are interlinked. An analysis of the interlinkages between those aspects reveals possible trade-offs that may weaken adaptive capacity and hinder adaptive responses. Furthermore, this study indicates that, despite conceptual differences, the adaptive capacity framework presents a potential to examine the Russian context that is still understudied in the Arctic adaptation studies.

With the disappearing sea ice and globalization of the Arctic, shipping development will continue to increase. Hence, I conclude that the community agency – the community’s ability to act – is crucial for the development of adaptive responses that support and correct institutional responses.

## SAMMENDRAG

Denne avhandlingen undersøker hvordan skipstrafikken i Barentsregionen av Arktis påvirker kystsamfunn. Arktisk skipstrafikk som inkluderer alle typer fartøyer som opererer i de arktiske farvannene har historisk dekket alle transport- og forsyningsbehov. Den nylige økningen i skipstrafikken i regionen har blitt påvirket av samspillet mellom flere endringer i de arktiske sosioøkonomiske, geopolitiske, miljø- og klimaforholdene. Denne økningen skaper nye risikoer og muligheter i regionen, og har flere konsekvenser for kystsamfunnene. For å forstå disse koblingene, bruker denne casestudien en samfunnsbasert forskningstilnærming og et rammeverk for tilpasning og tilpasningskapasitet. De empiriske resultatene kommer fra kvalitative intervjuer med relevante aktører og innbyggere fra to øysamfunn: Longyearbyen på Svalbard og Solovetsky i Nord-Russland.

Resultatene fra dette prosjektet er presentert i fire sammenhengende vitenskapelige artikler. De identifiserer konsekvensene fra skipstrafikk i Arktis; belyser aspekter av tilpasningskapasitet og tilpasningsstrategier; analyserer måten det teoretiske rammeverket brukes for å studere russisk kontekst, og beskriver hvordan et rammeverk for tilpasningskapasitet er utviklet av arktiske forskere. Mine resultater indikerer at oppfatningen av konsekvenser fra skipstrafikk varierer fra samfunn til samfunn, ettersom den samme påvirkningen kan gi forskjellige tolkninger. De aspektene som påvirker lokal tilpasningskapasitet og tilpasningsrespons er hvordan naturmiljø, infrastruktur, lokale verdier, økonomiske ressurser og lokalsamfunnets beslutningsevne henger sammen. En analyse av sammenhenger mellom disse aspektene avslører mulige avvik som kan svekke tilpasningskapasiteten og hindrer aktivering av tilpasningsrespons. Dessuten antyder studien at, til tross for konseptuelle forskjeller, det konseptuelle rammeverket for tilpasningskapasitet brukes til å forske på den russiske konteksten som er fortsatt understudert i de arktiske tilpasningsstudier.

Skipstrafikken forventes å øke over tid med den forsvinnende sjøisen og globaliseringen av Arktis. Derfor konkluderer jeg at lokalsamfunns evne til å handle, *community agency*, er avgjørende for utviklingen av tilpasningsrespons som støtter og korrigerer institusjonelle respons.

## АННОТАЦИЯ

В диссертации рассматривается развитие судоходства в Баренцевом регионе и его влияние на прибрежные сообщества. Арктическое судоходство, которое включает в себя все типы судов, плавающих в акватории Арктического бассейна, исторически покрывало потребности в перевозках и поставках. В настоящее время, рост судоходства в Арктике происходит под влиянием многочисленных социально-экономических, экологических и климатических изменений. Этот рост обуславливает новые риски и возможности для региона, которые в свою очередь оказывают воздействие на жизнедеятельность прибрежных сообществ. Чтобы понять происходящие изменения, в исследовании применяется научный подход для изучения местных сообществ и теория адаптации и адаптационного потенциала. Эмпирические результаты получены из качественных интервью с жителями и заинтересованными лицами двух островных поселений: Лонгиер на Шпицбергене и поселок Соловецкий на Севере России.

Результаты исследования отражены в четырех взаимосвязанных научных статьях. В них представлены последствия роста судоходства, аспекты адаптационного потенциала и адаптивных стратегий местных сообществ, проанализировано применение теоретических основ для изучения российского контекста, и описано развитие теоретических основ по адаптивной способности в исследованиях Арктических ученых. Мои выводы свидетельствуют о том, что восприятие воздействия развития судоходства зависит от контекстуальных характеристик местных сообществ, поскольку один и тот же тип воздействия может иметь разные толкования. Аспекты, которые формируют местный адаптивный потенциал, такие как природная среда, инфраструктура, местные ценности, экономические ресурсы и общественные организации, взаимосвязаны. Анализ взаимосвязей между этими аспектами выявляет возможные отклонения, которые могут ослабить адаптивную способность и препятствовать активации адаптивных стратегий. Также, результаты исследования показывают, что, несмотря на концептуальные различия, теория адаптивного потенциала может быть использована для изучения российского контекста, который до сих пор менее изучен в адаптационных исследованиях Арктики. С исчезновением морского льда и глобализацией Арктики развитие судоходства будет продолжать расти, поэтому в заключение хотелось бы отметить, что способность сообщества коллективно принимать решения имеет решающее значение для разработки адаптивных стратегий, которые поддерживают и корректируют институциональные ответы.

## PREFACE

Thank you for reading this dissertation that, I hope, will bring you closer to the Barents region of the Arctic and its people, whose livelihoods have been formed under the Northern lights and the midnight sun.

The idea for the Ph.D. had been accumulating for several years prior to its realization and was motivated by personal and research interests. Personally, I am passionate about the Arctic, its nature, and its people. My parents moved to the Barents area at the end of the Soviet era, and it was here that I was born and raised. This area has been experiencing a northward industrial expansion for the past century, becoming a 'northern dream' for the southern population. My hometown of Ukhta was literally built on an oil field. The smell of oil production, the history of exploration, and the belief in the social benefits of this development filled my childhood. Since opening the academic door at Ukhta State Technical University (for a degree in the economy of the oil and gas sector) and later at Nord University (for a degree of Master of science in sustainable management), I have learned more about the complexity this development has brought to the North. This region, with its vulnerable environment, is home to the ethnic Komi group and now also to Russians and other nationalities who have migrated there. Learning more about the social and environmental impacts of industrial expansion, in the form of pollution, multiple oil spills, and accidents, I changed my views on economic development. I became more environmentally conscious and tried to understand how economic development, societal need, and environmental limits can be balanced sustainably.

Passion for the Arctic inspired my study in Bodø. In 2010–2011, the 'opening' Arctic and increasing business opportunities, including shipping, were highlights of both academic literature and mass media. Discussing Arctic shipping development with my father-in-law, a tanker captain with almost 40 years of global navigation experience, I gradually became more and more engaged with the subject. But it was not until I started my research career at Nordland Research Institute in 2012 that I started to ask myself the critical question: "What does this development in shipping really mean for those of us who live in the Arctic?" Therefore, the desire to fill the gap in our knowledge of the consequences of 'industrial expansion to the north,' in the form of increasing ship traffic in the Barents area, and to communicate it to an audience within and outside of academia were the main motivations for this project.



At the beginning of the 20th century, Russian poet Valery Bryusov wrote “Praise to the Man,” illustrating man’s subjugation of the natural environment. I would like to present here the first part of this poem where shipping is portrayed as ‘steel leviathans’ entering areas where previously only whales had played. Something has changed since then and bringing about an important change in the human relation to nature and its role in our wellbeing. My dissertation aims to discuss this changed side of humanity.

<p style="text-align: center;"><b>Хвала Человеку (Валерий Брюсов, 1906)</b></p>	<p style="text-align: center;"><b>Praise to the Man (Translated by Elena Skar, 2019)</b></p>
<p>Молодой моряк вселенной, Мира древний дровосек, Неуклонный, неизменный, Будь прославлен, Человек!</p>	<p>Young sailor of the universe, Ancient woodcutter of the world, Unyielding, eternal, Be glorified, Man!</p>
<p>По глухим тропам столетий Ты проходишь с топором, Целишь луком, ставишь сети, Торжествуешь над врагом!</p>	<p>On deaf paths of centuries You walk with an ax, You aim with a bow, you set nets, You triumph over the enemy!</p>
<p>Камни, ветер, воду, пламя Ты смирил своей уздой, Взвил ликующее знамя Прямо в купол голубой.</p>	<p>Stones, wind, water, flames You have tamed with your bridle, You have raised exultant banner High into the dome of blue skies.</p>
<p>Вечно властен, вечно молод, В странах Сумрака и Льда, Петль заставил вещей молот, Залил блеском города.</p>	<p>Eternally mighty, forever young, In the countries of Dusk and Ice, You have made prophetic hammer sing, You have flooded cities with light.</p>
<p>Сквозь пустыню и над бездной Ты провел свои пути, Чтоб нервущейся, железной Нитью землю оплести.</p>	<p>Through the desert and over the abyss You have laid your tracks, To braid the earth With an unbreakable, iron thread.</p>
<p><b>В древних вольных Океанах, Где играли лишь киты, На стальных левиафанах Пробежал державно ты.</b></p>	<p><b>In the ancient free Oceans, Where only whales had played, You have sailed sovereignly On steel leviathans.</b></p>

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## **ABBREVIATIONS**

AIS	Automatic Identification System
AECO	Association of Arctic Expedition Cruise Operators
CBA	Community-Based Approach (Adaptation)
GEC	Global Environmental Change
HDCA	Human Dimensions of Changing Arctic
HDCC	Human Dimensions of Climate Change
HEP	Human Exemtionalist Paradigm
HFO	Heavy Fuel Oil
IMO	International Maritime Organization
IPCC	The Intergovernmental Panel on Climate Change
LME	Large Marine Ecosystem
NEP	New Ecological paradigm
NSR	Northern Sea Route
NWP	North West Passage
NEP	North East Passage
SAR	Search and Rescue
SES	Socio-Ecological System
TPR	Trans-Polar Route
UNFCC	United Nations Framework Convention on Climate Change

## LIST OF PAPERS IN PART II

This thesis is based on the following four scientific papers:

- Paper 1:** Olsen Julia and Nenasheva Marina (2018). Adaptive capacity in the context of increasing shipping activities: A case from Solovetsky, Northern Russia, *Polar Geography*, 41:4, 241-261.  
DOI: 10.1080/1088937X.2018.1513960
- Paper 2:** Olsen Julia, Hovelsrud Grete Kaare and Kaltenborn Bjørn (2020). Increased shipping and community engagement: A case from Longyearbyen, Svalbard. In Eva Pongrácz, Victor Pavlov & Niko Hänninen (eds.) *In search of Arctic marine sustainability: Arctic maritime businesses and resilience of the marine environment*. Springer Nature. Switzerland.  
[https://link.springer.com/chapter/10.1007%2F978-3-030-28404-6\\_14](https://link.springer.com/chapter/10.1007%2F978-3-030-28404-6_14)
- Paper 3:** Olsen Julia, Natalie Ann Carter and Jackie Dawson (2019). Community perspectives on the environmental impacts of Arctic shipping: case studies from Russia, Norway and Canada. *Cogent Social Sciences* 5 (1).  
Doi: 10.1080/23311886.2019.1609189
- Paper 4:** Olsen Julia (under revision). Adaptive capacity of Arctic communities and shipping growth. *Polar Record*.

## **AUTHOR CONTRIBUTIONS**

**Paper 1:** Julia Olsen has designed the study. Julia Olsen had the main responsibility for collecting and analyzing, writing and editing the paper. Marina Nenasheva helped with data collection and writing of the paper.

**Paper 2:** Julia Olsen has designed the study and collected and analyzed the primary data during two fieldworks. Julia Olsen had the main responsibility for writing and editing the paper. Grete K. Hovelsrud contributed to the writing and editing and Bjørn Kaltenborn contributed to writing.

**Paper 3:** Julia Olsen has designed the study and collected data for two of three case communities. Natalie Carter has collected primary data for the community of Cambridge Bay. Julia Olsen analyzed data for this study and had main responsibility for writing and editing the article. Natalie Carter and Jackie Dawson contributed to writing and editing the paper.

**Paper 4:** Julia Olsen designed the study, collected and analyzed data and wrote and reviewed the paper.







# 1 INTRODUCTION

*“All of us here, to a certain degree, depend on shipping”*  
Interviewee in Longyearbyen, April 2017

## 1.1 AIMS AND SIGNIFICANCE

It is difficult to imagine socio-economic development of the Arctic’s coastal and island territories without shipping connections. But what happens to the Arctic and its communities when shipping trends change and lead to significant growth in the number of vessels and community visitors arriving on those vessels?

This article-based dissertation examines whether and how the increasing shipping in the Barents area of the Arctic affects the adaptive capacity of coastal communities. The background for this study derives from the fact that although several coastal communities in the Barents area are experiencing growth in ship traffic, little is known about the human dimensions of such developments (e.g. Ng et al. 2018; AMSA 2009) and local ability to adjust to changes.

The Barents area, comprising the Barents Sea and the adjacent terrestrial areas, is one of the most navigable regions above the polar circle (Eguíluz et al. 2016) that accommodates both domestic, destination and transit ship traffic (Fig. 1.1). This is because, compared to other Arctic regions, the Barents area and its coastline is characterized by high population density, favorable climate conditions (AMAP 2017), availability of marine resources and its geographical location along the Northeast Passage (NEP) and Trans-Polar Route (TPR).

The opening of Arctic waterways, resulting from climate-change induced sea ice reduction, as an enabler for shipping activities, has received attention in scientific literature and the media. Here, it is important to mention that shipping activities are not a new industrial trend. The Arctic Ocean (i.e. areas south of the sea ice edge), and especially its European region, has been navigable for centuries, long before

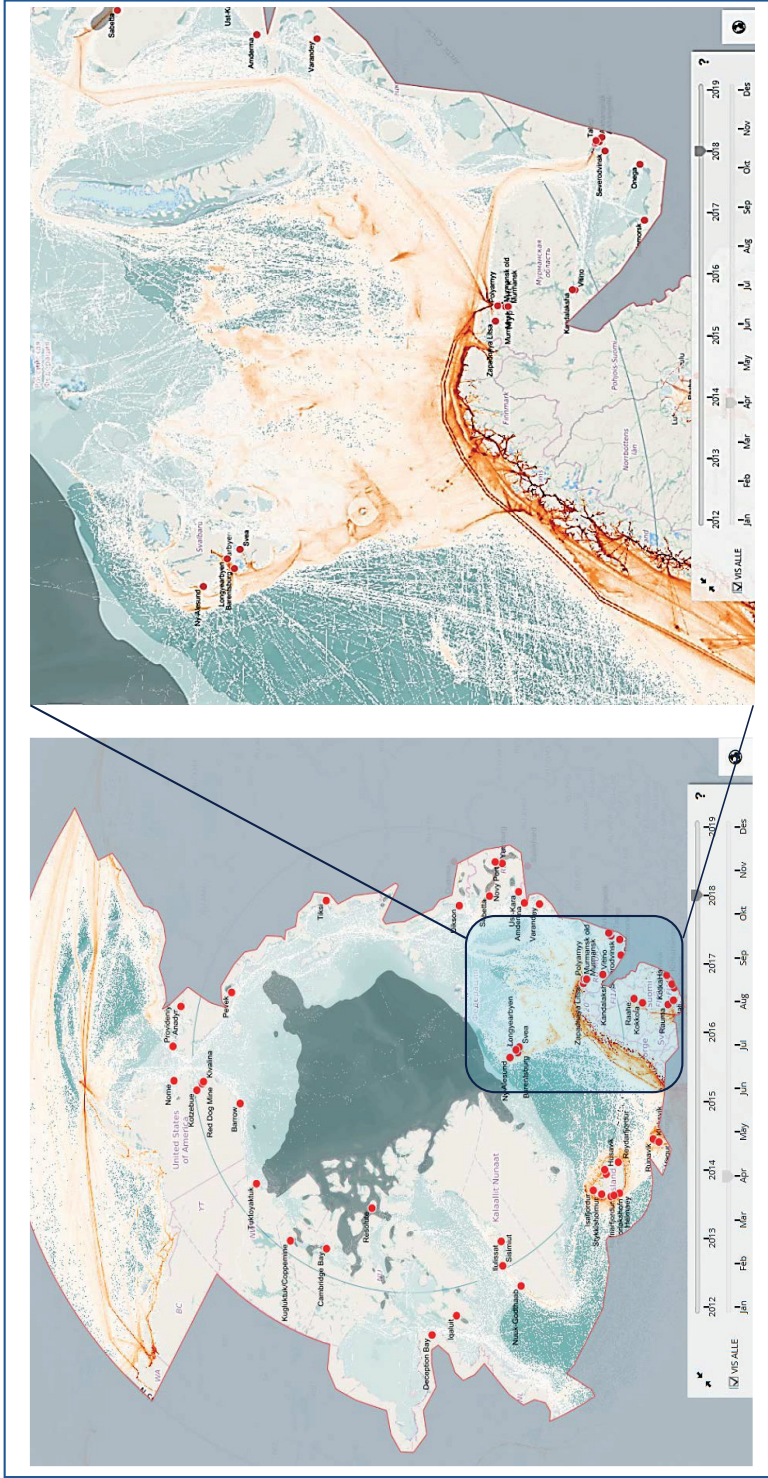


Fig. 1.1 Shipping distribution during 2018. Map on the left: In the Arctic; Map on the right: In the Barents region. Source: Arctic Ship Traffic Data –ASTD, by PAME. <https://map.astd.is/>

Pomors<sup>1</sup> explored Novaja Zemlja in the 14-15th centuries and before the Barents reached Svalbard in 1596 (Arlov 2003). The history of commercial navigation along the Northern Sea Route (NSR) is about 100 years old (Komarova 2016). Historically, domestic shipping has been a vital part of the socio-economic development of numerous coastal and island communities (e.g. Nenasheva and Olsen 2018). For some, it was the only transportation option before other types of transportation reached the communities during the 20th century. However, the importance of shipping remains, to support supply, mobility, and subsistence needs.

Even though changes in sea ice conditions contribute to increasing accessibility and an extension of the navigation season, decreasing sea ice is just one of many factors that affect the distribution of marine vessels in the Arctic (Dawson et al. 2018; Ng et al. 2018; Farré et al. 2014). Among the factors contributing to shipping development, the literature identifies northward industrial expansion due to exploration and extraction of natural resources, tourism development, changes in shipping governance and legislation, technology and infrastructure development, commodity pricing and other commerce trends (e.g. Østreng et al. 2013; Farré et al. 2014; AMSA 2009), movement of marine species northward (Misund et al. 2016; AMAP 2017), and development of Arctic communities and settlements (Christensen et al. 2018, also Paper 1-2).

Arctic shipping, which comprises all types of vessels operating in the Arctic waters (see Table 2.1 in Chapter 2), is also projected to increase in the coming decades in the Barents area (e.g. Borch et al. 2016; DNV-GL 2016), while a new TPR may become navigable by the mid-century (Smith and Stephenson 2013). At the same time, Arctic waters have several natural and geographical challenges for navigation in a safe and environmentally sound way, such as polar nights, harsh weather conditions, low temperatures, polar lows and long distances (Marchenko et al. 2016;

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<sup>1</sup> Russian settlers living by the White Sea

St. Meld. 2015-2016). Hence, further development relies on third-party services, including Search and Rescue (SAR) facilities, port infrastructure, meteorological services, sea charts, and communication system (Farré et al. 2014), and local communities, which host the increasing number of vessels and are engaged in adaptive responses (Dawson et al. 2016; Stewart, Dawson, and Johnston 2015).

The comprehensive Arctic Marine Shipping Assessment (AMSA 2009) report describes in detail the impacts of Arctic shipping on governance arrangements, infrastructure, the Arctic environment, and Arctic communities. Since the report's publication, the governance and infrastructural challenges associated with shipping have received considerable attention in scientific studies, the media, and government reports; however, shipping's social and environmental aspects remain underrepresented (see also 2.3 Previous research). A recent literature review on Arctic shipping emphasizes that "the social, environmental, and local impacts posed by increasing shipping in the Arctic are often pushed to the backseat. Further research on Arctic shipping must address this deficiency" (Ng et al. 2018, 15).

This study was encouraged by the need to understand the possible concerns and opportunities of Arctic shipping development for local communities, who are the first to experience the impact of this growth. Yet, during the past decade, there has been little holistic research on the community impact of shipping development, in contrast, for example, to the considerable attention given to cruise tourism impacts in the Canadian Arctic (e.g. Dawson et al. 2016; Stewart, Dawson, and Johnston 2015).

Data on cruise development has also been generated for other Arctic regions (e.g. Lück, Maher, and Stewart 2010; Viken et al. 2014; Lamers and Pashkevich 2018), but research on other types of shipping activities has only recently started to emerge (see also Chapter 2: Background). For example, the 2018 comprehensive assessment report *Adaptation Actions for a Changing Arctic (AACA): Perspectives from the Baffin Bay/Davis Strait Region* contains an entire chapter on shipping development and its impacts for the communities of this region (Christensen et al. 2018), but less attention

was given to shipping in the 2017 AACA: Perspectives from Barents Area report (AMAP 2017).

The literature also addresses the complexity of shipping governance that presents a mosaic of local, national and international rules, regulations, and guidelines (Pashkevich, Dawson, and Stewart 2015), meaning that ship traffic and its impacts are managed differently in various countries and involve diverse groups of stakeholders (e.g. Lamers and Pashkevich 2018; Têtu, Dawson, and Olsen 2018). Olsen et al. (2020) argue that local communities are an important stakeholder in this development, but little is known about their interaction with shipping activities, including their responses and adaptive capacity.

One important conclusion, however, can be drawn from the existing literature on shipping-community interactions: shipping activities will continue to increase in the opening Arctic, and there is a need to understand the human dimensions of this development. Here, *human dimensions* refers to the social aspects of shipping development, such as the interrelationship between the Arctic population and the changing environment, and institutional responses to change (AMSA 2009, 122). In the literature on cruise tourism, *human dimensions* also refers to the form of institutional responses and other concerns related to safety, ethical standards for visitors and possible cultural impacts (Lück, Maher, and Stewart 2010).

### **1.1.1 Research approach**

To address the local perspectives of shipping development, this explorative study applies the analytical and conceptual framework of adaptive capacity and a community-based approach. The framework derives from a developing body of literature on Global Environmental Change (GEC) and the Human Dimension of Climate Change (HDCC) in the Arctic (Ford et al. 2012b). Ford et al. (2012b, 810) argue that the “HDCC covers scholarship that examines how human systems (households, communities, businesses, regions, etc.) will be/are affected by and/or respond to



climate change, including impacts, adaptation, and vulnerability studies” (see also Ford et al. 2012a).

Even though climate change is a concern for Arctic communities (IPCC 2014a; AMAP 2017), HDCC literature recognizes the need to examine multiple and interconnected changes that impact local adaptive capacity. As argued by Handmer (2009, 218), “adaptive capacity exists in most communities, but it is unlikely to have been developed solely for climate change.” Several assessment reports and scholars have collected comprehensive evidence arguing that multiple and interconnected changes in socio-economic, environmental, and political systems, coupled with climatic changes, will pose cascading effects and challenges for local communities in the Arctic and their adaptive capacity (Hovelsrud and Smit 2010; Risvoll 2015; West and Hovelsrud 2010).

To gain a holistic understanding of this multi-faceted change to which Arctic communities adapt to, I suggest calling this body of literature Human Dimensions of a Changing Arctic (HDCA). Hence, HDCA represents a supplementary title for literature exploring social adaptation to changes taking place in the Arctic, some of which are climate induced. The definition of HDCA in this study connects three bodies of literature: the human dimensions of Arctic shipping (e.g. PAME 2009; Lück et al. 2010), the human dimensions of climate change (Ford et al. 2012b; Ford et al. 2012a), and Arctic human development (AHDR 2004; TemaNord 2014). Therefore, the adaptation approach is applied in this study to analyze how the current adaptive capacity of coastal Arctic communities is affected by increasing shipping.

The relationship between multiple changes taking place in the region, in shipping distribution, and in local communities is illustrated in Figure 1.2. The figure shows that these elements are interconnected and affect each other.

Over the past two decades, the number of studies on local impacts of a changing Arctic has increased (Ford, McDowell, and Pearce 2015; AMAP 2017, see also Paper 4) (Link 1 in Fig. 1.2), covering mostly the North American part of the Arctic



and Scandinavia. However, the Russian context remains underrepresented in this literature (see Paper 4), even though, geographically, the Russian region contains nearly half of the Arctic. Moreover, shipping development is seen as a result of multiple changes in the Arctic (Farré et al. 2014; Østreg et al. 2013) (Link 2 in Fig. 1.2) but also as an impact factor that affects local coastal communities (e.g. AMSA 2009, also Part II of this thesis) (Link 3 in Fig.1.2).

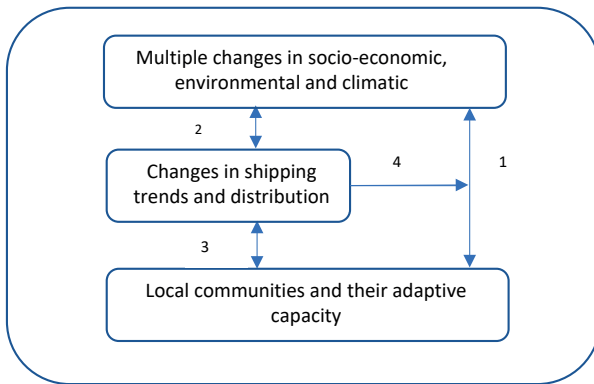


Fig. 1.2 The relationship between the study elements: multiple changes, shipping trends, and local communities.

Links 1 and 2 present the existing knowledge.

Links 3 and 4 present the objectives of the study.

Similar to other Arctic scholars who examine the local consequences of changing conditions, including those induced by climate (Hovelsrud and Smit 2010; Smit and Wandel 2006; Ford et al. 2012a), I apply community-based approach (CBA) methodology to investigate local adaptive capacity and its proxies (including studies that address changing conditions other than climate and shipping). In these studies, the local communities are usually the unit of analysis, and the application of CBA helps to examine changing conditions by engaging relevant stakeholders and community residents. This is because the local communities are usually the first to experience the local impacts of multiple changes, including shipping growth, and are the first to respond to these impacts. Understanding the human perception of changing conditions will also require an understanding of the local context (Keskitalo 2008; Ford et al. 2008). Given that the focus of this study is on the local community's perspectives, I examine the impacts of the global shipping industry while emphasizing

the heterogeneity of the Arctic region in its socio-economic and environmental conditions and diversity in shipping trends. This heterogeneity derives from uneven distribution of resources and diversity in cultural practices across the Arctic (Lukin 2017). Inspired by Stewart et al. (2015), I am also concerned with understanding whether various communities within the Barents area will be affected differently by shipping growth.

Hence, this research is carried out on two case communities: the island community of Solovetsky on the Solovetsky archipelago in the Russian Arctic and the island community of Longyearbyen on the Svalbard archipelago in Norway (see Fig. 2.1, and Papers 1 and 2 for descriptions). Historically, both communities have been dependent on shipping and are currently experiencing a growth in the number of vessels and the amount of community visitors arriving on those vessels.

The objective and originality of this research is twofold: to increase knowledge of the impacts of shipping on local communities in the Barents area (Link 3 in Fig. 1.2) and to enhance the theoretical development by examining adaptive capacity of local communities in the context of shipping growth (Link 4 in Fig. 1.2).

## 1.2 RESEARCH QUESTION

This explorative study examines communities' perspectives on shipping development in the Barents area and how shipping growth shape local adaptive capacity. The research objectives of this dissertation are addressed in the main research question: **What are the consequences of shipping development in the Barents area on local communities and for their adaptive capacity?**

This research question is divided into four sub-questions (RQ 1–4), which are answered in four scientific papers (Papers 1–4).

1. What are the main impacts of increasing shipping on local communities? (RQ1)
2. What are the salient aspects of adaptive capacity, and how do they shape local adaptive capacity in the context of shipping growth? (RQ2)
3. Are there any limitations for the applications of the adaptive capacity

- framework to understanding the Russian empirical reality? (RQ3)
4. How can studies on shipping development contribute to our knowledge of adaptive capacity of Arctic communities? (RQ4)

### **1.3 DISSERTATION OUTLINE**

This thesis consists of two separate but related halves: Part I and Part II. Part I contains six chapters—including this chapter—and presents the background and foci of the study, explains the choice of theoretical and conceptual frameworks and methodological approaches, and provides a synthesis of findings and conclusions. Part II consists of four inter-related scientific papers (Papers 1–4), each of which addresses two or more research questions of this study (Table 1.1).

#### **1.3.1 Part I**

The first chapter introduces the research project by presenting its aim and scope, the relationship between the papers, and its scientific contribution. Chapter 2 describes the background of the study: the contextual settings; shipping trends and interlinked changes in the Barents area; previous research on shipping–community interaction; and visualization of Arctic shipping. Chapter 3 outlines the theoretical and conceptual frameworks that guide the analysis. It includes a discussion of the adaptive capacity framework and its connection to the research tradition of social constructionism in the field of environmental sociology and describes the construction of the concepts of local community, local engagement, and natural environment that in turn contribute to our understanding of local adaptive capacity, also in the Russian context. Chapter 4 presents methodological considerations and reflections by describing research design, case studies, ethics, and reflections on data collection and analysis. Chapter 5 presents summaries of the individual papers and a discussion of the results and interconnection of the studies. Chapter 6 discusses how the research questions are answered in the study, presents this study’s contributions,

and concludes the dissertation by presenting the research’s limitations and the potential for further research.

### 1.3.2 Part II

The research questions are addressed in four inter-related but self-contained scientific papers (Papers 1–4). Figure 1.3 presents the relationships between the dissertation papers and the research questions they answer.

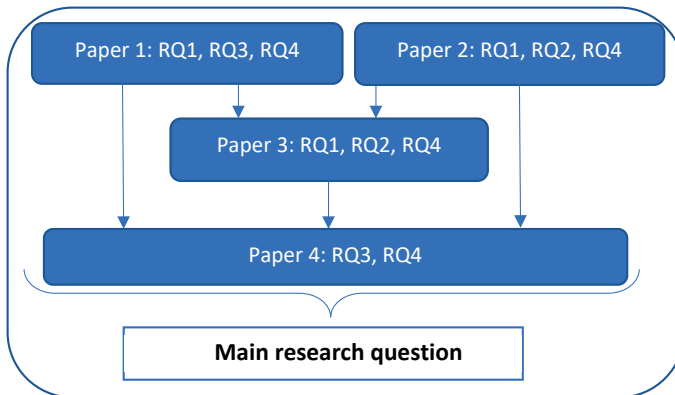


Fig. 1.3 Relationship between the dissertation’s papers.

I present the justification and explanation for the research design choices in Part I and in the methodological and theoretical sections of each of the papers (Part II: Papers 1–4). Table 1.1 summarizes the aims of the Papers the methodological and theoretical study settings and main findings of each paper and empirical and theoretical contributions to the HDCA literature, including conceptual development of local adaptive capacity (see 6.1 Study Contributions).

The first three empirical papers present locally identified shipping impacts on two coastal communities and their environment in the Barents area (a third community is added in Paper 3) and local determinants that are particularly salient in the context of shipping growth.

Table 1.1 Outline of the papers: aims, methods, framework, and findings.

#	Aims:	Methods	Framework and concepts	Findings and contributions
1	<p>1. Identify the shipping impacts and salient determinants of local adaptive capacity</p> <p>2. Identify how the determinants shape local adaptive capacity</p>	<p>Community-based approach</p> <p>Primary: semi-structured and unstructured interviews</p> <p>Secondary: literature, media, and document review, preliminary fieldwork</p>	<p>Framework: Adaptive capacity,</p> <p>Application for the Russian context</p>	<p>Five salient determinants of adaptive capacity are identified: local involvement in the decision-making system; infrastructure; local values; the natural environment; and economic resources. Each of the determinants and their interconnections shape local capacity to adapt in the context of the shipping development.</p>
2	<p>1. Identify the impacts of different types of shipping</p> <p>2. Identify the aspects of a community's adaptive capacity that emerge in response to such impacts</p>	<p>Community-based approach</p> <p>Primary: semi-structured and unstructured interviews</p> <p>Secondary: literature, media, and document review</p>	<p>Framework: Adaptive capacity, Adaptive responses, Community engagement (agency)</p> <p>Concept: Local communities</p>	<p>Community engagement shapes and activates adaptive capacity, which, in turn, enables adaptive responses. This engagement relies on place attachment, perception of the changing environment, cooperation practices, and the ability to influence decision makers. Community engagement also constructs the concept of local communities.</p>
3	<p>1. Illustrate if and how the impacts of shipping on the natural environment vary across the communities</p> <p>2. Examine the concept of the natural environment as a determinant of adaptive capacity</p>	<p>Community-based approach</p> <p>Primary: semi-structured and unstructured interviews</p> <p>Secondary: literature, media, and document review</p> <p>An additional case, Cambridge Bay, is added to strengthen the findings</p>	<p>Framework: Adaptive capacity, Construction of environmental problems.</p> <p>Concept: The natural environment</p>	<p>The impact of shipping on the local natural environment varies across the Arctic. This variation depends on the way the local population is perceives and engages with their surrounding environment. The study argues that the natural environment presents a critical aspect of adaptive capacity, but this determinant should be re-constructed to capture multiple meanings.</p>
4	<p>1. Examine how knowledge on shipping contributes to the development of the adaptive capacity framework</p> <p>2. Examine how the adaptive capacity framework is addressed in Russian studies</p>	<p>Systematic literature review of Russian and Western studies, in combination with the synthesis of the results from the empirical papers (Papers 1–3)</p>	<p>Adaptive capacity framework</p> <p>Application for the Russian context</p>	<p>The Russian context is still underrepresented in studies on local adaptive capacity with regard to multiple changes in the Arctic, largely due to conceptual differences in addressing Russian empirical reality. Studies on how shipping shapes local adaptive capacity engender a greater understanding of local context and development of a conceptual framework.</p>

Paper 1 presents how local adaptive capacity of the Solovetsky community is shaped by empirically identified salient determinants of adaptive capacity and how these determinants are interlinked. Paper 2 summarizes the locally identified impacts of different types of vessels in the community of Longyearbyen and offers an understanding of the way community engagement, a determinant of adaptive capacity, activates adaptive responses and thus strengthens adaptive capacity. The paper also examines the applicability of the concept of local communities. Paper 3 illustrates how the impacts of shipping on the natural environment, a determinant of adaptive capacity, differ between three island communities, based on local engagement with and use of the local environment. A community of Cambridge Bay was added to this study for strengthening this argument. Ultimately, the results illustrate that the perceived shipping impacts are case specific.

The contextual Paper 4 combines the results from a literature review on local adaptive capacity in the Arctic with the results from the empirical studies to understand if and how shipping development is addressed within this framework. It illustrates how empirical studies on Arctic shipping development contribute to the understanding of local adaptive capacity, arguing that the impacts from shipping vary greatly between cases, and different determinants emerge in response to this growth. This paper also compares the application of adaptive capacity framework by Western and Russian scholars.

Finally, this dissertation produces knowledge on emerging topics and the strategic research fields of Nord University and the Research Council of Norway (RCN):

1. Nord University's focus on the High North and Blue Growth.
2. The RCN strategic area: Research and innovation in and for the North that includes climate and environment; the ocean's resources and maritime businesses; and living conditions and community life.
3. The project also contributes to both organizations' targets on stimulating international cooperation between scholars in Norway, Russia, and Canada.

## 2 BACKGROUND

*“The Pomors became one with the sea in their childhood and couldn’t imagine their life without it. Their hearts belong to the sea forever. All through the winter the Pomors longed for the coming of the spring when the northern nature would wake up and the sea would break from the ice.”*  
Kornitskaya (2014, 51)

### 2.1 STUDY REGION: BARENTS AREA

Given the explorative basis of this study, context is a key variable in assessing the consequences of shipping development for local communities and their adaptive capacity but also for understanding why communities are exposed to and benefit differently from the same types of shipping operations.

The Barents area was chosen as a case area for this study. It is broader than the Barents Region and includes the Barents Sea, and the adjacent terrestrial areas and Svalbard and Franz Josef Land (AMAP 2017, ix). The Barents Sea together with the White sea comprises the Barents Sea Large Marine Ecosystem (LME) (PAME 2016). The opportunities and limitations for navigation will vary across the Barents Sea LME depending on ice conditions, population density, ecological situations, and types of shipping activities, etc.

For the purpose of this study, ‘Arctic shipping’ covers all vessels operating in the Arctic waters; however, it is important to mention that the designated boundaries of the Arctic waters and the Arctic region are not fixed. Rather, they will vary according to the field of study and between the international organizations (e.g. the International Maritime Organization [IMO] and the Arctic Council). As the focus of this study is on the human dimension, that is coastal communities and their adaptive capacity, it applies Arctic geographic boundaries from the first Arctic Human Development Report (AHDR 2004) (Fig. 2.1). These boundaries consider human interactions and administrative borders and correspond with the Russian maritime Arctic area in its Barents part, which also covers the White Sea (AMSA 2009, 14; Mière and Mazo 2013). Hence, the Arctic waters comprise all sea waters within the Arctic boundaries (e.g. Østreng et al. 2013, xxiii).

### **2.1.1 Socio-economic and environmental settings**

From a demographic perspective, the Barents area is the most populated area within Arctic borders. The population of 5.5 million is distributed across Norway, Sweden, Finland, and Russia and centralized in several big cities, while small communities are spread across the region, many of which are coastal (AMAP 2017, 22). The population also includes indigenous groups (Sami, Nenets, and Veps) and other ethnographic groups, such as the Pomors, Karels, and Komi.

Contextual diversity is also apparent in the variety of livelihoods, sectors, and industries of the area and across communities. Traditionally established subsistence activities (for example fishing, hunting, and mushroom and berry gathering) are connected to the surrounding natural environment and still play an important role in food security for some communities (Hovelsrud and Smit 2010; AMAP 2017), and seaweed collection (Olsen and Nenasheva 2018). In addition to renewable resources, the extraction of non-renewables, such as oil, gas, coal, minerals, and metals, forms local economies (Rasmussen, Hovelsrud, and Gearheard 2014). Employment in the area is also connected to research and education, tourism, and other high-tech services (AMAP 2017). Water transportation has played a crucial role in the socio-economic development of local coastal communities and is a vital part of the infrastructure that covers communities' mobility, subsistence, supply, and transportation needs (Arlov 2003; Nenasheva and Olsen 2018; Bernshtam 1978).

The Barents LME is one of the most productive areas in the world (Norwegian Environmental Agency 2013). Coastal waters are used intensively by coastal residents and those whose livelihoods are connected to their marine environment. In Norway, for example, 80% of the population (including Longyearbyen) live close to the sea (Norwegian Environmental Agency 2018), while historically, the Pomors' settlements by the White Sea in Russia (including Solovetsky) have also been connected to the marine environment and its resources (Bernshtam 1978).



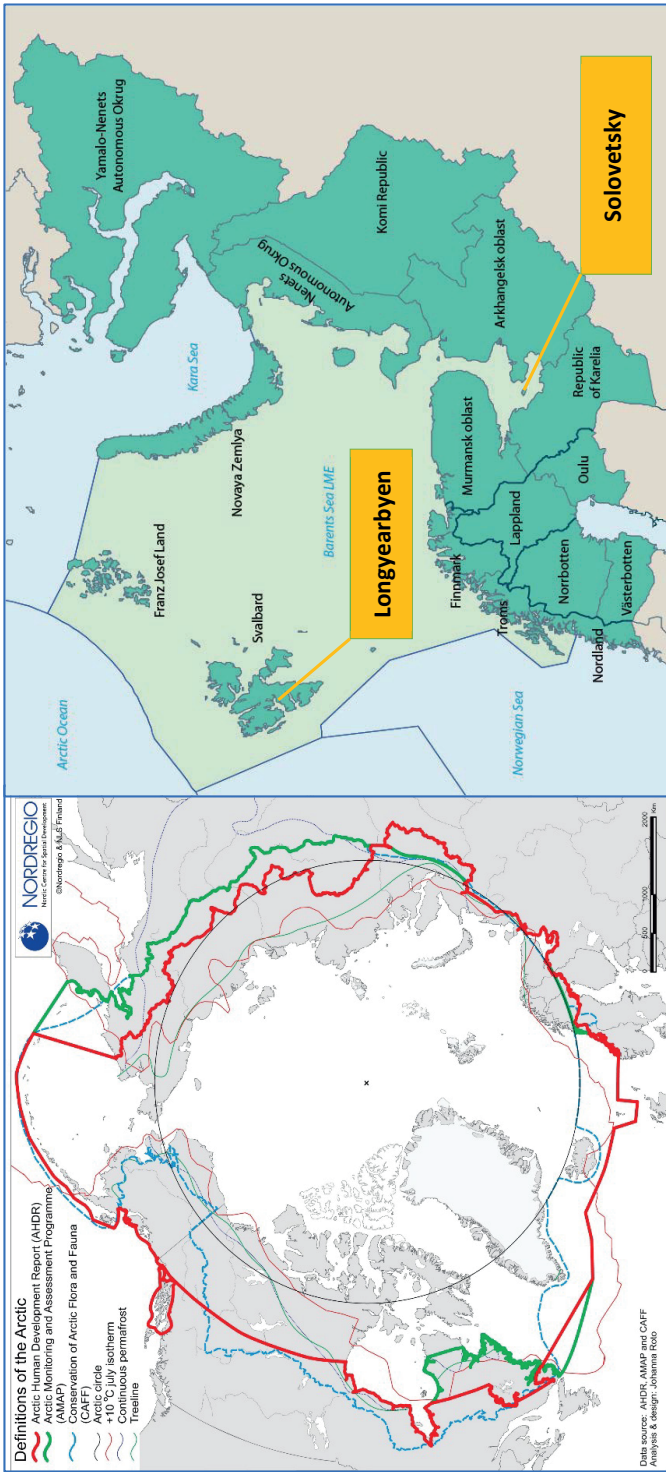


Fig. 2.1 Arctic boundaries (left, adopted from Nordregio). This study follows the definition, offered by AHDR (red). On the right, the map of the Barents area (Source: AMAP, 2017) with case communities: Longyearbyen and Solovetsky.

This use of water transportation and economic expansion has resulted in the development of port/pier infrastructure, the adaptation of local economies to facilitate shipping in the area (e.g. cargo, marine tourism, fishing, research activities) and in some cases the development of logistical connections to other sources of transportation (e.g. the air, railroad and cars).

The Barents Sea LME comprises ten areas of heightened ecological significance with a rich combination of flora and fauna (PAME 2013). The majority are located near coastal areas and are populated by marine mammals (beluga, ringed seals, harp seal, walrus, etc.); fish stock (polar cod, herring, capelin, etc.); and colonies of sea birds (Atlantic puffins, razorbills, common and thick-billed murres, blacklegged kittiwakes, and great cormorants). The marginal ice zone is also used by seals and sea birds and is a vital feeding area for polar bears. Shipping lanes that are adjacent to coastal areas pass through almost all of these ten subareas of heightened ecological significance (Fig. 2.2 b). Any accidents might threaten the vulnerable Arctic environment with the potential cascading impacts for the local livelihoods and food security (described in the Paper 3).

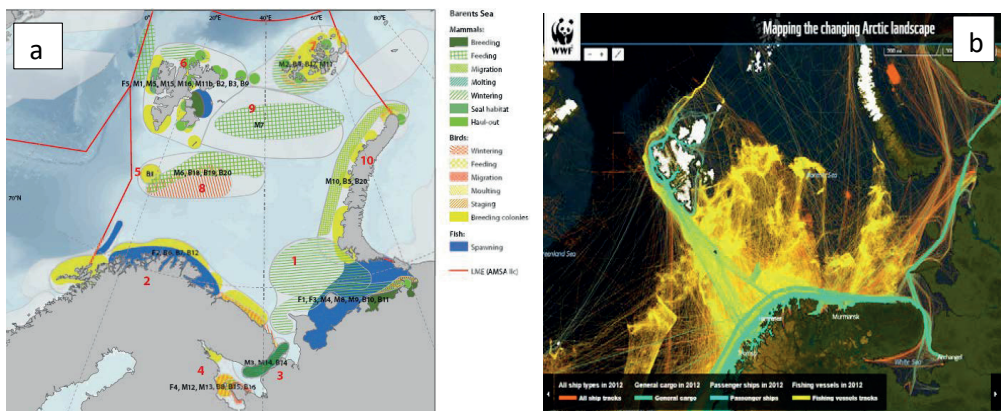


Fig. 2.2 (a) Areas of heightened ecological significance in the Barents LME (AMAP/CAFF/SDWG 2013: 25). (b) Ship traffic density in the Barents area. Data-source: Automatic Identification System (AIS) data, provided by The Norwegian Coastal Administration/www.havbase.no (2013) and further processed by DNV-GL and WWF.

Two case communities along the Barents Sea LME were selected for this study: specifically, the island communities of Longyearbyen on the Svalbard archipelago, and Solovetsky on the Solovetsky archipelago (Fig. 2.1). Both are characterised by a combination of extraordinary historical, cultural and natural sites that attract domestic and international tourists, including marine tourism. Case communities' socio-economic and governance characteristics are unique in regard to other communities in Norway and Russia respectively. A detailed description of these characteristics is presented in the dissertation Papers 1, 2, and 3 and in Chapter 4, while this section presents the contextual characteristics of the Barents region and the relationship to shipping in the Arctic waters.

### **2.1.2 Interlinked changes**

Available scientific literature and assessment reports show that communities in the Barents area, as in the rest of the Arctic, are undergoing rapid changes caused by climate change, globalization, geopolitical changes and movement of numerous industries northward with cascading impacts on environmental, social and economic systems (Fondahl and Wilson 2017; Hovelsrud and Smit 2010; AMAP 2011, 2017b, 2017; AMSA 2009; Hoogensen Gjørsv, Lanteigne, and Sam-Aggrey 2020).

The changes in socio-economic systems interact with climatic and environmental changes in a complex way, creating new challenges for social adaptation and communities' adaptive capacities (Hovelsrud and Smit 2010; AMAP 2017). Changes in Arctic shipping distribution are directly connected and influenced by climatic changes, socio-economic changes and geopolitical factors (e.g. Dawson et al. 2018; Stewart, Dawson, and Johnston 2015; Têtu, Dawson, and Olsen 2018).

Since the end of the Cold War, the geopolitical situation between Russia and the West in the Arctic has been characterised by cooperation practices. Those practices were partly established in the end of the Soviet period and in 1996 through an intergovernmental forum, the Arctic Council, and other cross-boarders initiatives

(e.g. The Norwegian Barents Secretariat). During this period the security concerns in the High North were intentionally sidelined to create a low-tension region (Hoogensen Gjørsv, Lanteigne, and Sam-Aggrey 2020). Worsening cooperation between Russia and other NATO countries took place after Crimea/Donbas crisis in 2014 that together with increasing ship traffic along NEP led to greater military presence in the Arctic (ibid.). However, while all forms of military cooperation were canceled, the Coast Guard cooperation between remains stable (Østhagen 2016).

From climatic perspectives, it is important to mention that this region is warming two to three times faster than the rest of the globe (IPCC 2018). Changes in sea surface and ocean temperature, precipitation, and extreme weather conditions have an impact on the marine environment (Barber et al. 2017), which in turn affects local communities, especially those that rely on the natural environment for their subsistence (AMAP 2011, 10-18).

The Barents area is influenced by a warm ocean current—the Gulf Stream—and therefore is not as cold as other Arctic regions. The climatic conditions are interrelated with the cryosphere<sup>2</sup> and local ecosystems. Sea ice is of particular relevance for this study as it has a significant influence on the shipping distribution in the Arctic, particularly in the Barents region. Northern and eastern parts of the Barents Sea and the White Sea are covered by seasonal sea ice during winter–spring periods (Dumanskaya 2014; PAME 2016). The maximum sea ice extent in the Barents Sea occurs in April and the minimum in August–September, when it is almost ice free (PAME 2013).

Sea ice reduction is one of the most noticeable changes in Arctic waters (Meier et al. 2014). Almost 40 years of satellite observation of sea ice show that, despite seasonal variations, it continues to decline, migrate northward, thin, and weaken (Barber et al. 2017, xxiv; Østreng et al. 2013). Over the period 1979–2013, the

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<sup>2</sup> This is “a part of the Earth’s surface that is seasonally or permanently frozen” (AMAP, 2011, vi).

“average number of days with sea ice cover in the Arctic declined at a rate of 10–20 days per decade” (AMAP 2017b, ix). Figure 2.3 shows the sea ice extent for September 2018 and the average extent for the period 1981–2010. Sea ice volumes, as well as associated decreases, vary across the Arctic, especially in the Barents area. These changes have, among other factors, extended the navigation season for marine traffic. This extension affects coastal communities’ food security, accessibility by marine traffic, and mobility options, while the period of community ‘isolation’ is decreasing. ‘Isolation’ here refers to the period of the year when the shipping turnover is low, or no vessels can approach the communities due to ice conditions (also discussed in Papers 1, 2, and 3).

It is still unclear to what degree retreating sea ice has led to increasing amounts of shipping in the Arctic, as certain types of shipping operations, such as cargo and resupply, are driven by demand. As argued by Dawson et al. (2018, 16) “climate change [and sea ice conditions] is only one of a range of important factors influencing Arctic marine traffic trends” (describing shipping in the Canadian Arctic), while globalization, tourist interest in the Arctic, and socio-economic development play an equal (if not greater) role in shipping activities . The marine tourism activities are also driven by consumer demand (e.g. Papers 1 and 2).

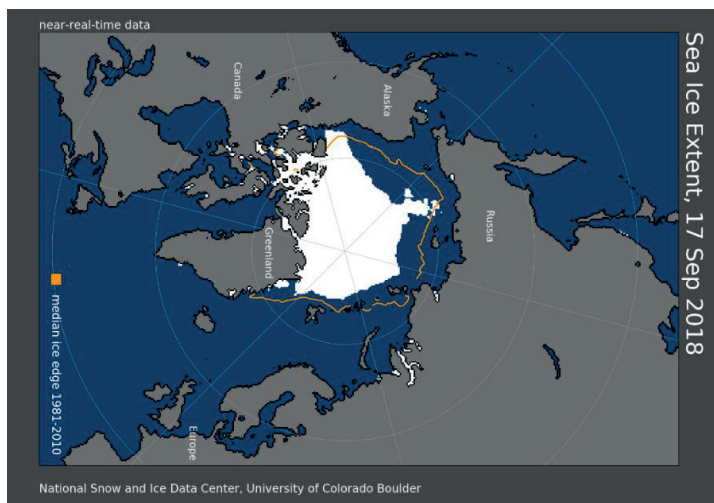


Fig. 2.3 Arctic sea ice extent for September 17, 2018 was 4.60 million square kilometers (1.78 million square miles). The orange line shows the 1981 to 2010 average extent for that day. Sea Ice Index data. Credit: National Snow and Ice Data Center.

## 2.2 SHIPPING IN THE BARENTS AREA

Literature on Arctic shipping usually highlights the opening Arctic, its globalization, governance, and resource frontier as the main contributors to shipping development (Ng et al. 2018; Stevenson et al. 2019; Dawson et al. 2018; Farré et al. 2014). Increased accessibility of areas that contain natural resources, such as oil and gas (Farré et al. 2014), the northward movement of some fishing species (Misund et al. 2016; AMAP 2017) and increasing tourism in the Arctic (Lück, Maher, and Stewart 2010) are examples of shipping contributors.

This development in shipping is followed by changes in spatial distributions of tanker, fishing, and supply vessels in the Barents Sea (Borch et al. 2016). In addition to industry-related activities, Arctic shipping serves demand-driven resupply needs for local coastal populations (see Papers 1 and 2). Since resupply season in the Barents area usually correlates with the navigation season, sea ice reduction extends the length of the resupply season and improves local food security (see Paper 1).

### 2.2.1 Defining Arctic shipping

AMSA (2009) defines Arctic shipping as comprising tankers, bulk carriers, offshore supply vessels, passenger ships, tug/barge combinations, fishing vessels, ferries, research vessels, and government and commercial icebreakers operating in Arctic waters (see Figs. 2.4–2.6).



Fig. 2.4 A private small boat and a pleasure craft at Solovetsky (left). Icebreaker *Dikson* at the port of Arkhangelsk (right) Photo credit: Julia Olsen.



Dawson et al. (2017) elaborate on this by providing examples and descriptions of each type (see Table 2.1).

Table 2.1 Classification of Arctic shipping (adopted from Dawson et al., 2017).

Classification	Description	Examples of Ship Types
Government vessels and icebreakers	<ul style="list-style-type: none"> <li>• Designed to move and navigate in ice-covered waters</li> <li>• Must have a strengthened hull, an ice-clearing shape, and the power to push through ice</li> </ul>	<ul style="list-style-type: none"> <li>• Coastguard</li> <li>• Icebreakers (private, research, government)</li> </ul>
Container ships	<ul style="list-style-type: none"> <li>• Cargo ships that carry their load in truck-size containers</li> </ul>	<ul style="list-style-type: none"> <li>• Cargo transport</li> </ul>
General cargo	<ul style="list-style-type: none"> <li>• Carry various types and forms of cargo</li> </ul>	<ul style="list-style-type: none"> <li>• Community resupply</li> <li>• Roll-on/roll-off cargo</li> </ul>
Bulk carriers	<ul style="list-style-type: none"> <li>• Bulk carriage of ore (can carry either oil or loose or dry cargo, but not simultaneously)</li> </ul>	<ul style="list-style-type: none"> <li>• Timber</li> <li>• Oil, ore</li> <li>• Automobile carriers</li> </ul>
Tanker ships	<ul style="list-style-type: none"> <li>• Bulk carriage of liquids or compressed gas</li> </ul>	<ul style="list-style-type: none"> <li>• Oil, natural gas, chemical tankers</li> </ul>
Passenger ships	<ul style="list-style-type: none"> <li>• Carry passengers for remuneration</li> </ul>	<ul style="list-style-type: none"> <li>• Cruise ships</li> <li>• Ocean liners</li> <li>• Ferries</li> </ul>
Pleasure craft	<ul style="list-style-type: none"> <li>• Recreational vessels that do not carry passengers for remuneration</li> </ul>	<ul style="list-style-type: none"> <li>• Motor yachts</li> <li>• Sail boats</li> <li>• Row boats</li> </ul>
Tugs/Barges	<ul style="list-style-type: none"> <li>• Tug: Designed for towing or pushing and general work duties</li> <li>• Barge: Non-propelled vessel for carriage of bulk or mixed cargo</li> </ul>	<ul style="list-style-type: none"> <li>• Resupply vessels</li> <li>• Bulk cargo transport</li> </ul>
Fishing vessels	<ul style="list-style-type: none"> <li>• Fishing boats used in commercial fishing activities</li> <li>• Generally small vessels, between 30 and 100 meters</li> </ul>	<ul style="list-style-type: none"> <li>• Small fishing boats</li> <li>• Trawlers</li> <li>• Whaling boats</li> <li>• Fish-processing boats</li> </ul>
Oil- and gas-exploration vessels	<ul style="list-style-type: none"> <li>• Designed specifically for the exploration and extraction of natural gas and oil</li> </ul>	<ul style="list-style-type: none"> <li>• Seismic, oceanic, and hydrographic survey vessels</li> <li>• Oil drilling/storage vessels</li> <li>• Offshore resupply</li> <li>• Portable oil platform vessels</li> </ul>

The category of government (military) vessels is not considered in this study due to the classified nature of their presence in the Barents area and the difficulty accessing knowledge of their connections to local communities. The geographical patterns of military vessels are not broadly available as they are not required to report

the Automatic Identification System (AIS) position (Eguíluz et al. 2016). However, there is an increasing trend in the number of sailing hours by Russian navy vessels (including submarines), especially to and from the reopened military bases in Russian Barents areas (e.g. Franz Josefs land) (Borch et al. 2016), and due to implementation of several naval exercises in the Barents and Norwegian Seas (Bruun-Hanssen 2020). Norwegian Navy vessels, including coast guard, have completed 38 % of their sailing time in Northern Norway (ibid). The coast guard also has a presence on Svalbard; however, the coast guard performs only civilian tasks (SAR, fishery control) in Svalbard waters as laid out by Article 9 of the Svalbard Treaty, which requires that the area should not be used for military purposes and no navy station can be built (Arlov 2003).

Neither AMSA (AMSA 2009) nor Dawson et al. (2017) include smaller (private) boats, for example those for indigenous or local community use (Fig. 2.4), in their classification of Arctic shipping, even though these vessels were the first to navigate these waters and, for many communities, still present the only means of transportation that is regulated at the local level (Olsen, Nenasheva, and Hovelsrud in review). Given the lack of data on the types of small local boats and their current usage, this category is excluded from the thesis.

All vessels operating in the Arctic can be divided into three categories: domestic (sail on intra-Arctic routes between Arctic locations), destination (sail on destination-Arctic routes, between harbors located inside and outside the region), and transit (sailing via the Arctic Ocean between harbors outside the Arctic region) (Østreng et al. 2013, xxiii). Transit shipping is less dependent than domestic and destination shipping on port infrastructure and thus rarely interacts directly with local communities; however, its indirect impacts, such as pollution, emissions, and icebreaking activities, may affect local livelihoods (e.g. Paper 3). In this dissertation, research is limited to domestic and destination marine traffic, since they dominate the Barents waters and interact directly with coastal communities.



### 2.2.2 Arctic shipping characteristics

Given the typology of Arctic shipping, one can ask whether Arctic shipping differs from global shipping. Both the empirical analysis and relevant literature identify some aspects of Arctic shipping (or shipping in polar waters) that differ from other global trends:

- **Seasonality.** The first aspect is related to the seasonality of operations. The Arctic, including the Barents area, is mostly navigable during summer–early autumn (Borch et al. 2016). Even though the Barents area can facilitate year-round navigation, some parts, including the northern part of the Barents Sea and the White Sea, are icebound during winter.
- **Challenging natural conditions.** Cold climate, harsh weather conditions, winter darkness, polar lows, and waves may present challenges to navigation in Arctic waters (Marchenko et al. 2016).
- **Challenging geographical conditions.** The area is characterized by long distances that, together with severe natural conditions, create challenges for SAR and preparedness, and increases response time.
- **Third-party services.** These are less developed in the Arctic (Knol et al. 2018). They include sea charts, meteorological services, port infrastructure, SAR and preparedness resources, repair and maintenance services, traffic control, communication services, and Automatic Identification System (AIS) data (Farré et al. 2014, 19; Vold et al. 2013).
- **Shipping technology.** The majority of vessels operating in the Barents Arctic were constructed for open-water operation, but the special Polar Class requirements (IMO 2010) were developed for vessels operating in ice-covered waters (Fig. 2.4), ranging from vessels that are capable of operating year-round in ice-covered waters (PC1) to those vessels whose design allows only for summer/autumn operation in thin, first-year ice (PC7).
- **Polar shipping governance.** These are global, national, regional, and industrial initiatives that have been developed to govern and manage shipping in polar waters (Pashkevich, Dawson, and Stewart 2015). The most central element is the IMO's International Code for Ships Operating in Polar Waters (Polar Code) that presents a set of recommendations for vessels operating in waters surrounding the two poles (IMO 2017). In addition to the Polar Code, regional regulations, such as a heavy fuel oil (HFO) ban and restrictions on the size of vessels and season of operation, were implemented on Svalbard (The Governor of Svalbard 2016). The Association of Arctic Expedition Cruise Operators has developed a set of guidelines for their member operators in order to limit their impact on the vulnerable Arctic environments and avoid social tension (AECO 2018).

### 2.2.3 Shipping development

To understand the current navigation trends, I provide a brief historical overview of shipping development in the Barents area. Martynov (2012) suggests that in 4000–5000 B.C., the coastal territories in the Russian Barents were visited by fishers and hunters on skeleton boats made of birch bark. However, much of the historical navigation and exploration of the Barents Arctic waters relates to the Viking period, which was followed by 14th-century European interests in alternative routes between Europe and Asia (AMSA 2009, 39). This was followed by Pomor expansion northward to the High Arctic (the islands of Kolguev, Novaya Zemlya, and later, Svalbard) in the 15th–16th centuries in search of new hunting areas (Arlov 2003), which resulted in the establishment of Arkhangelsk in 1584—the Pomors’ trade center in the Russian North.

Around the 19th century, the Barents area became attractive for marine tourism, and ferry routes were established in the European Russian Arctic (Popov and Davydov 2003). The need to improve connectivity between the settlements in Northern Norway at the end of the 19th century resulted in the establishment of the “Hurtigruten” shipping route between Trondheim and Hammerfest in 1893, led by Captain Richard With (Hurtigruten 2018). The route was extended to Bergen in 1898, and reached Svalbard in 1896 with the opening of a hotel on Spitsbergen (Hurtigruten 2018; Arlov 2003).

Even though the Eastern coastal part of the Barents area, toward the river of Yenisei, had been mapped in the 16th century and seasonally navigated (Komarova 2016), sea ice conditions challenged navigation. The Northern Sea Route (NSR), a shipping route along the Russian Arctic coast, was first crossed during the same navigation season in the early 1930s, followed by the establishment of *Glavsevmorput* in 1932, an administrative body for the NSR. Since then, a number of settlements, polar stations, cargo vessels, ice-breakers, and flight services have been developed to support this transportation link between the West and the East (Komarova 2016,

114). Activity peaked along the route in 1986, before dropping significantly with the collapse of the Soviet Union (Marchenko 2012).

The current use of Russian Arctic waters can be described as a ‘resurgence’ and/or rebuilding of Soviet marine and river transportation activities (Nenasheva and Olsen 2018). However, in recent years, the route has experienced growth in transported cargo; in 2018, the NSR hosted the first transit of a container ship (Humpert 2018). This development indicates that the near future of shipping in the Russian Barents Arctic, and the Arctic in general, will be dominated by destination shipping (related to exploration and cargo of natural resources and marine cruises) and domestic shipping (resupply—see Fig. 2.5—and passenger vessels) and less by transit activities (Borch et al. 2016).

Arctic shipping accounts for less than 10% of the world’s shipping (Eguíluz et al. 2016). The Norwegian sector is one of the most navigable regions in the Arctic (St. Meld. 2015-2016) and facilitates transit, destination, and domestic shipping (Eguíluz et al. 2016). In fact, about 80% of all Arctic shipping crosses the Norwegian sector of the Barents area (St. Meld. 2015-2016), while fishing vessels alone make up 70% of all traffic in Norwegian Arctic waters (Borch et al. 2016, 12). The density of shipping activity in the Barents area is lower than in the Norwegian Sea, and shipping distributions vary throughout the year, peaking during the summer (ibid).



Fig. 2.5 Supply vessel *Norbjørn* in the port of Longyearbyen. Photo credit: Julia Olsen.

Marine cruises represent one of the fastest growing sectors, especially during the summer—autumn, but also during the winter along the Norwegian coast (Borch et al. 2016). The passenger traffic trends shift toward bigger boats, with a capacity of up to 5,500 passengers, and an increase in pleasure crafts (Papers 1 and 2; Fig. 2.6). Arctic shipping is predicted to increase over time (Borch et al. 2016; DNV-GL 2016). While much of the growth will be related to destination ship traffic, the planned TPR (predicted to be navigable by the mid-century) will offer a viable connection between the East and the West for transit traffic (Smith and Stephenson 2013). The area around Svalbard will become an intersection of shipping routes (Paper 2).



Fig. 2.6 (Top) The port of Longyearbyen hosts overseas cruise vessels with a capacity of 5,500, expedition cruises, day-trip cruises, and pleasure crafts (August 2017); (bottom left) domestic passenger vessel and small private boats at Tamarin Pier on Solovetsky; and (bottom right) a passenger vessel in the Arkhangelsk region. Photo credit: Julia Olsen.

## 2.3 PREVIOUS RESEARCH

Although scientific interest in different aspects of Arctic shipping has increased over recent decades, it is not new. The development of the literature on the opening Arctic as an enabler for shipping operations that bring certain economic benefits to the communities has been skewing toward presenting shipping also as a stressor for Arctic communities and their socio-economic and environmental systems.

The environmental impacts of shipping–nature interactions are to a certain degree covered in existing literature. Ships impact on air and water quality through HFO pollution, oil spills, ballast, and grey water discharge and on land in the form of garbage in ports and coastal settlements (Aliabadi, Staebler, and Sharma 2015; Stevenson et al. 2019; McWhinnie et al. 2018; Lindstad, Bright, and Strømman 2016). Noise pollution and marine mammal disturbance have also been the subject of researchers’ attention (Halliday et al. 2018; Stevenson et al. 2019; Smiley 1990). Marine litter in the Barents region has received substantial media and scientific attention too (e.g. Vangelsten et al. 2018), partially connected to environmental concerns about fishing activities. Carter et al. (2018) underline that icebreaking activities pose risks for humans and animals, for example, with the latter, when sea ice is used as a platform for rookeries. These are only a few of the possible negative consequences of increased Arctic shipping for climate, nature, and health.

Literature that assesses the human dimensions of shipping development also reflects on the management and/or governance of environmental impacts. If not properly managed, increased shipping and a longer navigation season increases the potential for negative impacts (AMAP/CAFF/SDWG 2013). When discussing shipping governance and management practices, the literature refers to (1) diverse levels of shipping governance from the global to local scale (Pashkevich, Dawson, and Stewart 2015; Dawson, Johnston, and Stewart 2014), including polar governance with the recently adopted Polar Code, and (2) collective self-governance that includes both decision makers and users (industry, community) (Van Bets, Lamers, and van Tatenhove 2017; Viken et al. 2014), as well as local initiatives established in a particular settlement by or with engaged communities (e.g. Papers 1 and 2). The same literature indicates that management and governance practices rely on third-party services, such as meteorological and communication services, SAR, and traffic control, proper infrastructure (Farré et al. 2014; Knol et al. 2018), and the use of local and

scientific knowledge for developing low-impact corridors for shipping operations (Dawson et al. 2016).

In the increasing body of literature on Arctic shipping, less attention is given to shipping impacts on local communities. Much of the existing literature on the social impacts of shipping development covers the Canadian Arctic (Christensen et al. 2018; Jull 1990; Dawson et al. 2017; Dawson, Johnston, and Stewart 2014; Stewart, Dawson, and Johnston 2015; Carter et al. 2018; Kelley and Ljubicic 2012), with a focus on marine tourism, which has grown substantially since 2005 and currently presents one of the fastest-growing shipping segments in the area (Dawson et al. 2018). Applying a CBA, scientists have explored the risks and opportunities for Canadian Arctic communities' sociocultural environments in relation to shipping (Stewart, Dawson, and Johnston 2015; Carter et al. 2018).

Although the existing literature on Arctic marine tourism development extends to regions other than the Canadian Arctic, its focus is on economic trends and management practices (Grushenko 2014; Van Bets, Lamers, and van Tatenhove 2017; Lamers and Pashkevich 2018; Pashkevich, Dawson, and Stewart 2015; Olsen et al. 2020) rather than the social and cultural aspects of a community's viability.

Existing studies also address the indirect impacts of shipping development, including the increasing number of visitors arriving with marine vessels (described in Papers 1, 2, and 3). Davydov and Mikhailova (2011) use the example of interactions between the local Nenets population of the Vaigach Island in the Russian Arctic and the passengers of vessels operating along the NSR. The community visitors exchange imported goods for locally collected natural resources "in such quantities that they are capable of damaging the life of the Nenets community on the island" by transforming their local resource management and leading to the breaking of hunting regulations and illegal poaching (Davydov and Mikhailova 2011).

### **3 THEORETICAL AND CONCEPTUAL PERSPECTIVES**

In order to examine the local communities' adaptive capacity in the context of shipping development, I adopt theoretical and conceptual advances from studies on social adaptation to climatic and non-climatic changes (Pelling 2011; Schipper and Burton 2009a). This approach varies from those associated with functionalism and evolutionary thinking in social theory as it focuses on the ability of social actors to plan in proactive and preventative way to respond to vulnerabilities (e.g. Giddens 2011; Burton 2009). The application of the adaptation approach in this study concentrates around (1) an understanding of this research field from sociological perspectives, (2) how adaptation approaches contribute to relevant social science, for example, within Environmental Sociology, and (3) a current use of the framework and its connection to adaptive capacity and other relevant concepts. To illustrate this connection between adaptation and other closely related concepts in contemporary studies on Global Environmental Change (GEC), I apply an analytical model (fig 3.1) based on research advances in this field. This model presents a supportive tool for analysing my empirical data; however, the model is not the representation of the social world's reality, as people produce their own social reality.

Drawing on discussions in the dissertation papers, this section conceptualizes three abstractions that emerge from empirical analysis: the natural environment, local communities and community agency. Their conceptualization follows a sensitizing tradition, one in which a researcher first defines loosely central concepts based on social actors meanings in order to provide an orientation for the research, and then refines their meaning during the research process (Blaikie 2010, 118-119). I apply and refine concepts based on approaches in GEC research and reflections from actor-orientated sociology.

### 3.1 ADAPTATION IN SOCIOLOGICAL THEORY

Adaptation, in this study, relates to local communities' respond strategies to changing conditions, as: *"people have little incentive to adapt unless they believe that their actions can produce desired outcomes or forestall undesired ones"* (Cinner et al. 2018, 120). Understanding how local communities' choices lead desired outcomes (or goals of adaptation) represents the main rationale for applying an adaptation framework to this study. This application also comes with the potential to examine whether, why and how groups or communities choose to respond to changes and what local factors enable such responses. To do so, I approach local communities as collective actors with agency to choose whether and how they deal with changing conditions (the conceptualisation of local communities is also presented in 3.3.2). Hence, the responses may follow several conceptual pathways, including adaptation. In fact, the empirical data indicates that case communities develop responses to changes - such as the impact of shipping traffic - and I argue that the adaptation framework provides tools for understanding these actor-driven responses.

The application of an adaptation approach to understanding local community perspectives on changes in shipping is rooted in major debate in sociology, such as structure versus agency, or a systems versus actor perspective (discussed in for ex. Giddens 1984; Benjaminsen and Svarstad 1998, 18-19; Tucker 1998). One wave of debates in climate change research revolved around the role of individual actions and the ability of social groups to act collectively in order to develop diverse responses. This actor-centered approach emphasizes the role of community agency in enhancing local adaptive capacity and the anticipation of possible impacts. As such, adaptation in this study is understood as a social *process* of developing responses to changing conditions through meaningful actors' interactions to manage, maintain and in some occasions change their way of acting. The choice of adopting an actor-centered approach narrows the focus to the local level, where individuals' action and self-



mobilisation can also take place independently from external institutions, a process known as a community-based adaptation (CBA) (Reid and Schipper 2014; see also Pretty 1995). CBA is a community led process, based on local needs, knowledge and capacities that empower people to address a changing condition themselves (ibid). Though the CBA takes place at the local scale, I should mention that adaptation to climate change is an international concern, instituted at multiple levels in decision-making system. Hence adaptation can also be studied from a top-down perspective (See part 3.3), though that is not a case for this study.

The adaptation approach chosen for this study follows CBA or an actor-centered tradition in sociology which varies from those associated with Darwinian evolution theory (Schipper and Burton 2009c), where adaptation is associated with the process of natural selection (Smithers and Smit 2009, 19). Some sociological concepts - including adaptation - were borrowed from natural science. For example, earlier sociologists such as A. Comte and E. Durkheim approached social systems from an evolutionary perspective and had “a tendency to see it as an organism” (Ritzer 1983, 26, 113). They are also known for influencing the development of structural functionalism. Approaching adaptation as a function of a social system was typical of early British sociologist Herbert Spencer who suggested that, like with plants and animals, social institutions adapt to their social environments. In parallel with Darwinian natural selection, Spencer applies “survival of the fittest” to the social system (e.g. Social Darwinist tradition) (ibid).

In fact, evolutionary components of adaptation were loosely used in social science disciplines in the middle of the 20th century, referring to resource use and risk responses (Orlove 2009). However, in some studies adaptation was received negatively, and was subsequently criticized and avoided (Schipper and Burton 2009c). Adaptation has been one of the central concepts in functionalist tradition, in that it approaches society as a self-regulated system. In Talcott Parsons’ work, for example, adaptation was seen as one of four imperative needs (functions) of a social system in

order to survive: adaptation, goal-attainment, integration and latency/pattern maintenance (AGIL). In the AGIL model, adaptation refers to necessity of “a system to cope with the situational exigencies facing it” (Ritzer 1983, 190; see also Martinussen 1984, 182-183). Parsons also assumes that each evolved subsystem undergoes adaptive upgrading through the increase of adaptive capacity (ibid.).

Functionalist tradition and related evolutionary thinking had a number of limitations and was later criticized by, among others, Giddens (Giddens 1984). Giddens rejects the application of evolutionary thinking in social theory and criticized the view on adaptation of society as a functional need (Held and Thompson 1989, 91; see also Giddens 1984). Functionalism does not tend to consider power and conflict and is not overly concerned with actors’ meanings and actions, seeing actors as passive human beings. Despite this critique, the adaptation concept did not disappear from the social sciences and sociology. The concept of adaptation in sociology refers to social adaptation and/or socialization and integration (Simonet 2010). Even Giddens, for example, adopts the adaptation concept in his work “The politics of climate change”, to address emerging problems of the modern world society - environmental and climate change - arguing that “adaptation as far as possible has to be anticipatory and preventative” (Giddens 2011).

That being said, the adaptation approach applied in this study takes a step away from evolutionary thinking and system approaches (see section 3.3). This tradition acknowledges the role of individual actors and community agency, their meaning and culture in forming the responses to change. In this tradition, adaptation is no longer seen as a linear and passive process but acknowledges actors’ ability (or reluctance) to develop responses to changing conditions.

The discussion of use of the adaptation concept, its limitations, and its connection to other concepts is expanded in Part 3.3. In the next section, I justify the choices of the application of social constructionism paradigm in environmental sociology to examine the elements of adaptation.

## 3.2 SOCIAL CONSTRUCTIONISM AND ENVIRONMENTAL SOCIOLOGY

Within the CBA approach, the research focus is in examining the local perceptions of climate-induced impacts in combination with other changes and the ability of communities to respond to them. With relevance to my study, and in order to integrate the environmental challenges in sociological research, I apply the social constructionist perspectives that originate in sociology<sup>3</sup> and were later adopted into environmental sociology (Hannigan 1995). The study's topic addresses human-nature interactions in two ways: first, changes in sea ice conditions as one of the factors that affects Arctic shipping distribution in space and time, and; second, Arctic shipping development's direct and indirect socio-economic and environmental impacts on local communities.

Another potential benefit from applying the insights from the discipline lies in the relevance of the research topic to some of the central tasks of environmental sociology, such as understanding perception, reaction and adaptation to new environmental conditions by people and governments (Gåsdal and Sande 2009, 16; Lidskog, Mol, and Oosterveer 2015). Furthermore, I approach social phenomenon, like local vulnerability, as a socially constructed phenomenon (Adger and Kelly 1999). To examine local impacts of shipping growth, I apply a logic similar to Hannigan's argument that "catastrophe doesn't construct itself" (Hannigan 2014, 12); where I would argue that the perceived impact and experience of a change are also, in part, socially constructed.

At the same time, this study's research question requires cross-disciplinary insight and advances from studies on adaptation and GEC in order to be understood.

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<sup>3</sup> According to Gåsdal and Sande (2009, p.30), the social constructionism tradition has its origin in Berger and Luckmann (1967) seminal work "The Social Construction of Reality," which discusses how social reality is constantly constructed by its actors. (Hannigan 1995) also refers to M. Spector and J. Kitsuse (1973) work entitled "Social Problems: A Reformation" that challenge structural functional approach to social problems.

The limitation that comes with 'borrowing' concepts from other disciplines is their preconceived connotations and required adjustments. Hence, in line with Lidskog and Waterton (2016), I would argue that environmental sociology has potential to adjust the use of concepts borrowed from natural science disciplines (e.g. adaptation, adaptive capacity) toward more sociological ways of thinking in order to conceptualize relations between humans and changes in their natural environment. I use adaptation as an analytical concept in this study to describe the variety of pathways available and/or developed by community agency, stretching from non-adaptive and resistant choice, to building of resilience, and/or facilitate transition and transformation (See also 3.3)

I should underline that human action and interaction always take place in an environment, be it natural or social. Hence, the relation between the society and the environment have been conceptualized in several social science disciplines prior to the establishment of environmental sociology<sup>4</sup>. However, the need to address the significance of environmental crisis initiated a shift in sociological thinking at the end of 1960s (Dunlap 2001). Around that time, sociological approaches had been moving from system-orientated towards actor-centered perspective, while earlier environmental sociology was enriched by functionalism. The discipline emerged with Dunlap and Catton proposing New Ecological paradigm (NEP) instead of Human Exemptionalist paradigm (HEP). While HEP implicitly assumed that "the world as we know it is solely the outcome of human decisions" and the only limits are socially imposed, NEP aims to incorporate ecological limits to social research (Young 2015, 7-8). Furthermore, Dunlap et al. (2002) emphasize that in contrast to sociology, which studies social processes, environmental sociology fundamentally explores the relationship between modern society and changes in that society's biophysical environment (See also Gåsdal and Sande 2009, 16).

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<sup>4</sup> E.g. Human Ecology (Chicago school), Rural Sociology, Human Geography, Anthropology.

Influenced by both natural and social sciences, there is a long running debate in environmental sociology on understanding of nature. The first perspective - environmental realism - views nature as a semi-autonomous actor, existing independently from society and shaping human behaviour (Young 2015). The second - social constructionism, which is adopted in this study - sees nature as a cultural phenomenon, constructed by actors perceptions, values, and interests (Young 2015; Gåsdal and Sande 2009). Hence, in contrast to realist perspectives, which argue that the environmental impacts shape human behaviors (see Young 2015, p. 59), I follow social constructionist perspectives in order to examine shipping impacts and the perception of said impacts are built through the mobilization of claims. An example of such a construction is presented in the Paper 3, which illustrates that the perception of the natural environment varies between three case communities and depends on their engagement with the surrounding environment; hence the similar impacts from shipping on the environment are perceived differently (Part 3.2.1 Constructing the concept of “the natural environment”).

In this study, I apply two ideas drawn from the social constructionist perspective: (1) the claim-making process, developed by John Hannigan (Hannigan 1995, 2006, 2014) and (2) the construction of environmental problems by Steven Yearley (Yearley 2002, 1992):

1. According to (Hannigan 2006), the construction of environmental problems and claims takes place through a three-step process of assembling, presenting, and contesting. My role as a researcher is central in understanding the process of assembling the claims, their origins and the interests behind them (ibid.). The fact that the claims derive from firsthand knowledge originating at the local level, in the daily experiences of local indigenous and non-indigenous populations (Hannigan 2006, 67-69), has implications for my research as I adopt a community-based approach (Chapter 4: Methodology). In line with earlier established community-based methodology, this study gives the power of defining a problem to local communities (e.g. Hovelsrud and Smit 2010).
2. The construction of a particular environmental problem takes place at the expenses of others (Buttel et al. 2002, referring to Yearley 1991, 1996). Given the

heterogeneity of the Arctic, the study aligns with Yearley's (2002, 275) statement that "[a]t any particular moment there are more potential environmental problems than there is public attention and media coverage devoted to them" and with Young's (2015, 63) assertion that some serious environmental problems do not receive any attention at all. In relation to my study, this indicates that there are possibly several environmental and/or socio-economic impacts from shipping activities that are not identified at a given community.

Although the application of the social constructionism perspective has been useful to analyse my explorative study, providing firsthand insights into identifying shipping impacts and local perceptions of this development, the same perspective comes with some limitations. This is because, first, the construction of an environmental problem "tend[s] to minimize the explanatory role of the actual state of environmental harm or of actual environmental problems," (Yearley 2002, 274) and according to Young (2015, 69), moves attention away from the severity of environmental issues. Second, the social constructionist perspective depends on actors' interpretations (Mjøset 1998, 62), and consequently, the research may result in "multiple and contradictory uncertainty," which may be wrongly used for economic or political motives (Hannigan 2006, 29-33).

The rationale for following social constructionism stems from the need to explore how consequences of shipping development become a social and environmental concern. Here, I align with Adger and Kelly's (1999) approach to vulnerability as a socially constructed phenomenon that is defined by socio-economic and biophysical dynamics. Section 3.3.1 and Paper 4 also reflect on this interconnection between vulnerability and adaptive capacity and resilience—illustrating that the enhancement of adaptive capacity will likely lead to a decrease in vulnerability and increasing resilience. Moreover, actor-oriented sociology coupled with the social constructionist perspective allows me to examine the elements of adaptation and adaptive capacity in the context of changing condition. The following section will present an example of such construction.

### **3.2.1 Constructing the concept of the natural environment**

What are the relationships between shipping development, the natural environment and local communities? The answer to this question, which seemed obvious during early research design, required significantly more attention during data collection and analysis. As presented in Chapter 2, Arctic shipping takes place in a rapidly changing environment, while simultaneously driving many of environmental changes. However, Paper 3 acknowledges and addresses a knowledge gap on if and how the nature–shipping interaction and its impacts become a constructed environmental problem for case communities. The reason for this understanding also lies in the argument made by Lidskog and Sundqvist (2013, p. 33, see also Hannigan, 2006) that environmental problems (in this study’s identified impacts) are constructed by actors who engage with and use the environment.

The socially constructed basis of environmental impacts can be exemplified in how these three local communities perceive the icebreaking activities in the Arctic. In the included Paper 3, empirical data reveals that for the local community of Cambridge Bay, these activities present a threat for local mobility of human and animals and create uncertainty in daily planning. On Svalbard, the local government bodies in Longyearbyen prohibit (with some exceptions) icebreaking in fjords because sea ice presents a platform for animals. Simultaneously, evidence the community of Solovetsky does not mention impacts from icebreaking activities, except for the occasions when icebreakers were required to deliver community resupply.

However, discussing shipping impacts on the (marine) ‘environment’ during the fieldwork and then analyzing the empirical data shows that a focus on environmental impacts alone does not capture all the meanings associated with ‘nature.’ My analysis aligns with Walker (2005, p. 80), who argues that “sociology’s engagement with the environment is that the environment is seen only in terms of crisis, which in turn dissolves into some kind of societal crisis...” Data analysis in Papers 1 and 3 indicates that the natural environment–shipping discussion in this study is not concentrated

only on the notion of crisis, problems, or impacts. Hence, this study examines the natural environment not only as a specific locality but as a web of interconnected variables which affect human activities. Such an approach looks beyond environmental impacts and creates a need to adopt a concept of “the natural environment” that reflects the natural settings as perceived by case communities.

The importance of adopting the concept of “the natural environment” instead of for example “natural capital” is presented in Papers 1 and 3 but should be addressed briefly here. Natural capital usually refers to a collection of natural resources and ecosystem services (Kofinas et al. 2013) that provide the necessary resources to sustain livelihoods (Mortreux and Barnett 2017). As table 3.1 illustrates, the discourse surrounding nature in the context of shipping growth assume different meanings in each of the three communities (in Paper 3) where natural capital presents only one of the identified meanings. Therefore, “the natural environment” can be used as an umbrella concept to summarize those constructed meanings.

Table 3.1 Perceptions of the natural environment in two case communities and added community of Cambridge Bay (modified from Olsen, Carter, and Dawson 2019).

Community	Perception and use of “the natural environment”
Solovetsky	<ul style="list-style-type: none"> <li>- Natural boundary for shipping and tourism seasons</li> <li>- Local natural capacity with limits for use</li> <li>- Natural capital (stock of natural resources)</li> <li>- Natural heritage (an object for protection)</li> </ul>
Longyearbyen	<ul style="list-style-type: none"> <li>- Vulnerable environment (disturbance should be kept to a minimum)</li> <li>- Local natural capacity with limits for use</li> </ul>
Cambridge Bay <sup>5</sup>	<ul style="list-style-type: none"> <li>- Integrated part of the community livelihood (needs to be protected)</li> <li>- Natural capital a part of food security (i.e. natural resources)</li> <li>- Sea ice as platforms for animals and community mobility</li> </ul>

This study suggests employing the concept of “the natural environment” to describe surrounding nature that is modified by human activities and comprises a vital part of their existence. In contrast to the concept of “untouched nature,” “the natural

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<sup>5</sup> Data from Cambridge Bay is used here for visualization of paper results, although it is not a case community in this Ph.D. project. It is considered as a comparator due to the availability of recent data on the research topic.



environment” allows for the further exploration of natural dimensions from sociological perspectives (Paper 3). Here, I agree with Lidskog and Sundqvist (2013, p. 47) who argue that “[t]he task is to focus more clearly on how the nature is used by human[s]... Nature should be integrated as something present that human[s] affect or ha[ve] affected as long as they have existed.” In my work, I examine how local communities perceive their surrounding environment to understand the impact for such environment.

### **3.3 CONTEMPORARY USE OF ADAPTATION**

Given a brief historical use of adaptation concept in sociology and its mainstream in environmental sociology, it is important to mention that in the contemporary social sciences, adaptation to climate change presents rather a complex interdisciplinary concept. Firstly, the conceptual complexity relates to the introduction of adaptation concept in social sciences and integration of approaches from several academic disciplines such as economics, psychology, anthropology, geography, but also influenced by insights from biology (e.g. Simonet 2010). Secondly, complexity emerges from the diversity of research traditions studying adaptation (Pelling 2011; see also Schipper and Burton 2009c). that differ in answers to core questions about adaptation, specifically:

1. What to adapt to?
2. Who or what adapts?
3. How does adaptation occur?
4. What are limits to adaptation?

Furthermore, the first complexity arises with the reintroduction of adaptation to social sciences in 1992 with the implementation of the United Nations Framework Convention on Climate Change (UNFCCC). Adaptation together with mitigation<sup>6</sup> were introduced to reshape our understanding of climate change and environmental

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<sup>6</sup> Actions that reduce greenhouse gases emission

challenges, but also to promote the sustainable development agenda in an era of Earth's history often called the Anthropocene. This era calls for the necessity to explore new pathways of environmental, sustainability, and development policies and “emerging coexistence with earth system variability, encompassing both human dignity and environmental sustainability” (Lynch and Veland 2018).

This reintroduced adaptation concept presents a new direction in social science research that underlines the crisis in interrelation between the natural environment and society, recognising the role of social actors (here, community agency) in planning proactive and preventative ways to respond to vulnerabilities (Smithers and Smit 2009; see also Giddens 2011, 164). Studies have moved from theorising on adaptation as a technical act of adjustment, towards a process with a need to integrate local values and perceptions (Pelling 2011). Burton (2009, 13), argues that the reintroduction of adaptation does not represent a return of evolutionary thinking but requires a focused change toward strengthening social adaptive capacity.

The IPCC reports (IPCC 2014a, 2007, 2001) present a comprehensive synthesis of adaptation and mitigation to climate change literature (Schipper and Burton 2009b). Moreover, the development of adaptation knowledge in the IPCC reports corresponds to an increasing body of literature on the Human Dimensions of Climate Change (HDCC) (Ford et al. 2012b; Ford et al. 2012a). These studies examine the local impacts and community responses to climate-induced changes in combination with other changes. The studies also recognize that adaptation to environmental changes is not a new social phenomenon, as local communities have historically been adapting to weather variations. However, the modern challenges of adaptation to climate change lies in a change of temporal scale - from episodic to constant, spatial scale - from local to global scale (O'Brien and Selboe 2015) and the necessity to respond in a sustainable way (Schipper and Burton 2009b).

The second complexity of adaptation approaches connects to the first complexity due to diversity of research traditions (Pelling 2011). Many of these

research traditions differ from others in their *actor* perspectives (whether individual or collective), studied *outcomes* (here adaptation pathways), and come with a set of relative to adaptation concepts. The actor perspective refers to the multitude of involved actors in adaptation *governance*.<sup>7</sup> Hence, the research design would differ with respect to who is defined as having *agency* (see for ex. Tennberg 2012, 6; Giddens 2011, 5). This study, in contrast to top-down adaptation, emphasizes shared power and responsibility, looks at local bottom-up initiatives, and the role of community agency in local responses.

Furthermore, these research traditions differ due to examining different types of outcomes. Adaptation, as an analytical concept, refers to a process that aims to reduce vulnerability and enhance community resilience (Adger et al. 2009; Smit and Wandel 2006). Depending on the context, adaptation can take several development pathways, such as enhancement of resilience, enabling transition and/or transformation<sup>8</sup> (Pelling 2011). Adaptive responses may also lead to maladaptation, that reduces adaptive capacity, or to restrictions of the implementation of adaptation (Brown, Naylor, and Quinn 2017). It is also suggested that the adaptation approach has a strong connection to sustainable development agenda, as the ability to adapt to change is one of the conditions for sustainability (Berman, Kofinas, and BurnSilver 2017). That being said, some scholars argue that adaptation can be a synonym to sustainable development, while others argue that adaptation might lead us to move in a sustainable direction (Pelling 2011).

In addition to the above-described complexities, the application of the adaptation framework has other limitations for my work. Firstly, despite a growing research and attention to adaptation, there is still no consensus among scholars and

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<sup>7</sup> “Governance refers to a multitude of actors, activities and relations between the state and other societal bodies working for the “government” (Tennberg 2012, 6)

<sup>8</sup> Resilience pathway refers to improving of actions without questioning of established practices (maintaining status quo); transitional pathway facilitate incremental change and transformation leads to radical change (Pelling 2011, 23).

researchers on its definition (e.g. Biagini et al. 2014, 98). I should mention that each research tradition comes with its own set of concepts. If the concept's use is not actively clarified in a given work, it can create communicative challenges within a given research framework. Secondly, adaptation requires a common understanding of a changing condition. As illustrated in paper 1, skepticism about climate change and its connection to sea ice reduction in the Russian community may affect the efficiency of adaptation. Especially in the situations when the changes in the navigation season do not lead to the extension of the vessel's operations period. Thirdly, by focusing on the outcomes the adaptation approach is limited to the degree which it can facilitate discussion on power and conflict and hence disguise important dynamics and even prevent important voices from being expressed. For example, little focus is given to those actors who choose not to adapt or those who moved away from a community because of change (this is also a case in my study). The fourth limitation relates to a dilemma around how much a given community should adapt. For example, in relation to cruise industry development it refers to the possible limitations in the length of the navigation season, the number of vessels and passengers, and the geographical distribution of vessels.

In proceeding with this study, I will reflect on the previously mentioned core questions on adaptation. The first two questions (what to adapt to and who adapts) are guided by the CBA research approach, as the study aims to understand the case communities' adaptation to increasing ship traffic in the context of climate change. The last two questions (how adaptation occurs and what are the limits of adaptation) are addressed in the empirical articles that analyze community adaptation processes, but also the limitation and trade-offs of adaptation and adaptive capacity.

The analysis of CBA usually starts with an exploration of local communities' vulnerability, exposure-sensitivity, and capacities in order to examine adaptive responses (Smit et al. 2010; Smit and Wandel 2006). These concepts are context dependent and vary between social units and scales. In this study, the application of

these connected concepts is presented in Figure 3.1 and explained in the following section. I should reinforce that this model presents an analytical tool for analysis and does not project perfectly on the social world.

To conclude, the choice of applying the CBA approach comes with the necessity to address emerging conditions where community-developed responses are studied as a supportive mechanism to existing adaptation governance. Since adaptation presents manifestations of adaptive capacity (Smit and Wandel 2006), I aim to contribute to this debate by examining how local communities build their adaptive capacity.

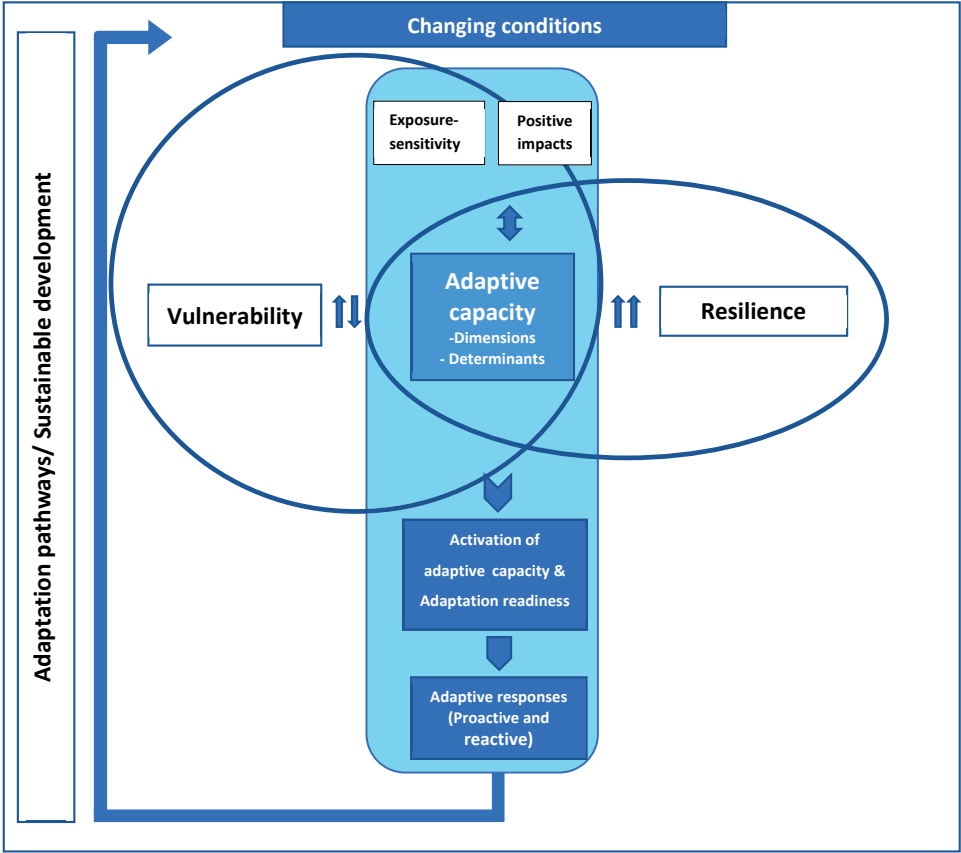


Fig. 3.1 Adaptive capacity as a study object. The 'blue box' represents adaptive capacity and its connection to adaptive responses, and the 'white box' represents concepts in GEC literature that are applied in this study.

### 3.3.1 Adaptive capacity

I investigate the development of adaptive capacity's conceptual framework by Arctic scholars (HDCA) in Paper 4. This part synthesizes the paper results and a contemporary understanding of the adaptive capacity in GEC literature.

Adaptive capacity is one of the central concepts in the GEC and HDCA literature and is applied in this study to examine what factors in a given community lead to or limit adaptation responses. Simultaneously, I should make clear that these concepts can create a dilemma, as with in earlier research traditions, adaptive capacity was described as a system variable (e.g. functionalism, evolutionary thinking). In contrast to system thinking, adaptive capacity in CBA is used as an analytical concept that is actor-centered and socially constructed.

There is a debate in GEC literature on the relationship between adaptive capacity and resilience. Smit et al. (2010) argue that adaptive capacity is closely related to resilience. Resilience can be defined as a local ability to cope with and adjust to changing conditions, an ability that is shaped by local processes and cultural characteristics (Amundsen 2013). Paper 1 also identifies that, in the Russian context, adaptive capacity and resilience in some discussions, are synonymous (Olsen and Nenasheva 2018). However, resilience is usually studied as a property of the socio-ecological system to maintain its core functions in order to adapt, change but also transform if the system is no longer able to adapt (Arctic Council 2013).

In line with Pelling (2011, p. 21) and Brown and Westaway (2011), I approach adaptive capacity and adaptive actions (responses) as preconditions for adaptation. Latent characteristics of adaptive capacity must be activated to drive the scope of actions that affect adaptation (Brown and Westaway 2011, p. 322). Moreover, adaptive capacity is a context dependent and dynamic attribute of society that changes over time and manifests across scales (Pelling 2011; Smit and Wandel 2006). In Paper 4, I show how, over the past two decades, the adaptive capacity framework has been developed theoretically and methodologically in the literature that studies

Arctic communities. This part reflects on some aspects of this development also in the GEC literature.

Adaptive capacity in CBA studies is an “individual’s or community’s ability to cope with, adjust to or recover” from particular conditions, forces, and impact factors (Smit et al. 2010, p.5)<sup>9</sup>. A community’s ability to respond is not only associated with a set of necessary recourses, but in a combination with community willingness and ability to convert resources into actions. Cinner et al. (2018, 117) suggests that several aspects can contribute to building adaptive capacity, such as community assets; flexibility of changing responses; social learning; and community agency with free choices on those responses that is also dependent on the ability to act collectively (ibid). The last two elements, community agency and the ability to act collectively, represent a specific interest in this study and are discussed in Part 3.3.3.

The concept of adaptive capacity presents a cornerstone concept in this study. Within the GEC literature, it is approached as a dynamic variable that is interlinked with other analytical categories. In Figure 3.1, I summarise the recent research advance to illustrate those interconnections. With the help of this model, an analytical tool, I analyse my findings, but this model does not present the social reality.

Adaptive capacity, in this model has an inverse connection with social vulnerability: when enhancement of adaptive capacity lead to adaptation, vulnerability decreases. Similar to existing studies, I approach vulnerability (see Paper 4) as a degree of community susceptibility to changing conditions, which comprises of both adaptive capacity and exposure-sensitivity (Smit et al. 2010; Smit and Wandel 2006; Berman, Kofinas, and BurnSilver 2017). Here, exposure-sensitivity refers to the likelihood that a community will experience changing conditions, and the ways in which they are sensitive to such conditions (Hovelsrud and Smit 2010; Engle 2011).

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<sup>9</sup> In IPCC reports, adaptive capacity also refers to “the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences”(IPCC 2014a, 118).

Though vulnerability is a central concept in adaptation studies, I would argue that its examination alone is not sufficient for understanding adaptation pathways and must be considered together with aspects of adaptive capacity and the way with which it is activated.

Research interest in adaptive capacity has increased after it was highlighted in the IPCC's Third Assessment Report (2001) and can be viewed as occurring in two generations (Mortreux and Barnett 2017, see also Paper 4). The first generation of adaptive capacity studies, according to Mortreux and Barnett (2017), assumes that availability of assets that determine adaptive capacity are translated into actions; while the second generation tests this assumption and tries to explain the mobilization of adaptive capacity into adaptive actions/responses.

In the first generation, adaptive capacity was measured by one's capabilities (assets) (Mortreux and Barnett 2017; see also Engle 2011). This is also relevant to my research, where the examination of adaptive capacity starts with identification of assets (also known as capitals) (Smit and Pilifosova 2001; Furness and Nelson 2016). underline that the studies on the community attributes that determine adaptive capacity have been influenced by different research traditions (including vulnerability and resilience approaches). Therefore, different concepts can be used to describe those attributes. For example some scholars, including those that apply resilience approaches, examine the kinds of capital that determine adaptive capacity (Kofinas et al. 2013; Mortreux and Barnett 2017; Furness and Nelson 2016), such as human, social, natural, physical, financial, knowledge access and cultural capital.

In line with IPCC reports and GEC literature, I conceptualise assets and attributes that have a potential to enhance a community's ability to respond to change as *determinants* of adaptive capacity. I adopt this definition from the third IPCC Assessment Report, where Smit and Pilifosova (2001) summarize the determinants that assist the social ability to adapt to changing conditions. These determinants relate to communities' features or contextual conditions and comprise



economic resources, technology, information and skills, infrastructure, institutions, and equity (Smit and Pilifosova 2001 p. 895).

In recent years, studies have expanded the list of empirically defined determinants of adaptive capacity by integrating latent cognitive attributes, such as values, perceptions, and attitudes (Adger et al. 2009; Furness and Nelson 2016; O'Brien and Wolf 2010). Hence, the adaptive capacity can be approached analytically as a sum of objective (access to resources, infrastructure, technology, and governance) and/or subjective dimensions (place attachment, flexibility, culture, knowledge, ethics, and perception of risks, etc.) (Amundsen 2013; Bay-Larsen and Hovelsrud 2017; Hovelsrud, Karlsson, and Olsen 2018; Risvoll 2015, see also Papers 1, 2 and 3).

Even though it is sometimes assumed that availability of assets enhances adaptive capacity, in line with Keskitalo et al. (2011), I argue that they may serve as a barrier for adaptation. Keskitalo et al. (2011) argue that technology is important for time savings, but implementing technologies comes with high maintenance costs that may become a barrier. In Paper 1, we argue that the economic benefits from shipping and tourism development can both enhance local adaptive capacity if it contributes to local value creation, but may weaken it if the income does not remain in the local community (Olsen and Nenasheva 2018). Additionally, this study has examined whether the determinants of adaptive capacity are interlinked. Paper 1 illustrates that these interlinkages may reveal trade-offs, for example, between local decision making and local values, but also between economic resources, infrastructure development, and the natural environment.

It should also be noted that the relationship between adaptation and adaptive capacity is complex (Ford and King 2015). The availability of community assets which determine adaptive capacity does not necessarily result in adaptation (Mortreux and Barnett 2017; Bay-Larsen and Hovelsrud 2017), meaning that the asset-based theory reveals a gap between adaptive capacity and adaptive responses (Mortreux and

Barnett 2017). Merely having assets or potential adaptive capacity does not guarantee actual adaptation. Hence, the focus has shifted towards factors that mobilize local adaptive capacity and translate it into adaptive responses.

This same shift resulted in the development of the second generation of adaptive capacity research, which explores the preconditions for mobilizing adaptive capacity (Mortreux and Barnett 2017). This research direction explores the role of psycho-social or subjective attributes of adaptive capacity (O'Brien and Wolf 2010) and the role of community agency (Cinner et al. 2018). Given the diversity in worldviews and values across and within the communities, subjective variables may activate local adaptive capacity and, similar to objective variables, may also create barriers to adaptation (Adger et al. 2009; Bay-Larsen and Hovelsrud 2017). Based on results from a literature review, Mortreux and Barnett (2017) list subjective factors that activate local adaptive capacity, such as risk attitudes, personal experience, trust and expectations in authorities, place attachment, competing concerns, and household composition and dynamics. Building on these results, and from other scientific literature (e.g. O'Brien and Wolf 2010; Wolf, Alice, and Bell 2013), I examine the role of local values in shaping local adaptive capacity, arguing that they may lead to trade-offs which in turn can weaken local adaptive capacity (Paper 1). Paper 1 illustrates that infrastructure development to accommodate increasing shipping and tourism may result in a trade-off of local values if local history and traditions are not considered during the construction process (Olsen and Nenasheva 2018). Paper 2 emphasizes that local subjective determinants, such as sense of place, perception changes in the natural environment, cooperation practices, and the ability to influence decision making motivates community agency in developing adaptive responses.

Mobilization of adaptive capacity through community agency is dependent on both the ability to act collectively (Adger 2003; Pelling and High 2005), and the form of said community engagement (See Part 3.3.3). Regarding governance

arrangements, Ford and King (2015, p. 505) introduce the concept of adaptation readiness, which seeks to characterize whether leadership/agency are prepared and ready to “do adaptation”. Additionally, in this dissertation, this also relates to adaptive responses. Therefore, scholars suggest that activation of adaptive capacity (Mortreux and Barnett 2017; Bay-Larsen and Hovelsrud 2017; Hovelsrud, West, and Dannevig 2015) and adaptation readiness (Ford, McDowell, and Pearce 2015) can facilitate adaptive responses (Fig. 3.1).

### **3.3.2 Conceptualizing local communities**

The need for understanding the characteristics of local community is twofold:

1. Local community presents a study case in my research. This leads to question whether Longyearbyen has community characteristics?
2. Local community comprises diverse groups of residents and stakeholders with different perceptions of change and sense of belonging. What does this plurality mean for community responses and adaptation?

The conceptualisation of local community has been debated in various disciplines - sociology, anthropology and human geography, to name a few- to address, amongst others, relational and special dimensions of social grouping (Munkejord 2016, 433, referring to Panelli 2006). Although there are some conceptual similarities in the way the literature approaches ‘local community,’ there exist multiple definitions in the literature (Aarsæther 2016, 135). In line with Tuen (1997 in Haugen and Villa 2016, p. 20), I approach local community as a socially constructed entity that facilitates interaction of diverse groups of residents and processes. The geographical boundaries of such interactions are case dependent and can expand beyond a given settlement (ibid.). However, with relevance to my study, it is important to note that in the Arctic context, the concept ‘local communities’ is also usually applied to small settlements - a geographically bounded social unit - outside urban regions, with a population of up to a few thousand (Aarsæther 2015, 139). Those Arctic communities are directly or indirectly affected by global processes and

socio-economic, cultural, and environmental changes (AHDR 2004; AMAP 2017), where increased shipping is an example of emergent change.

In this work, I move away from the earlier structural functionalist traditions, which see local community as a stable phenomenon (Munkejord 2016 referring to Panelli 2006). Simultaneously, I align with the contemporary approach that highlights the role of community agency, power, meanings (here also perceptions and traditions), networks and change processes in forming local community. As such, the community concept in this study is associated with a relational dimension, referring to interactions between people who feel attached to a place or an area (Haugen and Villa 2016, p.18; McMillan and Chavis 1986). Such relations, according to Valestrand (2016, referring to Gullestad 1978) are characterised by a certain form of livelihoods, physical proximity, facilitation of interactions and shared perceptions of challenges and duties, experiences, and tasks which all contribute to shaping local institutions (administrative or voluntary organizations) (see also Aarsæther 2016; Haugen and Villa 2016).

At the same time, this diversity in community characteristics may contribute to the diversity in communities' response to changing conditions within and between settlements in the same region (Rasmussen, Hovelsrud, and Gearheard 2014, 428). Such diversity also comes with two interconnected aspects that are discussed throughout the dissertation papers: community viability and livelihoods. Aarsæther (2016, p.139) describes a viable community as "one in which people feel they can stay as inhabitants for a period of their lives, where they find sources of income and meaningful lives." According to Rasmussen, Hovelsrud, and Gearheard (2014, p. 434), community viability connects to place (place attachment), their natural environment, and a sense of common identity, while the term 'livelihoods' describes the types of activities in a specific community. Hence, before mapping the impacts of shipping development, this study is concerned with examining the two contextual variables - case communities' livelihoods and viability. Additionally, I would argue that despite

the demographic diversity and rotation, Longyearbyen can be studied as a local community due to presence of community characteristics.

Second, by studying local community, I recognized the theoretical implication that derives from the understanding of heterogeneity of 'local' population. Following the social constructionism tradition, I would argue that the first-hand and/or local knowledge is important in constructing the problem. In line with Hannigan (2014, 57-58) I would argue that a researcher should, among other things, note "where the claim [about the problem] comes from, who owns or manage it, what economic and political interest claim-makers represent and what type of resources they bring to claim-making process". This is because, the impacts from changing conditions will differ from community to community, and from resident to resident (Cinner et al. 2018). Both case communities present heterogeneous combination of inhabitants and stakeholders with diverse perceptions of shipping trends and impacts. The research task was to secure this plurality of voice by including residents who are engaged with and/or affected by a diverse type of shipping. The integration of this heterogeneity of voices is presented in the empirical papers where I describe the diversity of the identified impacts that are also summarised in the table 6.1. Moreover, the understanding the origins of the claims was challenged by the understanding of who are 'locals' and how they become claim-makers.

In modern society 'locals' here refers to one's sense of belonging and place attachment. Giddens (1990) suggests that modernity is characterised by a greater interaction of people with those who are strangers to them; and a modern phenomenon of multiple belongings (Haugen and Villa 2016, 21).

'Locals', when applied to community members means different things. For example, by some measures, a local resident in Longyearbyen is the one who have resided there for more than 30 days; however, according to the interviewees this was not a case a few years-decades ago when locals, were those who have been living there for many years. 'Locals' on Solovetsky are long-term residents and those who

might no longer live on Solovetsky but visit the community and their relatives. A similar logic is applied to organizations and institutions that are localised on the Archipelagos but are not necessarily registered there. One of the seasonal summer workers on Solovetsky expresses the place belonging as “Osoloveli”- becoming local or becoming a part of Solovki. A similar expression is used to describe people who visit Svalbard and tend to come back: “Svalbardbasillen” or the “Svalbard virus”. Hence, I argue that in contrast to settlements, which geographical boundaries belong to a physical setting, communities can reach beyond the boundaries of a given settlements (see also Rasmussen, Hovelsrud, and Gearheard 2014). Moreover, the shipping-related stakeholders are not necessarily those who are located on the Archipelago. The Solovetsky case (Paper 1) illustrates that some stakeholders are based in Arkhangelsk, an administrative center of the region, or in other neighbouring regions.

Hence, I would suggest that the official demographic information of a particular local community does not necessarily inform the researcher of who the ‘locals’ are. Instead, further investigation is required to map those actors whose knowledge is important in constructing the multiple sides of a changing condition.

### **3.3.3 Conceptualizing community agency**

The increasing focus on climate-induced changes and realization of the limitations of top-down governmental power in responding to them emphasizes the role of community agency in developing local adaptive responses. As mentioned above, availability of resources in a given community would not necessarily lead to such adaptive responses if community does not have power, freedom and knowledge for their mobilization (see also Cinner et al. 2018). Based on the empirical results, I argue that *community agency* has a focal role in *activating* local adaptive capacity to enable adaptive responses. Such bottom-up approaches and responses support and correct institutional or top-down responses.

The phenomenon of community agency is examined closely in this dissertation, and I approach it as an important community characteristic in the understanding of and responses to increasing ship traffic. It is first discussed in Paper 1, referring to the Solovetsky community involvement in decision making regarding shipping development. Following that, Paper 2 discusses the role of local community engagement in enabling adaptive responses and, in Paper 3, the local perceptions of the natural environment. In line with Cinner et al. (2018), my empirical studies indicate that community agency mobilizes adaptive capacity but may also create barriers or problems through adaptation responses in the form of trade-offs. Moreover, I and my co-authors conclude in Paper 2, that community agency is supported by engaged actors and community initiatives and, thus, is sensitive to community fluctuation and demographic changes.

A conceptualization of community agency (an umbrella concept for the community processes described above) follows a sensitizing tradition allows the researcher to get closer to the actors' meanings about social phenomenon in case communities. Then, I refine these meanings with a use of theoretical or academic disciplinary language. In doing so, I adopt a definition of agency described by Giddens (Giddens 1984, 14; Tucker 1998, 80) and by Cinner et al. (2018, 120). Here, they "refer to the ability of people - individually or collectively — to have free choice in responding to environmental change. It [agency] is dependent upon people's belief in their own ability to perform and manage prospective situations and control events that affect them, encompassing aspects of empowerment, motivation, and cognition (ibid). The empirical papers suggest that the community agency depends on (1) local ability to act collectively, (2) the form of local engagement, and (3) inclusion of relevant stakeholders.

The ability to act collectively to develop adaptive responses presents an important characteristic of local community (Adger 2003). This aspect of community agency has been explored in adaptation studies to understand if and how formal and

informal relations between community individuals and other stakeholders lead to adaptive responses (e.g. Karlsson and Hovelsrud 2015; Adger 2003). Collective action is of special interest in such a dynamic and multi-cultural community of Longyearbyen, where community members develop adaptive responses despite a short residence period. Our analysis in Paper 2 indicates that the collective actions and engagement are motivated by four contextual factors: place connection, perception of the changing natural environment, cooperation practices, and the possibility to influence decision making.

According to Wøien (1998, 325), local engagement has several forms and ranges from passive engagement (a population simply being informed about a project) to self-mobilization (active participation). To describe these conceptual differences, this study adopts Wøien’s (1998, modified from Pretty 1995) typology of local engagement (Table 3.2).

Table 3.2 Forms of local engagement (modified from Wøien 1998, see also Arnstein 1969; Pretty 1995).

Typology <sup>10</sup>	Practices
1. Passive participation	People participate by being told by external actors what is going to happen.
2. Information-provided participation	People participate by answering questions from external actors, without the possibility to change decisions.
3. Participation by consultation	People participate by being consulted. External agents define problems and solutions beforehand, but responses can change decisions.
4. Participation for material incentives	People participate by contributing resources, for example labor, in return for material incentives.
5. Functional participation	People may participate by forming groups to meet predetermined objectives related to the project.
6. Interactive participation	People participate in joint analysis, development of action plans, and formation or strengthening of local institutions that would control local decisions.
7. Self-mobilization	People participate by taking initiatives independently of external agents.

<sup>10</sup> Wøien (1998). 1–4: projects are developed independently of local participation; 5–6: local participation affects decision making; 7: collective action rather than participation.



For example, in the case of Longyearbyen, Paper 2 provides examples of community engagement in adaptive responses, such as strengthening of local preparedness, forming cruise networks of local actors, improving infrastructure, and mapping opportunities for fishing activities. This means Longyearbyen's engagement falls within categories 6–7. Alternatively, despite existing self-mobilization initiatives on Solovetsky (such as the development of private tourism services) Paper 1 indicates that community engagement is more akin to that which Wøien (1998, 324) calls a “means to achieve objectives that are already predetermined by other stakeholders” (in Paper 1, this would mean industrial and regional stakeholders). Here it is important to mention that in the ‘five-keys’ decision-making model, several stakeholders are residents, meaning that local engagement applies to categories 4–7.

Additionally, Wøien (1998) describes another type of engagement, in the form of grassroots movements (in Norwegian *grasrotbevegelse*), referring to NGOs that emerge due to a lack of formal institutional arrangements. An NGO —The Red Cross — is also described in the Svalbard case (Paper 2) as a local resource for SAR and preparedness activities.

Agreeing with Pettersson, Stjernström, and Keskitalo (2017, 994), I argue engagement is not the only thing of import here, but also the time component; meaning, that earlier participation in the planning process for development of shipping responses, reduces the potential for conflicts of interest. In fact, some Arctic communities are sometimes uninformed about shipping and cruise development (Olsen, Carter, and Dawson 2019). This lack of information limits the community's ability to exercise their agency.

Finally, social connections within communities and with other relevant stakeholders who are not necessarily located in the main geographic community may provide support, knowledge and resources, thus strengthening local adaptive capacity (Cinner et al. 2018). This presupposes that stakeholders, even those having

complementary and/or conflicting interests, may agree on outcomes (Sautter and Leisen 1999). The shipping stakeholders in this study comprise of a mosaic of individuals, community networks, organizations and representatives including multi-level decision-making systems, but also researchers and other supporting organizations, such as SAR services (Olsen et al. 2020). However, the results in the Paper 1 indicate that the inclusion of multiple stakeholders does not always strengthen local adaptive capacity. The possibility for trade-offs arises when relevant stakeholders fail to consider local cultural characteristics and values, and address community needs and perspectives. Such trade-offs emerge in situations when local values are not addressed in decision-making, planning for infrastructure development in historically and ecologically important places.

### **3.5 REFLECTIONS FROM THE RUSSIAN CONTEXT**

One of the key questions the study is concerned with is what the challenges are for transferring a research approach to a new study area/context (RQ3). Papers 1 and 3 examine the application of Western theoretical approaches and concepts within the adaptation field for the Russian context. In both papers, I argue that this application comes with some limitations but also opportunities. I will present some reflections in this section.

Before conducting this research, it was clear that few studies had examined adaptation and the adaptive capacity of Russian local communities. Therefore, in this study, I was faced with not only a lack of available literature, but also with difficulties translating concepts to and from the Russian language. This challenge corresponds with Stammler-Gossmann's (2010, 136) statement that "[A] specific challenge in assessing vulnerability [and other concepts] for the Russian case studies is served by the fact that the whole climate change vocabulary is simply transferred from Western vocabulary, which does not necessarily correspond with Russian understanding of terms." Stammler-Gossmann (2010, 136) further argues that the challenge is not only

rooted in translation but also in the compatibility of Western concepts with the Russian cultural context. This is further exacerbated by climate change skepticism in the context (Forbes et al. 2009; Graybill 2013). The methodological section of this dissertation reflects on the skepticism of some Russian interviewees on the connection between climate change and retreating sea ice. Compared to other Arctic nations, Russia was late in coming on board with climate change measures: (1) ratification of Paris agreement took place in October 2019 (Devyatkin 2020), while (2) the national plan for adaptation was issued in December 2019 (The Russian Government 2019).

A further challenge is that one of the central concepts of this dissertation, “adaptive capacity,” can be translated to Russian in three different ways. When translated directly, it reads as “adaptive potential,” but it can also be stated as “adaptive opportunity” and “adaptive ability or capacity” (see Paper 4). Each of these translations is widely used in Russian scientific literature. Moreover, the recent translation into Russian of the IPCC AR5 Synthesis report (IPCC 2014b) uses at least two different translations of the term, such as “adaptive ability (or capacity)” and “adaptive potential.”

Furthermore, the analysis of empirical data revealed that the use of Western concepts for describing the Russian context may be contradictory. Paper 1 illustrates the need to substitute the concept of “governance” for “decision making” to avoid misunderstanding. This is because the concept of “governance” (meaning the participation of several stakeholders in a decision-making process) is sometimes associated with the concept “to govern,” which is a specific type of top-down decision making.

It is important to acknowledge that the field of environmental sociology is more deeply established in Western academia (Buttel et al. 2002) than in Russian. However, Lidskog et al. (2015) argue that the US and European roots of environmental sociology have become a globally acknowledged discipline, particularly with the launch of the journal “Environmental Sociology,” in 2015.

Given these developments, it is important to recognize that several Russian scholars have contributed to the field's development, including Yanitsky. However, although this sub-discipline is becoming more mainstream in Russian academia (e.g. Yanitsky 2011), the Russian context is still less represented in globally available studies that examine social and environmental relations. Yanitsky (2014) attributes this to the fact that the discipline of environmental sociology is still not thoroughly institutionalized in Russian academia. Moreover, I would argue that most of these studies are published only in Russian and therefore are not broadly disseminated to an international audience.

## 4 METHODOLOGY

*“Thus, the task is not so much to see what no one yet has seen,  
but to think what nobody yet has thought about that which everybody sees.”*  
(Schopenhauer in Aase and Fossåskaret 2014)

### 4.1 RESEARCH DESIGN

The methodological considerations for this study began with the question: what kind of knowledge can be generated about adaptive capacity? Engle (2011) argues that the latent nature of adaptive capacity can be empirically investigated by examining actions from previous changing conditions and using this knowledge as a proxy for understanding future adaptive capacity (see also Hovelsrud and Smit 2010). Furthermore, Engle (2011, 653) suggests that the adaptive capacity assessment can be done by measuring or characterizing local adaptive capacity. This measuring approach contributes to theory building since it identifies and describes which determinants of adaptive capacity are salient and are mobilized in response to an exposure-sensitivity from a changing condition, while the characterizing approach, in contrast, applies theory in order to assess adaptive capacity through pre-determined system attributes (ibid).

This study employs the measuring approach for examining local adaptive capacity and its determinants. Following constructionist perspectives, which assume that the social world is constructed by the social actors perception and the language that they use (Easterby-Smith, Thorpe, and Jackson 2012; Blaikie 2010), the knowledge in this study derives from those actors and their context, while my role as a social scientist is to interpret and translate this knowledge into scientific results (Blaikie 2010, 95).

As explained in Paper 4, research on adaptive capacity still calls for theoretical and conceptual development (see also Siders 2019). Hence, this work is designed as a qualitative, explorative study that adopts case-study methodology in order to: (1) increase our knowledge about the social phenomenon of adaptive capacity in the

context of shipping growth and (2) contribute to theoretical development by applying a framework to analyze the empirical data collected in the unique community of Longyearbyen (see Papers 2 and 3) and in the Russian context that is still underrepresented in the international scientific literature (see, e.g. Papers 1 and 4).

Blaikie (2010, 70) acknowledges the importance of explorative studies where knowledge on the research topic or about the research context is limited and calls for flexibility in methods, while also exploring new contexts and phenomena. This flexibility and reflection on conducting explorative research I present throughout the chapter.

My previous experience with research projects on community adaptation, coupled with guidelines in the methodological literature, helped me to design this research process. The process comprises all decisions about the research project before it is carried out and consists of several interrelated elements, such as research questions, strategy, research paradigm, concepts, data sources, selection, collection, and analysis (Blaikie 2010, 43).

The decisions related to this study are divided into three main phases of the research process: planning, data collection, and data analysis (adopted from Holm 2018). The planning phase incorporates decisions relating to research design, which develop the research protocol and case study selection. Data collection involves some decisions on timing and the process of the fieldwork itself. The data analysis phase incorporates decisions on coding strategies. This chapter presents the decisions associated with planning of an explorative study, illustrating that a researcher is not always aware of all challenges before collecting and analyzing the empirical material. The empirical material is described by Alvesson and Kärreman (2011, 14) as “an artifact of interpretations and the use of specific vocabularies,” pointing to the role of the researcher “who act[s] as a mediator of the social world.” The following sections illustrate choices made in regard to studying the social reality, that is local adaptive capacity in the context of increasing shipping activities.

## **4.2. PREPARATION**

### **4.2.1 Research approaches**

In this study, I apply case-study research inquiry guided by a CBA, which are frequently used in studies on HDCA (e.g. Ford et al. 2012b; Ford et al. 2012a; Hovelsrud and Smit 2010; Andrachuk and Smit 2012; Ford and Smit 2004; Smit and Wandel 2006) to understand in-depth the social phenomena of community vulnerability, adaptation, resilience, and/or adaptative capacity in the context of multiple changes. In line with HDCA studies, I apply a bottom-up approach, via an active engagement with community representatives, “to understand the stakeholders’ own information on their exposure-sensitivities and adaptive capacity” (Smit et al. 2010) and to “ensure legitimacy, information collection on community relevant phenomena and processes, the integration of information from multiple sources, and the engagement of decision-makers” (Smit and Wandel 2006, 288).

Similar to HDCA scholars, I study local context and am also concerned with understanding the multiple changes taking place in the Arctic and the rest of the world that influence a community’s viability. Shipping presents one of the changing conditions in the Arctic that occur in certain socio-economic, governance, and environmental settings. As described in Figure 1.2, I approach shipping development as one of many factors that influence local adaptive capacity and as a changing condition to which local communities respond.

I employ the case study approach to examine the social phenomenon of local adaptive capacity in the context of shipping growth. The case study is an empirical enquiry that investigates a contemporary phenomenon in-depth, using holistic and real-world perspectives without manipulation of the participants’ behaviors (Yin 2014) and according to Alvesson and Kärreman (2011, 3), when properly designed, contributes to theory building because of its potential for multi-layered descriptions that challenge established perspectives in the research field.

I found that the case study research approach, integrated with CBA, gave an opportunity for the further development of the adaptive capacity framework, through exploring local context and identifying salient aspects of adaptive capacity by engagement with community residents. Although there is criticism of case study research, related to the generalization of the research findings, scholars such as Yin (2014) and Blaikie (2010) contest this criticism. Yin (2014) compares the case study inquiry with an experiment, arguing that generalization is rare when based on one sample, while Blaikie (2010) argues that generalizations are possible but would require detailed descriptions of the sites in which study is conducted and selected methods. In designing the case study, the contextual characteristics and conditions should be examined in relation to the case itself (Yin 2014, 50).

In relation to this study, adaptive capacity as a sub-variable of adaptation varies broadly among communities, making it difficult to generalize the findings. However, in Paper 4, I show that despite the difference in context and the determinants of adaptive capacity (also its proxies), there are a number of similar local determinants of adaptive capacity that enable adaptive responses, making it possible to compare both the determinants and the adaptation processes across cases (e.g. Hovelsrud and Smit 2010, AMAP 2017a).

Case study inquiry in this study applies community-based, bottom-up approaches that correspond with the principles of abductive research strategy. This research strategy differs from inductive, deductive, and retroductive strategies in its ontological and epistemological assumptions, types of research questions, and purposes and it aims to contribute to theory development by elevating social actors' meanings and perceptions (Blaikie 2010, 89). While abductive and inductive methods can be used for exploration or descriptive purposes and can answer 'what' questions, deductive and retroductive strategies are used to answer 'why' questions and are applied for explanatory research (Blaikie 2010). Alvesson and Sköldberg (2009, 3) explain that induction strategy works to draw general conclusions from several cases,



while deductive research generally explains a single case. Abduction strategy is used in many case studies, as interpretation of a single case derives from a theory (that is an object for adjustment); and new cases can strengthen the interpretation (ibid.). Abductive research strategy entails a combination of idealist ontology and constructionism epistemology (Blaikie 2010, 96). In this study based on Bell's (1998, 3) discussion on the idealist versus materialist explanation of social life, I adopt the idea of the ideological origins of environmental problems (in this case, shipping impacts), which means that culture, values, beliefs, and experience affect the way we perceive the environment (see also Corbett 2006)

The starting point of abductive strategy is to understand a social world of social actors from everyday concepts and accounts, that is the way the social milieu is perceived and experienced by its members (Blaikie 2010, 98, 105; Alvesson and Sköldberg 2009, 6). The application of abductive strategy in this study resulted in knowledge generation on local communities' perspectives and perceptions on shipping development and what determinants of adaptive capacity emerge in the context of shipping growth.

#### **4.2.2 Case selection: unit of analysis and its boundaries**

The unit of analysis for this study is local community. In line with (Smit et al. 2010, 4), who highlight the importance of community-based assessment in addressing changing conditions, I argue that the local impacts of national and global shipping trends should be studied in cooperation with coastal communities, who are the first to experience such impacts. Aligning with the definition in the previous chapter 3: Theoretical and conceptual perspectives, the community is characterized as a social unit that facilitates social networks and shared perceptions of challenges.

To facilitate theoretical development of adaptive capacity, the study adopts a multiple-case design, including at least two communities, one Russian and one Norwegian, in the Barents area. The inclusion of the Russian case is important

because Russian communities are understudied in HDCA literature. However, it should be stressed that the purpose of the study is not to compare two cases and their adaptive capacity but rather to use the results for further development of the adaptive capacity framework and increase knowledge on possible shipping impacts in the Barents Arctic. This study contribution would derive from the understanding of whether and how contextual differences and determinants of adaptive capacity in each community affect the perception of change and shape local adaptive capacity.

Due to the large amount of coastal and island communities in the Barents area, case selection was a time-consuming process. One of the selection criteria was the communities had to be historically dependent on shipping and another that they are currently experiencing a growth in this area. Therefore, the collection and analysis of secondary data was necessary to understand shipping trends and port statistics. Even though many coastal communities in the Barents area are directly or indirectly connected to or impacted by ship traffic, not all have been experiencing rapid growth, partly due to an absence of port infrastructure. With the help of statistical data, detailed geographical maps, sea ice maps, and a media check in the first stages of selection, around 15 communities or port cities in the Barents area were identified as relevant.

Further criteria were then applied to narrow the search. These criteria, presented in Box 4.1, is based on local-context conditions (size, location, population, and seasonality in the operations), research needs, and practical opportunities for data collection. A desire to understand the role of recent climatic changes in the Arctic region on local shipping development and communities' adaptive capacity contributed to the selection process. Thus, the choice was narrowed down to coastal communities that experience seasonality in shipping operations, that is summer is the tourism season and/or open water navigation period, and winter is outside the tourism season and the waters are ice covered.

Box 4.1 Criteria for case selection.

1. Coastal communities in the Barents area
2. At least one Norwegian and one Russian community
3. Seasonality in shipping operations
4. Historical dependence on shipping activities
5. Current growth in ship traffic
6. Population of less than 3,000
7. Availability of communities' background information
8. Easily accessible and not a closed community

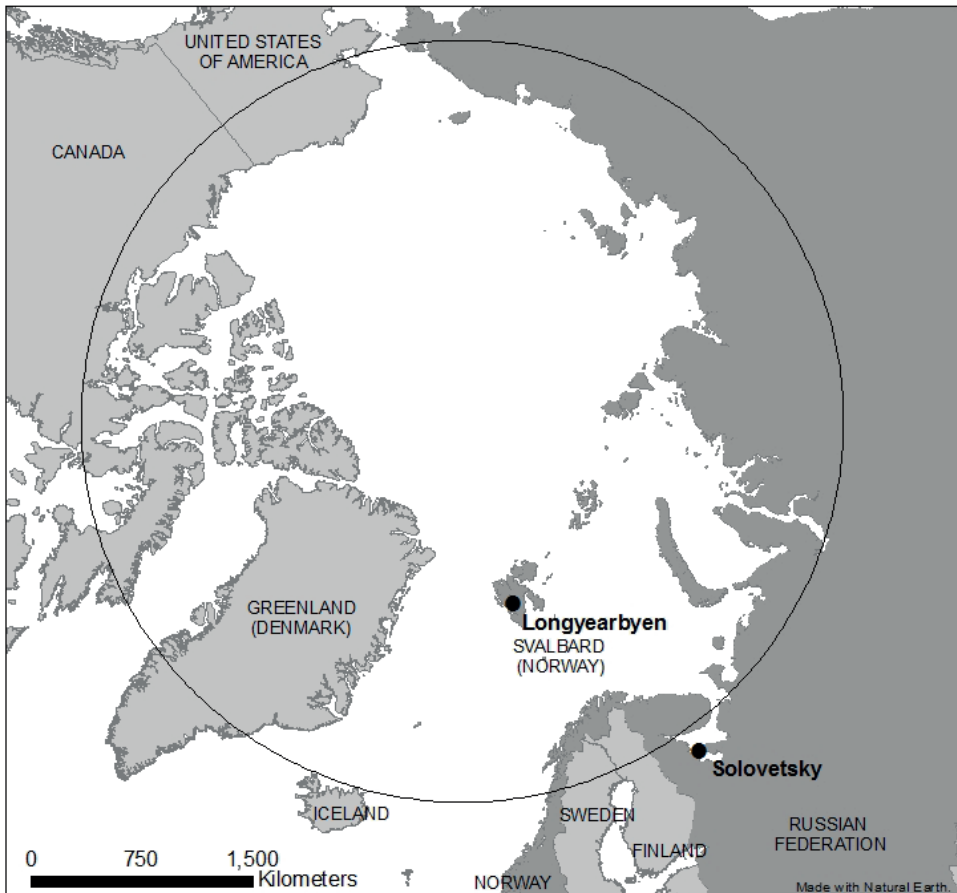


Fig. 4.1 Case communities

In addition to small coastal communities, the local impacts from shipping development will be felt in Arctic port towns (e.g. Onega and Kirkenes). However, I have limited the search to communities of under 3,000 people to make it easier to map relevant residents and stakeholders.

For the Norwegian case, the community of Longyearbyen (Fig. 4.1, 4.2) met all selection criteria, mostly due to its geographical location in the High Arctic, and so was selected for the study. Other Norwegian communities do not experience seasonality in relation to sea ice conditions as their coastal waters are free of ice all year round.

Other criteria for selection pertained to the community's accessibility, meaning that it should be relatively easy for the researcher to reach, and the possibilities for data collection. The latter refers to those settlements in the Russian Arctic that were or still are 'closed' for military purposes, circumstances that would have impacted on the data collection process.

Case boundaries were also framed by the type of shipping operation, time period, and stakeholder belonging:

- Type of operation. Although transiting, destinational, and domestic vessels all navigate in Arctic waters, only the last two interact with local communities and were therefore selected for the study.
- Time period. The significant increase in operations and extension of the navigation season has occurred mostly from the beginning of the 21st century; therefore, this study's time frame was limited to the period 2000–2016.
- Stakeholders. Both communities present an interplay of 'marine' stakeholders, described by van Bets et al. (2017) as a marine community, that is those who influence and are influenced by the growth in shipping. Due to the complexity of the shipping governance, not all stakeholders are located in the communities' geographical areas. In the Solovetsky case, several stakeholders from Arkhangelsk who manage the shipping development on the Solovetsky archipelago were interviewed for the study (Table 4.3).

### 4.2.3 Case description

In several ways, both case communities differ from other coastal communities in Northern Norway and Russia. Firstly, because of their decades long transition in governance and socio-economic systems. Secondly, both archipelagoes comprise a mosaic of historical and cultural heritage which, together with unique Arctic nature and wildlife, attracts thousands of tourists annually. Thirdly, given the island location of these communities, their socio-economic development has historically been dependent on shipping transport links with the mainland. Interestingly, despite its historical importance, the rapid growth of shipping challenges community's capacity to accommodate more recent developments. Table 4.1. indicates the increasing patterns in number of vessels and passengers in the period 2008-2016.

Table 4.1 Number of ship calls and passengers in case communities.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	% increase
<b>Number of ship calls in Solovetsky</b>	<b>466</b>	<b>410</b>	<b>516</b>	<b>490</b>	<b>563</b>	<b>545</b>	<b>540</b>	<b>595</b>	<b>596</b>	<b>128</b>
Number of passengers (thousands of people)	22,9	27,8	31,0	33,6	30,3	30,1	62,8	78,5	74,4	324
<b>Number of ship calls in Longyearbyen</b>	<b>771</b>	<b>799</b>	<b>814</b>	<b>773</b>	<b>777</b>	<b>802</b>	<b>1178</b>	<b>1163</b>	<b>1542</b>	<b>200</b>
Number of passengers (thousands of people)	38,6	41,4	40,1	39,0	55,1	56,9	54,8	63,7	75,2	197

Longyearbyen was established in 1906. The Norwegian sovereignty over Svalbard was first recognized in the Svalbard Treaty of 1920. The document provides equal rights to the nationals of the Treaty to engage in a wide range of commercial activities (The Svalbard Treaty 1920). The Treaty also prohibits the establishment of any naval base (Article 9) and Article 2 gives rights to Norway to “decree suitable measures to ensure the preservation and, if necessary, the re-constitution of the fauna and flora” (ibid). Those two articles have been throughout the time challenged by the Treaty parties. Because of equal access rights (Article 2 and 3), in addition to the multi-cultural community of Longyearbyen, there are two other notable Russian settlements on Svalbard: Barentsburg and Pyramiden (abandoned in 1998 and recently re-opened for tourism) and research institutes from 13 countries have their

stations on Svalbard (Kaltenborn, Østreng, and Hovelsrud 2019; Pedersen 2017). In accordance to Svalbard Environmental Protection Act, individuals who visit or reside on Svalbard should avoid unnecessary harm or disturbance of the natural environment and cultural heritage (Svalbard Environmental Protection Act 2001).

Svalbard's administrative center of Longyearbyen was, until 1970s, essentially "a facility for coal production" rather than a more standard or typical community (Arlov 2003). It has also always been reliant on government funding for support (Kaltenborn, Østreng, and Hovelsrud 2019). Since the 1980s however, Longyearbyen has been transformed from a male-dominated mining community towards a family-based society that, in 2002, has instituted a local government body (Norwegian: Longyearbyen *lokalstyre*). This democratization of society has been followed by an economic transition from coal economy to research, education and tourism (SSB 2016). The governance system in Solovetsky is also quite unique for Russian communities, as it comprises five decision-making parties: the Solovetsky Monastery, the Solovetsky Museum (under the jurisdiction of the Ministry of Culture), the local municipality (which includes local population representatives), the Primorsky District administration and the Arkhangelsk regional administration. This system is characterized not only by high community involvement in decision making, but also the acknowledgement of the role of church as a key stakeholder.

Tourism (marine tourism) is not a new economic sector either for Svalbard or for Solovetsky, but something with more than a century's worth of history in both communities (Viken et al. 2014; Popov and Davydov 2003). Svalbard's unique Arctic nature and wildlife are major attractions for domestic and international tourists, as are the historical and cultural sites from earlier European and Pomor expeditions (Johansen, Prestvold, and Overrein 2011). Approximately 65 % of Svalbard's territory is protected as either nature reserves or national parks (SSB 2016). Hence there are certain mobility limitations and mandatory reporting requirements for visits of areas outside Management area 10, Isfjorden-area (The Governor of Svalbard 2020).

As for the Solovetsky Archipelago - *Solovki* in Russian- pilgrimages have historically been the main source of visitors. In addition to the Solovetsky Monastery, (established in 1429 and since 1992 a UNESCO site), the rich history, culture and unique wildlife composition for a sub-Arctic areas has become a tourism magnet in the Russian European Arctic (Olsen et al. 2020). *Solovki* represents a preservation of several epochs of Russian history, including some of its darker pages. Due to its remote location, *Solovki* was a place of exile, beginning in the 16th century and continuing partly into the Soviet era. During the period 1923-1939, the Monastery operated as the Solovetsky Concentration Camp of Special Designation for opponents of the *Bolsheviks* regime (Skripkin and Slepko 2016). The reopening of the Monastery after the collapse of the Soviet Union triggered the promotion of the Solovetsky as a destination for foreign visitors as well as Russians. Visitors to *Solovki* also experience things such as encounters with Beluga whales and the colonies of seabirds (Cherenkova 2004).

More recently, the settlements in both Norwegian and Russian cases are characterized by a more heterogeneous population of residents than in previous eras. In Solovetsky, among a total population of almost 1,000, ten percent are monks of the Solovetsky Monastery (Solovetsky Strategy 2013) while the dominant part of the community is engaged in different tourism-related services, either organized or not by the Solovetsky Museum. Longyearbyen is home to 2,200 residents from over 40 nations, with an average duration of residency of roughly seven years (SSB 2016). Some of the residents in both communities are involved in tourism and shipping related activities (companies, organizations and NGOs). Those are also described as shipping stakeholders in empirical papers.

The residents in both communities (with some exceptions for *Solovki*) do not typically have historical roots there. This has altered the local sense of belonging and attachment, as the perception of being local does not necessarily connect to length of the residency (See also 3.3.2). “Svalbardianere” who have been living in

Longyearbyen for many years and have experience and knowledge are seen as a kind of “community glue” (Paper 2). Both communities have increasing number of seasonal workers during the summer season. Many of those who repeatedly return express an emotional attachment to place: a process of “Osoloveli” on Solovetsky and getting “Svalbardbasillen” (“the Svalbard virus”).

Both communities are linked to the mainland by marine shipping (domestic and destination) and/or air transport. Compared to Longyearbyen, which is accessible all year for ship traffic, the navigation season in the community of Solovetsky varies from six to eight months. The main impacts of shipping development are most evident during the summer (tourism) navigation season, characterized by high port turnover in both communities. Additionally, there is often overcrowding due to increasing numbers of visitors, which on one hand contributes to local value creation and employment opportunities, but on the other hand poses challenges to infrastructure and the natural environment. Detailed descriptions of the two case communities are presented in Paper 1 and Paper 2 and are summarized here in Table 4.2.

Table 4.2 Main characteristics of case communities (Source: Paper 3).

Characteristics	Solovetsky	Longyearbyen
Geographic location	65°N; on the Solovetsky archipelago ( <i>Solovki</i> ), White Sea, Arkhangelsk region, Russia	78°N; on the Svalbard archipelago, Barents Sea, Norway
Settlement type	The transportation and administrative hub of the Solovetsky archipelago	Transportation, administrative, and business hub of Svalbard
Demography	943 inhabitants, mostly native Russian, 10% are monks	2,200 inhabitants from over 40 countries. Average residence period is 7 years
Employment (Livelihoods)	Museum, monastery, municipality, tourism, seaweed collection; subsistence economy	Tourism, research and education, public sector, coal mining and different social services
Transport linkage	Shipping (seasonal) and air transportation (year-round)	Year-round shipping and air transportation
Type of shipping	Domestic (dominated by passenger and cargo/supply) and destination (cruise tourism)	Domestic and destination (marine tourism, cargo/supply, research, fishing, and SAR)



#### 4.2.3.1 Longyearbyen

My first introduction to Longyearbyen (Fig. 4.2) came in 2013 when I attended an “Arctic Shipping” course there. From the moment I started my Ph.D. work, in 2016, I have never had any reason to doubt that the concept of ‘local community’ applied to this unique settlement.

As I headed back to Svalbard via Tromsø to begin my fieldwork, at the airport I heard the passport officer ask another passenger the routine question of where they were going. Her response— “I am going home to Longyearbyen”—made me wonder what makes such a unique place a home. This highly routed, international town in the High Arctic (SSB 2016), whose identity has transformed from a community dominated by the coal industry to one of tourism, research, and education (St. Meld. 2015-2016), has become a home for many people who have made their livelihood there. When I started working on Paper 2, describing community engagement in adaptive responses, I recalled this conversation at passport control and again when considering whether we could identify Longyearbyen as a local community.



Fig. 4.2 Longyearbyen. A view of the town and harbor area from the slope of Sukkertoppen. August 2017. Photo credit: Julia Olsen.

This island community has experienced dramatic environmental and climatic changes that not only alter the physical setting (e.g. avalanches, sea ice reduction, flooding, glacier retreat, and permafrost thawing) but also alter local perception of untouched areas that are constantly exposed to human activities (Kaltenborn 1998).

The recent report “Climate in Svalbard 2100” indicates that Svalbard is one of the fastest warming places on Earth (Hanssen-Bauer et al. 2019). Human activities on the archipelago include coal mining, tourism, shipping (including marine tourism and fishing), research, and education. However, recent politically guided economic transition in Longyearbyen has prioritized tourism, research, and education over coal mining (St. Meld. 2015-2016), and the major coal mine *Svea* was shut down in 2017.

Paper 2 indicates that these changes in socio-economic and climatic conditions, coupled with local regulations, have an impact on shipping trends both in the port of Longyearbyen and in the Svalbard area.

#### 4.2.3.2 *Solovetsky*

In contrast to Longyearbyen, I did not visit Solovetsky (*Solovki*) until I began my fieldwork. Prior to this, Solovetsky to me was just a dot on the map or some pictures on Google. Although I knew less about the local Solovetsky community and their livelihoods than I did about Longyearbyen, from the results of the preliminary fieldwork (see description in the following section), I knew that the topic of study was important for the residents of *Solovki*, the Arkhangelsk region’s main attraction.



Fig. 4.3  
The Solovetsky  
Monastery.  
The main  
attraction of the  
Solovetsky.  
Photo credit: Julia  
Olsen.

Getting to this remote region can be quite a challenge. The plane to Arkhangelsk, followed by the train to Kem, and then boat to Solovetsky is a two-day journey. The ability to reach the archipelago by both plane and boat can also be

jeopardized by Arctic weather conditions. So, I was lucky that Solovetsky welcomed me, with no delays, on a rainy day in June 2017.

Approaching the archipelago, one can see its main beauty and tourist attraction: the Solovetsky Monastery (Fig. 4.3). The settlement's everyday activities are built around it in many ways, for example employment, tourism services, and religious purposes. Cultural and Historic Ensemble of the Solovetsky Islands was added to a UNESCO protected site in 1992.

Similar to Longyearbyen, the local viability of Solovetsky is related to marine transportation covering community re-supply and mobility needs (described in Paper 1) (Solovetsky Strategy 2013). The main changes associated with ship traffic are the dramatic increases in passenger transportation and, as a result, increasing numbers of visitors (Grushenko 2014, see also Paper 1). Also contributing to ship traffic is the extension of the navigation season for cargo vessels that supply the community with all necessary goods and products.

I found it interesting that the navigation season for passenger vessels in Solovetsky has not been extended as a result of sea ice reduction, unlike in Longyearbyen (see Papers 1 and 3). This is due to the traditional nature of the tourism season there and limited demand for related activities from the end of September. Moreover, this religious community values its period of quiet and isolation.

The impacts of human activity on the archipelago's heritage, mostly in the form of tourism, have led many stakeholders and residents to evaluate tourism growth (Cherenkova 2004). Evaluation efforts have resulted in attempts to establish the archipelago as a nature reserve in order to limit the environmental impact on the area's natural and cultural heritage, which may in turn limit the scope of human activities on the archipelago (Paper 1).

#### **4.2.4 Preparation for fieldwork: preliminary fieldwork**

After selecting the case communities, the next step was to gain an understanding of the contextual settings and to build a research relationship with the residents. This introductory investigation took place prior to primary data collection, during desk-based studies that included the preliminary fieldwork stage.

As described in the dissertation's papers, these desk-based studies involved work with the secondary data in order to develop research protocol, case background, and an interview guide and to identify and contact relevant interviewees. Several qualitative methods were used during this stage, including a literature review, media analysis (important due to a lack of historical memory), document analysis, and map reviews. Both geographical maps of the area and Google Maps were used to examine the shipping routes, heritage sites, and the locations of protected areas.

As I had limited contextual knowledge of Solovetsky compared to Longyearbyen, I needed to conduct preliminary fieldwork to learn more about the case area, gain practical knowledge, and ask for recommendations for interviewees. Caine et al. (2009, 491) define preliminary fieldwork as "the formative early stages of research in the field that allow for exploration, reflexivity, creativity, mutual exchange and interaction through the establishment of research relationships with local people." During the preliminary fieldwork, four unstructured interviews with stakeholders in Arkhangelsk were conducted to discuss the contextual characteristics and timing for the fieldwork (Table 4.3). Although it may have been preferable to talk to local people in Solovetsky, it was hard to find relevant contact information on the internet. Moreover, mobile phone coverage on the archipelago was limited, making contact with interviewees difficult, even during the fieldwork.

I also contacted some residents in Longyearbyen six-seven months prior to fieldwork in order to present my project and map their interest and that of stakeholders in participating in the study. This early introduction helped me plan the fieldwork by scheduling interviews several weeks prior to my visit to the community.

## 4.3 DATA COLLECTION

### 4.3.1 Timing

Given the seasonality of shipping operations in the Arctic, the timing of fieldwork is an important variable. To explore local perspectives and impacts of shipping development on local communities, the fieldwork was planned for summer months or the summer navigation period. Both Solovetsky and Longyearbyen experience high turnover in their harbor/port areas between June and September. During this period, the population of both communities increases dramatically due to the presence of seasonal workers, tourists, and other community visitors. At the same time, local key stakeholders and residents may leave for summer vacation. To ensure the high involvement of residents and stakeholders in this study, the fieldwork in Solovetsky took place as early as was possible in the summer season, in June 2017, since the majority of them were still there. In contrast, the interviews in Longyearbyen were conducted on two separate occasions. The first took place during April 2017, when the port turnover was low, while key stakeholders were preparing for summer navigation season, and the majority of residents were still in the settlement. The second took place in July–August 2017, the time of highest port turnover and also when seasonal employees were at the settlement.

While in the field, interviews had to be scheduled according to interviewees' availability. Interviewing key shipping stakeholders was sometimes only possible prior to the arrival of cruise vessels or after their departure. Thus, some interviews took place as early as 7am or as late as 10–11pm. However, even a well-constructed interview plan requires flexibility. Some of my interviews were cancelled or postponed, while others took more of an ad-hoc form. When I got in touch with one Solovetsky resident (whose contact information I received via snowball sampling) to schedule an interview, they were only interested in answering the questions if it could be done straightaway. Therefore, I always had to be prepared for data collection.

### **4.3.2 Fieldwork process**

Primary data for this study was collected during fieldwork in both settlements. The data derived from observation and taking note of details, researching the communities' daily life, participating in local events, and talking to people and interviewing them. In other words, my main activities were concentrated around learning about the local context and interviewing residents and stakeholders.

#### *4.3.2.1 Observations and field conversations*

After researching the context of these communities throughout the desk study and preliminary fieldwork, I spent time on location walking around the communities, visiting harbor areas, participating in local events, interacting with locals, and taking boat trips, to teach me about local life through the eyes of my interviewees. This method is based on Aase and Fossåskaret (2014, p. 31) description of how during field conversations and observation, researchers get answers to questions they may not have asked. When describing the natural environment, places, or impacts of shipping development, several interviewees told me that I should go and see these things for myself. I noted their suggestions and subsequently spent a great deal of time outdoors, paying closer attention to details and observing local realities.

During these walks, I had the chance to talk with random residents, which increased my knowledge about the communities and supplemented my understanding of local beliefs and traditions. Aase and Fossåskaret (2014, 32) also reflect on the importance of these types of conversations, arguing that a researcher may receive meaningful information from a chance encounter. For example, while passing a bridge (see Fig 4.4), a resident told me that it had been built by a tourist company advertising excursion for cruise passengers with limited mobility or for those visiting Longyearbyen without the appropriate shoes and clothing.

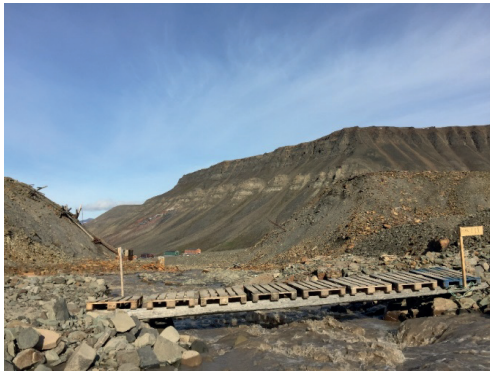


Fig. 4.4 A hand-built bridge over Longyear river. Photo credit: Julia Olsen.



Fig. 4.5 An interviewee draws a line to indicate the sea ice extension in the Isfjorden in 1998. Photo credit: Julia Olsen.

The same person also acknowledged that “we locals could cross the river without this piece of infrastructure.” Although this conversation was not included as a formal interview, I was able to reflect on it during the interviews while discussing infrastructure developments that accommodate increasing numbers of tourists.

#### 4.3.2.2 Interviews

My study and comprehension of the local context continued throughout the interviews. I selected the majority of the interviewees during the secondary data collection process, contacting them several weeks prior to the fieldwork to describe my project and schedule the personal interviews. During the fieldwork, I applied the snowball technique (Blaikie 2010, 179), asking interviewees to suggest other potential interviewees.

Alvesson and Kärreman (2011, 99) argue that “Through talks produced in the interview situation, the researcher becomes able to accomplish meaningful understanding of the interviewee and his/her social world.” To encourage residents’ engagement (including those who are involved in shipping-related activities) and to earn their willingness to talk openly and freely about the topic, my research strategy was an early introduction of the project and adjustment of the interview setting according to the interviewee’s wishes. The majority of residents were comfortable

holding the interviews at their place of work, and as this meant some taking place onboard vessels, I was also able to gain practical knowledge of shipping operations. In most of the interviews, I also used maps of the archipelagos. Having a map on the table (Fig. 4.5) provided me with a better understanding of geographical locations when talking about changes in environmental conditions and shipping distribution.

In total, 60 interviews were conducted, comprising 36 interviews in Longyearbyen and 24 interviews in Solovetsky. The next table (Table 4.3) presents the number and type of interviews conducted for each case study.

Semi-structured and unstructured interview guides were used during the interviews. These were developed prior to the fieldwork and based on the topics discussed during the preliminary fieldwork and review of the secondary data, such as the literature, document, and media review. The semi-structured interview guide had a set of open-ended questions covering the following topics: changes in social and ecological systems; shipping trends, such as seasonality, distributions, and types of vessels; positive and negative impacts; local decision-making systems; and perspectives for development (Appendix 1). This accords with Easterby-Smith (2012, 143) view that the use of semi-structured interviews enhances the flexibility of the interview process, providing the opportunity to explore relevant and interesting aspects in depth.

The unstructured interviews covered topics similar to those in the semi-structured interview guide. They were conducted to allow for the inclusion of relevant residents and stakeholders who were recruited via the snowball technique and/or had lived in the area for only a few months/years and had less knowledge of shipping and the community. However, the ability to speak freely about these research topics illuminated some interesting perspectives on how length of residence affects perceptions and attitudes towards shipping development and the way in which residents talk about places.



Table 4.3 Number and types of conducted interviews and interviewees.

Case	Type and number	Interviewees' involvement in the study
Solovetsky & Arkhangelsk (S1–S24)	Individual semi-structured interviews with pre-defined topics and questions, 12 in Arkhangelsk and 8 on Solovetsky	<p><b>Arkhangelsk:</b>                      Five stakeholders involved with marine cruise development                      Four stakeholders involved with other types of shipping-related activities                      Two researchers with shipping-related knowledge                      One resident with historical knowledge of shipping development</p> <p><b>Solovetsky:</b>                      Three residents involved with tourism/shipping development                      One seasonal worker with long engagement in Solovetsky                      One with resident involved in third-party services for shipping                      Two residents employed in the shipping industry                      One resident employed in the tourism industry</p>
	4 Group interviews, 2 in each location	Two with stakeholders involved with marine cruise development (one in each location) One with residents involved in decision making on Solovetsky One with researchers in Arkhangelsk
	4 Unstructured interviews/ field conversations	Two tourists and two seasonal workers on Solovetsky (brief conversations and not included in the analysis)
	4 Personal interviews during the preliminary fieldwork	Four residents of Arkhangelsk (not included in the empirical analysis)
Longyearbyen (L1-L36)	19 Personal semi-structured interviews, with pre-defined topics and questions	Six residents involved with marine cruise development Five residents involved with the development of harbor facilities and other types of shipping-related activities Four residents involved in decision making Two residents engaged with NGOs One seasonal worker
	17 Personal, unstructured interviews with pre-defined topics only	Two residents partly employed in the summer tourism industry Six residents involved in local services that serve tourism needs (stores, museums, and cafés) Five residents employed in the shipping industry Four residents with practical and/or historical knowledge of shipping development

Because the fieldwork took place at the beginning of the navigation season, the interview guide included a number of retrospective questions (e.g. Fink 1960) about experiences of previous navigation seasons. In line with Van Der Vaart et al. (1995), I argue that answers might be affected by behavior, attitudes, and situations that took place from the time of experience to the time of answering the question. At the end of each interview, the interviewees were asked if they had anything they would like to add to the topic discussed or the research project. In several cases, I was told

detailed stories about different aspects of shipping development, which made a substantial contribution to my empirical material. I also asked the interviewees if I could contact them later should there be a need for clarification of an interview-related question. Almost all of the interviewees agreed to this request, and many expressed an interest in reading the results of the study and/or commenting on the paper drafts.

Some questions were adjusted during the fieldwork in order to address the contextual differences between the cases. One such adjustment was made to understand the local perspectives on seasonality in shipping operations for the Solovetsky community, while follow-up questions on SAR were added to the interview guide for the Longyearbyen community. I developed the interview guides in English and then translated them into Norwegian and Russian.

#### **4.4. DATA ANALYSIS**

Almost all the interviews were recorded, but when recoding was not possible, notes were taken instead. I then transcribed the recorded interviews and digitalized the notes during the fieldwork, making it possible to analyze the primary data during its collection. This strategy was chosen to facilitate going through each interview during the fieldwork, marking important aspects or clarifying uncertainties, but also to add new suggested interviewees (via the snowball technique).

The data was transcribed in the same language in which it was collected (Norwegian, English, and Russian), to make it easier to recall the information in the later stages. Some interviewees used cultural expressions that are difficult to translate into English without losing the full meaning of the words, and in addition, the translation of 60 interviews into English would have been a time-consuming process. Therefore, I chose to translate only those parts of the interviews that were quoted in the dissertation papers.

To organize the collected volume of raw empirical data, the transcribed interviews were thematically analyzed using the software program, NVivo, which offers several functions and tools to 'manage' the data (Bazeley and Jackson 2013). Specifically, the software adopts coding methods for data systematization. The code, in this context represents an abstract identification of an event or object and can be descriptive or analytical (Bazeley and Jackson 2013, 70). A study's codes are created by the researcher and are thus subject to change during the research process.

I have coded the empirical data in two rounds (Appendix 2). In the first round of data analysis, a similar set of pre-determined codes were developed for both cases. These codes covered the topics from the interview guide, such as community characteristics, social and environmental changes, shipping trends, impacts, and perspectives. However, given the explorative and abductive nature of the research, there was a need to add new codes in the second round of data analysis, when data was approached through the lens of the adaptive capacity framework and related concepts. Although most of the codes were derived inductively from the interview guide and collected data, some were added deductively from the literature (e.g. community engagement, values, and governance). Such codes emerged from the empirical data for each of the cases while guided by concepts from HDCA literature.

#### **4.5. RELIABILITY AND VALIDITY**

Reliability and validity are two criteria used to judge the quality of research design (Yin 2014, 45). Reliability refers to the ability to conduct similar research using a similar research design that can eventually produce similar results (Yin 2014, 49). Reliability in this study is ensured through the accuracy and inclusiveness of the research data, as well as through the research procedures and careful development of the research design.

Validation of this study stems from transparency in the research's methodology and results, as well as verification from its participants. The methodological

transparency was achieved via a detailed explanation of the choices made during the research process (Easterby-Smith, Thorpe, and Jackson 2012). This explanation is contained both in this chapter and in the study's four dissertation papers, which present a detailed overview and justification for the research choices.

Validation of results among the study's participants was an important component that was also driven by community interest. This follow-up was especially necessary given the explorative nature of the research, which left me with some questions after data analysis that were not readily answerable using preexisting sources. In some situations, I needed to clarify different research details with interviewees, which was done through direct communication and/or presenting them with the preliminary results in the form of paper drafts.

## **4.6 ETHICAL CONSIDERATIONS**

Being a researcher involves a commitment to certain ethical rules and regulations. For my study, following the ethical guidelines issued by the Norwegian National Research Ethic Committees (Nesh 2016) and after discussions with a colleague at home and with partner universities, the collection of empirical data was approved at an early stage by the Norwegian Centre for Research Data (NSD). This information about the project and conditions for participation was distributed among the majority of the participants several weeks or months before the interviews, or in oral form prior to the interviews. Given the small size of the communities, I promised anonymization of the collected data so that the interviewees could not be identified in published studies (Appendix 3, in Norwegian) and also to enable the use of the collected interviews after completion of the project, for further research.

One of the main considerations during the construction of this research design was the ethical aspect of conducting research in a foreign country, that is a country such as Russia might recognize different norms of research ethics than Norway. According to the NSD (personal conversation with the NSD), in this situation, the

researcher has to follow NSD recommendations and the NESH guidelines (Nesh 2016). However, the researcher is also responsible for learning about the other country's data and ethical recommendations. In addition to guidelines and recommendations, a researcher can be advised by peers or acquaint themselves with literature that provides advice on the subject (e.g. Voldnes, Grønhaug, and Sogn-Grundvåg 2014; Kudrinskaya 2010). Ethical concerns were also discussed prior to data collection with a co-author of the first paper, a colleague from the Russian university.

Due to the small community size, a couple of interviewees told me they were aware that, due to their political opinions, it might be possible to identify them through their arguments. Therefore, to ensure anonymity, I tried to avoid direct citation of their statements, and a coding system was applied to the citations: Solovetsky (S1–S24) and Longyearbyen (L1–L36).

Another ethical consideration, which is discussed in Booth et al. (2008), is to avoid misreporting sources. This is particularly relevant for when I used Russian and Norwegian sources in my research. As defined in Papers 1 and 4, the interpretation of concepts varies across languages and cultures. I am aware that one of my tasks as a researcher is to organize and explain research results by justifying the use of specific concepts to my audience.

## **4.7 METHODOLOGICAL REFLECTIONS**

According to Alvesson and Kärreman (2011, 10), the construction and discussion of empirical research requires several filtering elements, including the researcher's background and philosophical and theoretical commitments and the relationship between interviewee and researcher. With this in mind, I will describe three main factors that I believe have affected the generation and analysis of my empirical data—researcher status during fieldwork, selection of the interviewees, and the interviewees' perceptions of the research topic.

#### **4.7.1 Status during fieldwork and interviewees roles**

During the preparation to the fieldworks, one emerging perspective came to my attention: the status or role of the researcher in the field. According to Aase and Fossåskaret (2014, 26), this comprises the expectations, rights, and duties connected to a particular person in a particular situation.

During the planning stage, and later in the field, I realized that the researcher status might affect the scope of the collected data. When I decided that the fieldwork should take place in both Russian and Norwegian communities, I wondered how I would be received in each respective place. Being a Russian Ph.D. candidate at a Norwegian University and having the ability to communicate in both local languages gave me the advantage of collecting data in interviewees' native languages and getting even closer to their interpretation of shipping development. However, after introduction to each of the communities, my status is different than how I had originally imagined. In the Longyearbyen community, I refer to myself as the "outsider with insights" researcher, while in the Russian community, I use "insider from the outside." These two statuses related to my academic position and thus were similar in rights and duties. At the same time, I felt that when learning about my background (a Russian researcher at a Norwegian university), the interviewees had different perceptions as to what kind of knowledge I might have about socio-economic conditions in those two communities.

The "outsider with insights" status finds its roots in the interview process and answers. Even though the information about myself and the Ph.D. were sent to several interviewees in Longyearbyen prior to the fieldwork, I felt that the status I received as an outside (Russian) researcher from a Norwegian University was beneficial in some conversations. Norwegian interviewees on Svalbard spent extra time explaining to me various aspects of the Norwegian community and political life, which would probably not have been the case for a Norwegian Ph.D. student. An example of this was the description I was given of the difference between

municipality and county there and how they function in the Norwegian context. This was also interesting for further data analysis since the community of Longyearbyen differs from other Norwegian communities in its political organization and demographic trends. Empirical Paper 2 about Longyearbyen particularly benefited from these detailed descriptions. Some interviewees were also interested in my background, so I spent some time talking about my home community, shipping development in the Russian Arctic, and historical Norwegian–Russian relations on the Svalbard archipelago.

The “insider from the outside” status created a different dynamic with interviewees. I felt that knowing I was born and raised in the Russian North resulted in some interviewees providing fewer explanations about community life, economic development in the North, and social trends, possibly because they assumed, I already knew these details. So, in some interviews, I had to ask for additional information or clarification. After interviews in Arkhangelsk, I discussed a number of topics with my colleague to verify some ideas and conclusions. An example of this discussion was local involvement in decision making and/or how local needs are accounted for in industry expansion.

The interviewees shared some secondary data that was available only in Russian, and it was easy for me to incorporate this straightaway into the research. On a couple of occasions, the interviewees were so engaged in the discussion that they shared shipping operation details that were not available to the general public, and I was subsequently asked to exclude this data from the transcripts.

#### **4.7.2 Selection of the interviewees**

As described in the background of the thesis and the empirical papers, several significant changes have taken place in the Barents area and case communities that have affected shipping trends and thus the research design. Since the time of writing the Ph.D. proposal in 2015/2016, the community of Longyearbyen has experienced a

reduction in coal mining, followed by the shut-down of the major coal mine *Svea*; the adoption of a new government White Paper on Svalbard at the end of 2016 outlining new economic perspectives (tourism, research, and education); two major avalanches, which has placed a greater focus on safety; and the extension of the navigation season (see Papers 2 and 3). All these major changes have an indirect impact on increasing marine tourism. With regard to Solovetsky, this study took place during active discussion among local stakeholders about the future of tourism in the area. One of the main suggestions was to establish the archipelago as a nature reserve, which could potentially limit the number of tourists (Paper 1).

Consideration of these changes was important, especially during the selection of the interviewees for the study, in order to involve those residents and stakeholders who manage, are involved in, or are locally affected by shipping growth. During the development of the research and in identifying and learning about relevant interviewees, I also realized that stakeholders with the same occupation had different responsibilities and different types of involvement in shipping activities across case communities. In designing my project, I learned that some of the stakeholders that manage local shipping on Solovetsky were based in Arkhangelsk, in contrast to the majority of stakeholders who manage shipping locally for Svalbard, who are based in Longyearbyen and are organized in networks.

The concept of 'local resident' also varies between cases: everyone who has resided in Longyearbyen for more than 30 days receives resident status (see Paper 2); while some of the interviewees in Solovetsky considered themselves locals even after moving to other locations and spending only summer months on the archipelago. In both communities, others only considered themselves residents after living there for several years. The community fluctuation in Longyearbyen and short residence time did not allow me to include all relevant stakeholders with experience and knowledge of shipping trends. For example, one person I interviewed in April 2017 and wanted to contact again in August 2017 for some additional information had moved to the



mainland. Conversely, at the end of my first fieldwork, I was introduced to another relevant stakeholder who had just moved to Longyearbyen and who agreed to participate in the study in the summertime.

Hence, I will argue here that community settings affect the type of knowledge one can generate on a certain phenomenon. Moreover, the empirical research I have experienced calls for flexibility of research design.

#### **4.7.3 Perception of the research topic**

During the data collection process, I had to account for different understandings of the research topic by the researcher and the interviewees. For this reason, I had to adjust the research questions during the interviews. I would like to illustrate this with two examples: 1) framing changing sea ice by climate change and relating shipping growth to this change and 2) discussing changing shipping trends as “rapid growth.” In the research proposal, climate change and sea ice reduction were described as one of the main triggers of increasing shipping development. During the data collection, I realized that this assumption was based on an understanding of general trends taking place in the Arctic that had also secured their position in the media and literature. A better understanding of local factors and historical trends has changed the way I explore the topic of my study.

During the interviews, it became clear to me that the idea of a direct connection between sea ice reduction and a growth in ship traffic was contestable. In April 2017 in Longyearbyen, the extension of the navigation season for passenger vessels was described as a demand-driven phenomenon and sea ice reduction more as a facilitator of the development. Challenging sea ice conditions, especially early in the season between March and June, may affect the navigation routes and quality of tours in Longyearbyen. In the community of Solovetsky, passenger vessels operate only during the summer–early autumn period, despite the extension of the navigation season. It is only cargo vessels that now have extended seasonal routes; one of the

interviewees told us that the last cargo delivery in 2015 took place in December, although navigation is often already closed by November. In contrast, at the end of May 2017, when navigation usually opens, one cruise boat could not approach Solovetsky due to hard ice conditions.

In both Solovetsky and Arkhangelsk, I experienced skepticism toward drawing connections between the extension of the navigation season and climate change, with several stakeholders questioning those connections. Some of the interviewees believed that any climate discussion should take into consideration a period longer than 20 years, which is the span that I defined for this study, while others thought that changing sea ice conditions may also relate to natural climatic variations that may eventually change in other ways. Similar views were also encountered by (Graybill 2013) when conducting research in Eastern Russia. Hence, in the interviews, I tried to discuss other factors that trigger shipping development and avoided using climate change (in the Russian case) to understand the change in sea ice conditions.

In Longyearbyen, another factor that affected the interviewees' perception of shipping growth related to their period of residence. Those residents who had been living on Svalbard for a couple of years had not experienced the growth in the same way as those who had been living there for more than a decade. This factor had implications for my second round of fieldwork in Longyearbyen, where I tried to contact the community members who were present during the shipping development of the early 2000s.

## 5 SUMMARIES OF PAPERS

This chapter presents a summary of the four dissertation papers and discusses their findings and their connection. This connection is also illustrated in Figure 1.3, while Table 1.1 presents the outline for frameworks and findings in relation to research sub-questions (RQ 1–4). Although each of the papers provides answers to two or three sub-questions, the contributions from all four papers answer the main research question.

### **Paper 1: “Adaptive capacity in the context of increasing shipping activities: A case from Solovetsky, Northern Russia”**

The first empirical paper was developed after conducting fieldwork in Solovetsky, to present the way shipping development interacts with the local Russian community. This explorative study aimed to identify whether and what aspects of the Solovetsky community were affected by growth in ship traffic and the ways in which salient determinants shape local capacity to adapt to changing conditions. In addition, a theoretical framework was applied to analyze Russian empirical reality, which is still understudied in HDCA literature.

Since the establishment of the Solovetsky Monastery in 1429, this island community has been dependent on shipping as the main source of mobility and community re-supply. Shipping links with the mainland were weakened with the collapse of the Soviet Union in 1991. Since then, investments in the tourism industry and in local infrastructure development became the primary triggers for growth in ship traffic. Growing shipping affects different aspects of community viability, due primarily to tourism activities during the summertime that depend on shipping operations. These aspects relate to changes in living conditions and include local value creation, employment, transportation options, and a period of community isolation, (i.e. outside the tourism season).

An analytical framework of adaptive capacity guides the analysis of the empirical results, which derive from qualitative interviews with local residents and relevant stakeholders who affect and/or are affected by shipping activities, both in Solovetsky and in the regional center, Arkhangelsk.

As a result, this study identifies salient determinants of local adaptive capacity in the context of increasing shipping activities and explores their interconnections. With increasing shipping activities, five determinants of local adaptive capacity are recognized, including the local involvement of the decision-making system, infrastructure, local values, the natural environment, and economic resources. Each of these determinants is described in detail in the paper's empirical section. In the discussion, we assess the way each of the determinants and their interconnections shape local adaptive capacity, and we illuminate their trade-offs. These interconnections become an important topic of discussion, especially when considering the way that the natural environment balances with economic development. Infrastructure strengthens local capacity when local values and the natural environment are considered in its development and mainstreamed in the decision making.

Finally, the paper applies a conceptual framework of adaptive capacity to analyze the empirical reality of a Russian Arctic community. The study reveals some differences in the use and understanding of specific concepts. For this paper, the broadly accepted determinant of adaptive capacity—governance—has a different meaning when applied in the Russian context, relating to the verb “to govern,” which is used to describe a top-down governing system. Hence, this paper suggests using the concept of decision making to examine local involvement and emphasize the inclusion of multiple stakeholders. The paper also introduces the concept of the natural environment to elaborate on the “natural dimension of adaptive capacity,” while Paper 3 extends the discussion of this determinant to demonstrate its variations and perceptions across different communities.

## **Paper 2: “Increased Shipping and Community Engagement: A case from Longyearbyen, Svalbard”**

As Paper 1, this second empirical paper was developed after completing fieldwork on Svalbard, in the local community of Longyearbyen. Similar research targets were set for this study, such as the identification of impacts from increasing shipping development and local determinants of adaptive capacity. However, some changes were made during analysis of the empirical data, primarily due to the need to conceptualize local community and investigate the role of community engagement in adaptive responses.

Prompting these questions and investigations was the fact that the research took place in an unusual community setting—was Longyearbyen a local community? This perspective was added to the conceptual framework, where we tried to problematize the concept of local community in order to analyze our empirical findings. This rotating community of 2,200 residents from over 40 nations has undergone a number of changes in its socio-economic and environmental systems. The most noticeable changes are a transition from a local, coal-dominated economy toward one of tourism, education and research; and impacts of climate change that have resulted in sea ice reduction and the migration of marine species toward ice margins. Shipping growth (especially marine tourism and fishing activities) has a direct connection to these changes, while simultaneously contributing to changes in the community with its implications for local adaptive capacity.

The main empirical contribution of this study comprises detailed descriptions of locally identified positive and negative impacts that apply to shipping in general and to different types of shipping activity in particular. The latter include fishing, community re-supply, and those related to marine tourism, such as pleasure craft and overseas, expedition, and day-trip cruises.

The empirical data identifies a strong community bottom-up engagement in several local adaptive responses that aim to limit the negative impacts of shipping

activities, while also benefiting from the positive ones. This engagement prevents environmental harm, strengthens preparedness and SAR, improves visitor-management systems, infrastructure, and information dissemination and maps and evaluates the socio-economic opportunities of fishing activities.

To understand the mechanisms behind strong community engagement in adaptive responses of such a transitory community, the paper identifies four motivation factors. These factors derive from community settings and include place connection, perception of the changing natural environment, established cooperation practices across a wide group of stakeholders, and the ability to influence decision making.

Based on these findings, the study draws two main conclusions: 1) that community engagement (also known as an ability to engage in collective actions) determines and shapes the local adaptive capacity of the Longyearbyen community in the context of shipping growth and (2) the mechanisms that enable this bottom-up engagement reside in the community settings (i.e. motivation factors). Further analysis led us to conclude that local ability to engage in adaptive responses, independent of a person's residency time or background and motivation factors, characterizes Longyearbyen as a local community.

### **Paper 3: "Community perspectives on the environmental impacts of Arctic shipping: Case studies from Russia, Norway, and Canada"**

The third empirical paper emerged from the discussions and results of the first two papers. Papers 1 and 2 indicate that impacts on the natural environment represent a critical part of shipping development for both the Solovetsky and Longyearbyen communities. However, in analyzing the empirical data, it became clear that the environmental concerns of shipping development differ between case communities. The Solovetsky population is concerned with indirect impacts on their terrestrial environment from the increasing number of visitors and generated on-land

waste, while less focus is given to the pollution and emissions from the shipping vessels themselves. The community of Longyearbyen is concerned with both the direct and indirect impacts of shipping on their marine and terrestrial environments, including tourist sites.

These varied perspectives on shipping impacts in the communities' natural environments have a clear connection to the social perceptions of environmental impacts—a connection that was the inspiration for this third scientific paper. After discussion with my co-supervisor, Jackie Dawson, the decision was made to expand on this idea by adding a case from the Canadian Arctic, where Jackie and her postdoctoral researcher, Natalie Carter, had collected empirical data that covered questions very similar to my research.

The paper starts by conceptualizing the natural environment and problematizing its connection to local adaptive capacity. Subsequently, the study presents the perceived impacts of shipping development in three case communities, which vary in their socio-economic and environmental settings and experience diverse trends in shipping operation. The analysis of these impacts resulted in several conclusions.

First, the paper underlines that shipping impacts on the natural environment present a great concern for all case communities, regardless of their use of the surrounding environment. Next, the study illustrates the relationship between the locally identified impacts of shipping operations and the communities' engagement with their natural environment (see Table 4 in Paper 3). Ultimately, the study argues that local perception and use of the natural environment influences the communities' perception of the environmental impacts.

Based on this discussion, we argue that the natural environment presents a salient determinant of adaptive capacity. This determinant offers an expanded version of that which is broadly addressed in the HDCA literature as “natural capital” (i.e. a resource to be utilized). “Natural environment” acts as an umbrella definition

of the natural dimension, as it (1) influences the scope of human activities, (2) is influenced by these same activities, (3) represents valuable capital for human well-being (e.g. [providing] local natural resources and enhancing the archipelago's attractiveness), and (4) is thus an object for protection. Finally, the paper concludes that the development of shipping impact assessments should be context driven and incorporate local perceptions of and engagement with the local environment.

#### **Paper 4: “Adaptive capacity of Arctic communities and shipping growth”**

The fourth paper integrates the results from a systematic literature review on local adaptive capacity of Arctic communities and the first three empirical studies (Papers 1–3). The main purpose of this study is to examine the status of the conceptual framework of local adaptive capacity in HDCA literature and discuss whether and how it is influenced by Arctic shipping development. The background for the study derives from the fact that despite an increasing interest in adaptation studies over the past two decades, little is known about whether and how local adaptive capacity is shaped by increasing shipping activities.

The results of this study are presented in two sections: results from the literature review and results from the empirical studies on shipping development. The paper starts with a presentation of the results from a systematic literature review on the framework development of local adaptive capacity in the Arctic. The originality of this review stems from the inclusion of literature on adaptive capacity developed by Russian scholars, who are still underrepresented in HDCA literature. This is followed by a synthesis of the impacts of Arctic shipping development on community viability (in two case communities) and what determinants of adaptive capacity emerge in the context of shipping growth and how they affect local adaptive capacity (based on Papers 1–3).

The study draws some preliminary conclusions. First, the unit of analysis in adaptation studies that examines adaptive capacity varies between Western and



Russian scholars. While more focus is given to local context in Western literature, Russian studies examine regional context and/or economic sectors. It is important to mention that the use and translation of the framework's terminology into Russian presents an additional challenge for the application of the framework. Adaptive capacity itself can be translated into Russian in three different ways—as adaptive “potential,” “possibility,” and “capacity/ability.”

Second, the framework itself has been advanced both theoretically and methodologically. Theoretically, the framework application has moved from identifying the determinants of adaptive capacity toward investigation of their interconnections and their role in activation of adaptive capacity (Mortreux and Barnett 2017). Methodologically, the studies moved toward a broader application of mixed and quantitative methods to assess local adaptive capacity.

Shipping development in these studies presents an example of one of the changes taking place in the Arctic with possible cascading impacts on local communities. The added results from empirical studies confirm this argument, illustrating that shipping growth has both positive and negative impacts. The study illustrates that the emerged determinants of adaptive capacity in the context of shipping growth are interconnected and may result in trade-offs. Community engagement in the form of participation in decision making is also a key determinant of adaptive capacity in both cases. Following the discussion in Paper 3, the study suggests the expansion of the natural dimension of adaptive capacity to “the natural environment.



## 6 CONTRIBUTIONS AND CONCLUDING REMARKS

*"If you only read the books that everyone else is reading,  
you can only think what everyone else is thinking."*

Haruki Murakami

This dissertation explores shipping growth in the Barents area of the Arctic Ocean and whether and how it affects local communities. Through the application of a community-based approach and adaptive capacity framework, it examines the impacts of shipping development on two local communities and what factors lead to or limit adaptation responses.

The originality of this study is twofold. First, it fills a knowledge gap by examining local adaptive capacity in the context of increasing shipping development. Second, it provides the means to apply the adaptive capacity framework to two types of communities that are rarely addressed in HDCA literature: the transitory community (here, Longyearbyen) and the Russian community (here, Solovetsky). However, it emphasizes the need for conceptual adjustments and/or flexibility of its determinants and the necessity to construct and conceptualize relevant variables, such as local community, community engagement, and the natural environment.

### 6.1 STUDY CONTRIBUTIONS

This section illustrates how the scientific papers answer the research sub-questions. It also summarizes empirical and theoretical contributions in order to answer the main research question.

#### **RQ1: What are the main impacts of increasing shipping on local communities?**

The rationale for this question is to increase our knowledge of shipping impacts on local communities in the Barents region. Shipping, in this study, represents a changing condition (precipitating both exposure-sensitivity and positive impacts that affect local viability).

The first three empirical papers answer this question by presenting the diversity of locally identified impacts. Paper 1 presents the locally identified impacts for the Solovetsky community in the empirical results; Paper 2 summarizes the impacts of different types of shipping on the Longyearbyen community by presenting the positive and negative impacts (Table 3); and Paper 3 outlines shipping impacts on the natural environment in the empirical findings section. Table 6.1 summarizing those impacts from Papers 1, 2, and 3.

Table 6.1. Summary of the shipping impacts on local communities.

Effects	Positive impacts	Negative impacts
<b>Longyearbyen</b>		
<ul style="list-style-type: none"> <li>• Need for development of harbor infrastructure and town facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Co-beneficial for local needs</li> <li>• Extends the ability to accommodate several vessels</li> </ul>	<ul style="list-style-type: none"> <li>• Conflict with cultural and natural heritage</li> <li>• Challenges current infrastructure capacity</li> </ul>
<ul style="list-style-type: none"> <li>• Constant improvement of local preparedness and SAR</li> </ul>	<ul style="list-style-type: none"> <li>• Cooperation between local population and voluntary organizations</li> <li>• Implementation of proactive institutional measures</li> <li>• Development of navigation services to avoid accidents</li> </ul>	<ul style="list-style-type: none"> <li>• Expensive</li> <li>• High reliance on SAR facilities, not all shipping is well informed on response time and difficulties of SAR operations</li> <li>• Lack of SAR facilities for bigger boats</li> </ul>
<ul style="list-style-type: none"> <li>• Marine pollution and emission and disturbance of marine species</li> </ul>	<ul style="list-style-type: none"> <li>• New regulations decrease negative impacts but also limit visiting opportunities</li> <li>• Shift toward new types of fuel</li> <li>• New types of vessels; constant improvement to reduce environmental impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Marine litter, emission, and water pollution threaten vulnerable Arctic nature and wildlife</li> <li>• Ballast water may precipitate the introduction of new species</li> </ul>
<ul style="list-style-type: none"> <li>• Increase in number of community visitors (crew members and tourists)</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing demand for more seasonal workers, especially in the tourism industry</li> <li>• New economic and employment opportunities</li> <li>• Focus on sustainable development</li> <li>• Local value creation including (environmental tax</li> </ul>	<ul style="list-style-type: none"> <li>• Overcrowding</li> <li>• Threatens local environment</li> <li>• Affects community's lifestyle</li> <li>• Engenders fear that the area will become a mass-tourism destination</li> <li>• Inappropriate behavior of some community visitors</li> </ul>

Effects	Positive impacts	Negative impacts
<b>Solovetsky</b>		
<ul style="list-style-type: none"> <li>• Infrastructure development</li> </ul>	<ul style="list-style-type: none"> <li>• Improving infrastructure for local needs</li> <li>• Harbor and on-land development meet increasing shipping and visitors' needs</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing pressure on the existing infrastructure during summer months</li> <li>• Trade-offs with cultural and natural capital</li> <li>• Isolated sites are becoming more accessible</li> </ul>
<ul style="list-style-type: none"> <li>• Contributes to local mobility and community resupply</li> </ul>	<ul style="list-style-type: none"> <li>• Increases local mobility during summer season</li> <li>• Improves food security</li> <li>• Cheaper delivery services compared to air transportation</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of subsidies for local population</li> <li>• High dependency on well-functioning shipping fleet</li> <li>• High dependence on sea ice conditions</li> <li>• Delivery of construction material is possible only during navigation period</li> </ul>
<ul style="list-style-type: none"> <li>• Increase in focus on environmental impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Actively limits the impact on the natural environment by improving local guidelines for natural use</li> <li>• Increases awareness about Arctic nature</li> </ul>	<ul style="list-style-type: none"> <li>• Inappropriate behavior among some visitors that is contrary to local rules</li> <li>• Disturbance of wildlife</li> <li>• Lack of waste management</li> </ul>
<ul style="list-style-type: none"> <li>• Increase in number of community visitors</li> </ul>	<ul style="list-style-type: none"> <li>• Contributes to local value creation</li> <li>• Hosting activities as an additional source of income</li> <li>• Increasing number of tourism-related facilities/activities/product variety at stores that are used by locals</li> <li>• Job creation</li> </ul>	<ul style="list-style-type: none"> <li>• Overcrowding</li> <li>• Generates revenue outside the settlement with limited contribution to the local municipality</li> <li>• Missing the sense of isolation and remoteness</li> <li>• Social tension</li> <li>• Challenges existing infrastructure, such as transportation, waste facilities, and mobile services</li> </ul>

Two general conclusions can be drawn from the findings. First, shipping development does not take place in isolation from socio-economic and environmental changes. Thus, it is important to understand the complexity and interlinkages of these changes (polar tourism development, high demand for local resupply, and resource extraction). Second, the impacts are context dependent and locally constructed. Paper 3 illustrates that the exposure sensitivity to environmental impacts varies greatly across the three communities studied and should be examined

in connection with local livelihoods, the way the communities are engaged with and use the surrounding environment, local shipping types and trends, and the seasonality of operations.

**RQ2: What are the salient aspects of adaptive capacity, and how do they shape local adaptive capacity in the context of shipping growth?**

This question is also answered in the first three papers. Paper 1 identifies the critical aspects of local adaptive capacity in the Solovetsky community in the context of shipping growth, that is local involvement in the decision-making system, infrastructure, local values, the natural environment, and economic resources. Paper 1 also argues that these determinants are interlinked, meaning that each determinant and its interlinkages shapes local adaptive capacity. This study illustrates that infrastructure development may limit adaptive capacity if local values (heritage and/or traditions) are not incorporated into the planning and construction phases. The economic growth that derives from an increasing number of community visitors and tourists strengthens adaptive capacity when economic development is balanced with environmental management, and when income stays in the community.

Paper 2 identifies community engagement in adaptive responses as a determinant that shapes local adaptive capacity. Although scientific literature outlines several practices for community engagement (from passive engagement to self-mobilization, Table 3.2), this study refers to self-mobilization practices, that is when local communities take the initiative in developing adaptive responses. In the community of Longyearbyen, this bottom-up community engagement is activated by four community-specific motivation factors—place connection, perception of the changing natural environment, established cooperation practices across a wide group of stakeholders, and the ability to influence decision making.

Paper 3 elaborates on the results of the first two papers and illustrates that the natural environment is a salient determinant of adaptive capacity in the context of

shipping development. It identifies that the construction of environmental impacts varies greatly across the three case communities (Table 4 in Paper 3). These differences are rooted in context-specific variables, such as local engagement (perception and use) with the natural environment, shipping trends, and the seasonality of operations. Hence, the study underlines the need for developing “context-specific assessments of shipping impacts on the natural environment that are based on different forms of use of said environments” (Olsen, Carter, and Dawson 2019, 17).

**RQ3: Are there any limitations for the applications of the adaptive capacity framework to understanding the Russian empirical reality?**

This question is answered in Papers 1, 3, and 4, while some reflections are also presented in Chapter 3: Theoretical and Conceptual Considerations. Papers 1 and 4 underline that the vocabulary of this Western-developed framework does not necessarily correspond with the Russian version of a similar concept. Paper 1 elaborates on the concept of governance that needs to be substituted with decision making, while Paper 4 illustrates that the concept of adaptive capacity has been translated in three synonymous, but different, ways by Russian scholars.

Furthermore, Paper 1 opens the discussion on the possibility to expand the natural capital of adaptive capacity toward a determinant of the natural environment, as empirical data collected in the Russian community brings several other meanings than the existing variable of natural capital covers. Paper 3 elaborates on this suggestion and argues that the perception of “the natural environment” varies across case communities and has several meanings depending on the local engagement with the surrounding environment. Hence, the application of the adaptation framework for the Russian context has the potential to modify and/or expand the meaning of previously identified aspects of local adaptive capacity.

Papers 1 and 4 also address the skepticism toward climate change discourses in the Russian context. This skepticism made me question the choice of using climate change alone as a backdrop for examining adaptive capacity, and as a result, the study aligns with scholars who address climate change (and climate-induced changes) in combination with the multiple changes to which Arctic communities adapt. It also contributed to the decision to adjust the category of Human Dimension of Climate Change in the Arctic— “HDCC”—literature to the more change focused Human Dimension of the Changing Arctic— “HDCA.”

Therefore, I can conclude that the conceptual framework of adaptive capacity can be applied for analysis of the empirical material from Russian cases when the terminology and contextual attitudes are taken into consideration.

#### **RQ4: How can studies on shipping development contribute to our knowledge of adaptive capacity of Arctic communities?**

The first three papers answer this question to some degree, while Paper 4 synthesizes the results to elaborate on the possible contribution. Paper 4 started by acknowledging that shipping development is already addressed in the literature as one of the changes that affect local communities. While Arctic shipping in HDCA literature is sometimes associated with opportunities that arise from the sea ice retreat, the dissertation papers indicate that shipping represents an exposure-sensitivity. By investigating the impacts of shipping growth on local communities, the first three papers show that they are interrelated with other exposure sensitivities, such as impacts of climate change and changes in the socio-economic system. Moreover, shipping represents global, national, and regional changing conditions with cascading impacts on the local level and communities, who are also the first to experience and respond to these impacts.

Furthermore, the study identifies several aspects of adaptive capacity that are salient in the context of shipping development. These aspects are interconnected and



case specific, meaning that not all communities will recognize their significance. Although the identified determinants are similar to those identified in the HDCA literature, two require more attention: local engagement (and/or participation in decision making) and the natural environment.

Local engagement (in decision making and adaptive responses) presents a supportive mechanism to existing shipping governance systems. The role of local communities in shipping development is discussed in the empirical papers, and I argue it will develop greater significance with increasing shipping operations (see also Olsen et al. 2020). The study also indicates that this latent determinant is interlinked with local values and other local motivation factors, for example networks, place attachment, ability to influence policymakers, and perception of the environment.

Examination of the determinant of the natural environment leads us to conclude that it embodies different meanings and varies significantly across the case communities, shaping their adaptive capacity in different ways. This variation connects to the heterogeneity of the Arctic region and the different levels of engagement with and use of nature. Hence, the construction of this variable identifies if and why certain communities are more vulnerable to impacts of shipping.

To conclude, I argue that this study has advanced our knowledge of local adaptive capacity by examining the complexity of shipping impacts in the context of multiple changes taking place in the Arctic. The study identifies the importance of the inclusion of human dimensions in Arctic shipping development research.

## 6.2 EMPIRICAL AND THEORETICAL CONTRIBUTIONS

### 6.2.1 Answering the main research question: What are the consequences of shipping development in the Barents area on local communities and for their adaptive capacity?

Here, I summarize the main findings of the dissertation papers, to address the main research question. The empirical and theoretical contributions of the main findings correspond with the objectives of this study, which are to (1) increase knowledge of shipping impacts in the Barents area and (2) enhance the theoretical development of adaptive capacity in the context of shipping growth. The theoretical and conceptual contributions are described here with help of Figure 3.1 (Chapter 3: Theoretical and conceptual perspectives). The five main contributions are listed below (also the 'five green arrows' in Fig. 6.1):

1. **Context matters.** This study elaborates on the heterogeneity of the Arctic region in the form of diversity within community settings, varying resource distribution, and the differing degrees of access to these resources. Thus, understanding contextual characteristics and local shipping trends should be a starting point for research that aims to explore the consequences of this industry. By viewing shipping activities as a changing condition, this study argues that not all types of Arctic shipping are increasing with sea ice reduction. Destinal and domestic traffic that is demand driven will certainly benefit from the extension of the navigation season, especially if there is demand for those activities outside the established navigation season. To conclude, the local context represents a key variable in assessing the consequences of shipping development for communities' adaptive capacity.
2. **Construction of determinants.** In line with scholars who investigate adaptive capacity, this study underlines the importance of an empirical investigation into community-specific aspects that form local adaptive here, here *determinants*. Those context-dependent determinants not only vary across the case communities but also receive different interpretations and perceptions depending on which community is studied. Hence, this study elaborates on the meanings of two identified determinants of adaptive capacity (community engagement and the natural environment) and justifies the use of this new terminology by describing their significance.

3. **Interlinkages and activation.** The identification of determinants of adaptive capacity presents the first step in examining adaptive capacity. The next step should be understanding the interconnection of the determinants and if and how they are activated to enable adaptive responses. This study agrees with research arguing that the availability of determinants of adaptive capacity does not necessarily strengthen the adaptive capacity itself and/or lead to adaptive responses. An analysis of the interlinkages of these determinants reveals possible trade-offs and a need to examine the way these compromises shape local adaptive capacity. As shown in this study, the activation of latent adaptive capacity depends on the *community agency* and contextual characteristics.

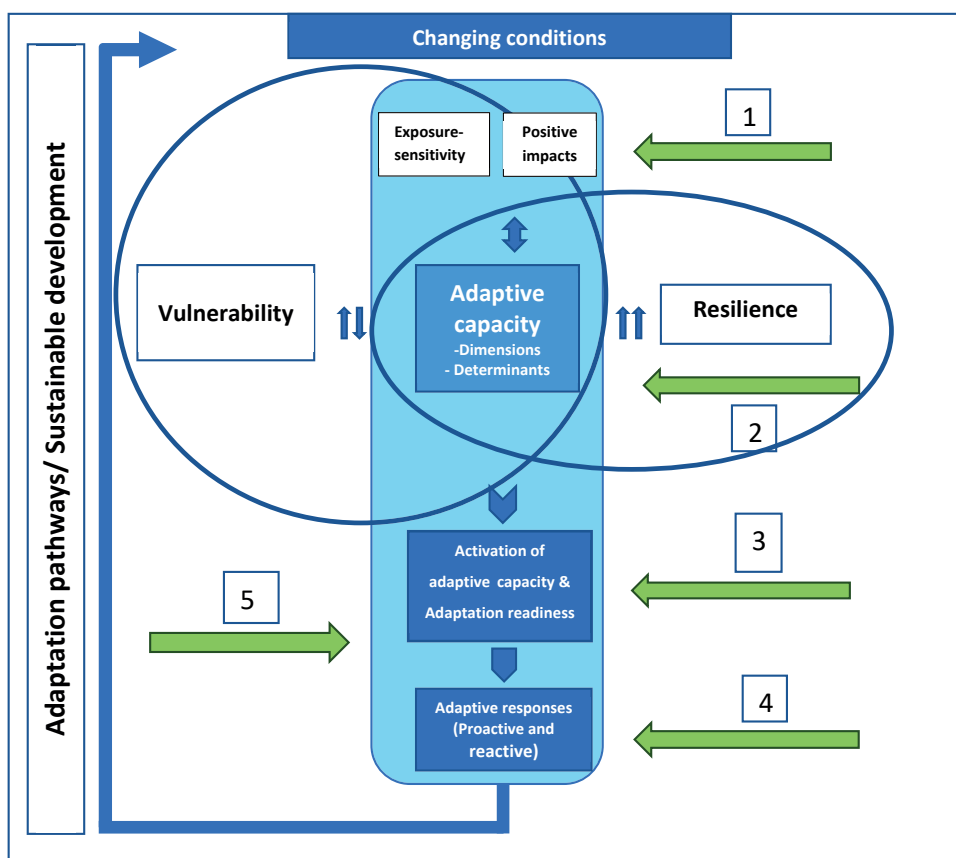


Fig. 6.1 The dissertation’s contribution (‘the green arrows’) to the development of the adaptation framework (‘the blue box’).

4. **Adaptive responses.** I argue, that a community agency has a focal role in activating local adaptive capacity to enable adaptive responses. The community agency depends on local ability to act collectively, the form of local engagement, and inclusion of relevant stakeholders. Local adaptive responses support and correct institutional or top-down responses that aim to limit the negative impacts of shipping development while enhancing the positive.
5. **Framework application.** Two reflections on the interactions between shipping and community were made while applying the framework of adaptive capacity to the two communities of the Barents area. First, a community-based approach via the engagement of local residents contributed to a general understanding of shipping impacts. However, given the complex governance system of shipping activities, some local stakeholders were not necessarily located within the community. Nevertheless, their inclusion in these types of local approaches to shipping impacts may increase knowledge of exposure-sensitivity and its positive impacts. Second, despite the skepticism toward climate change in the Russian context, as well as differences in vocabulary, the adaptation framework can still be applied to communities in Russia to understand if and how changing conditions affect communities' viabilities and if and how the communities adapt to them.

## 6.3 CONCLUDING REMARKS

### 6.3.1 Limitations

Despite these empirical and theoretical contributions, this study has two main limitations. First, from a research design perspective, the study had the potential to include more than two communities, but I was restricted by time and resource considerations. Seasonality in shipping operations sets a natural limitation on conducting research in the Arctic; in order to collect empirical data, fieldwork has to take place during the summer navigation season. Moreover, research on shipping in the Arctic requires planning for extra time to accommodate possible cancellations and delays in shipping operations. The communities' remoteness and the lack of mobile infrastructure in some areas limited my reliance on the phone as a means of communication. In Solovetsky, for example, I often visited offices and other places of

work to arrange interviews. On Svalbard, phone service disappears outside the Adventsfjorden area, making it difficult to contact interviewees.

Another limitation, which became a background aspect of this study, was the general lack of available knowledge on the possible impacts of shipping development on coastal communities. As stated in Chapter 2: Background, the fragmented knowledge available for only a small number of Arctic communities precludes a holistic understanding of shipping development interaction with these local communities. It was unclear, especially in the earlier stages, in which direction the research would head and whether theoretical and methodological choices were sufficient to answer these broad and also context-specific research questions.

### **6.3.2 Potential for further research**

Further research on the interrelatedness of shipping and community can be advanced both methodologically and theoretically.

From a methodological perspective, there is a potential to extend the list of case communities, and there are numerous Arctic areas that would benefit from the study of shipping growth. While the Barents area and the Canadian Arctic are addressed to some degree in the existing literature, less knowledge has been generated about other regions, such as Russian Siberia and the Far East, Alaska, Greenland, and Iceland. Different selection criteria may, of course, be chosen. One might investigate if and how decreasing shipping development would affect local viability. Alternately, one might study a specific type of shipping rather than a growth or decrease in shipping development. Also, shipping impacts should be investigated in larger settlements and/or port-towns with more than 3,000 inhabitants. Finally, there remains the potential to compare shipping impacts in Arctic communities with communities in the Global South.

From a theoretical perspective, one research possibility is to use an adaptive co-management approach to investigate local governance arrangements, that is how

shipping is co-managed locally and what role local stakeholders play in these arrangements. Shipping development is a rather new phenomenon in several parts of the Arctic, including the High Arctic. Knowledge of potential impacts will be beneficial for citizens of the Arctic and their decision makers, especially in light of the planned TPR that is expected to be navigable by the mid-century.

Arctic shipping governance presents a complex and interlinked mosaic of global, circumpolar, national, regional, and local sets of regulations, laws, norms, and guidelines (e.g. Olsen 2017; see also Pashkevich, Dawson, and Stewart 2015). Hence, the adaptive co-management approach, according to Westskog et al. (2017), is useful for understanding how different levels of governance interact in the case area and how the local context is mainstreamed in national policy. Without assessing the governance aspects of shipping development, this study elaborates on the role of the local communities as an important stakeholder in governance that affects and is affected by shipping activities (Papers 1 and 2; see also Olsen et al., in press-b) and their role in locally established adaptive response that presents a supportive mechanism for local governance arrangements (Paper 2).

The other aspect of this development that is yet to be addressed in shipping studies is ‘the economic lure.’ Although the existing literature describes a number of opportunities associated with sea ice reduction, including shipping, fishing, tourism, and natural resource extraction (e.g. Meier et al. 2014; Ford et al. 2018), it is important to ask “opportunities for whom?” Shipping operators who benefit from shipping development, such as transit operations and marine tourism, are often located outside the Arctic region, while coastal communities carry the possible risks of those globalized activities with limited value creation. However, this dissertation argues that local communities gain knowledge and establish local initiatives in order to benefit from this development.

Further understanding the complexity of shipping development (in combination with other changes) and its impacts on the Arctic socio-ecological system

would require an integration of natural science perspectives to explore the mechanism behind the impacts and the actual state of these impacts. Based on the conducted research, I concur with the assertion of Ng et al. (2018) that further research on this complexity will require an interdisciplinary approach and closer collaboration between the natural and social sciences. This collaboration can be achieved by the application of, amongst others, the human ecology paradigm, which utilizes an interdisciplinary basis for inquiry (Bates 2012; Catton 1994). As argued by (Benjaminsen and Svarstad 1998, 16), although social scientists study how environmental problems become social concerns, it is important to understand how the problem is understood by natural scientists as well. In conclusion, I suggest that further and more holistic investigation of these shipping impacts might be achieved through interaction between natural and social science.

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# APPENDICES

## Appendix 1 – Interview guide for Longyearbyen and Solovetsky.

A short project introduction (funded by NORD and SSF). Why I study this topic? Ensure anonymity. I will also ask if they wish to be anonymous. Ask permission to record the conversations.

1. Information about the informant.
  - a. Short information. How long have you been living in Longyearbyen/Solovetsky?
  - b. How does your work relate to shipping activities?
  - c. What role does the marine environment play in your daily life? (For ex. as a food resource, as transportation, free-time activities, decision-making)?
2. About area, including marine environment:
  - a. Have you noticed any changes in the marine environment? For ex. less ice, more fish, pollution.
  - b. Does it affect your daily life? Your business or organization? Logistics in the area.
  - c. How changes in the settlement development affected shipping activities? (New industries, population growth/decline, building of new infrastructure).
3. Shipping?
  - a. How would you define the navigation seasons in this area?
  - b. Have you noticed any changes in the navigation season (time and space)?
  - c. Have you noticed changes in amount/type of shipping? During described seasons. What are the main reasons for those changes?
  - d. Are there certain types of preparation (short-term and long-term) required to facilitate those activities?
  - e. Is local infrastructure/ port facilities/ information services / store capacity sufficient to facilitate all shipping needs?
  - f. Do you think Search and Rescue (SAR) activities/communication system are effective in case of emergency?
  - g. What improvements are required?
4. Impact from shipping activities (community/work situation):
  - a. What is your perspective on the possible direct and indirect impacts on marine environment? (Examples?)
  - b. How does it affect community/your daily life/your work situation? What are the possible positive and negative effects (for ex. infrastructure developments, improvements in goods delivery, opportunity for



- opening new businesses)?
- c. Are there any economic benefits/opportunities for your company/community/work situation?
  - d. Do shipping activities have any implications for your daily life/work situation?
  - e. Do you experience the increasing amount of cruise visitors in your community?
  - f. Are there any particular challenges / opportunities for your businesses/work situation?
  - g. What do you do during that period? Are you engaged in hosting/business activities?
5. Participation in the decision-making:
    - a. In what degree are you personally involved in shipping development?
    - b. To what degree do you think you can influence decision-making in this context?
    - c. Do you support increasing shipping/cruise tourism activities?
    - d. Have you been informed about the shipping development in the region? What is your role in the decision-making process?
    - e. What expectations to shipping administration do you have?
    - f. What is your involvement in SAR?
    - g. Do you have information about port development and possible development in the area to meet shipping needs?
    - h. Were there arranged any meetings to inform/consult with local residents?
    - i. Do you want to be involved in this process? Personal interest?
  6. Shipping regulation (questions only to public bodies)
    - a. What types of regulations and decisions happen locally/nationally?
    - b. What was the rationale for such regulations? (note to self: ban on heavy fuel oil) (Who started the process?)
    - c. What are the linkages to national policies?
    - d. How can the local population influence local and national decision making?
    - e. How does implementation of Polar Code affect shipping activities? What are potential for improvements? (to ban heavy fuel oil)
    - f. What are decisions made on accommodating cruise tourists?
  7. Future development.
    - a. What are your thoughts about future developments?
    - b. What are limitations and possibilities?
  8. Do you have any comments or/and some more information you would like to share that we have not discussed yet?
  9. Would it be possible to contact you if there is a need for clarification?

## Appendix 2 – Coding in NVivo

### 1. Round: Coding based on the interview guide:

- About community
  - o Dependence on shipping
  - o Stakeholders and processes on shipping development
  - o Socio-economic and demographic changes
- Changes in local environment
  - o Climatic changes
  - o Sea ice conditions
- Shipping trends
  - o Changing trends (types and distribution)
  - o Seasonality
  - o Perception of change
  - o Main impacts (positive and negative)
  - o Safety concerns
  - o Perspectives of development

### 2. Round: Coding related to the theoretical concepts

- Paper 1:
  - o Economical impacts
  - o Nature/natural capital
  - o Infrastructure
  - o Information and local involvement in decision-making
  - o Local values, worldviews and beliefs
- Paper 2:
  - o Local involvement in decision-making
  - o Knowledge and information
  - o Local institutions
  - o Responses/flexibility/ motivation
  - o Engaged stakeholders and residents
- Paper 3
  - o Impacts on marine environment
  - o Impacts on terrestrial environment
  - o Cascading effects
  - o Combination with other changes
- Paper 4:
  - o Definition and concepts
  - o Origin of the concept
  - o Relation to other concepts
  - o Determinants/aspects/variables
  - o Type of change
  - o Relation to shipping
  - o Study approach
  - o Study region

## **Appendix 3 – Agreement on participation in the research project (In Norwegian)**

### **Forespørsel om deltakelse i forskningsprosjektet *Skipstrafikk i Arktis og lokalsamfunnsperspektiv***

#### **Bakgrunn og formål**

Jeg holder på med et doktorgradsstudium ved Nord universitet i Bodø, som handler om økende skipstrafikk i Arktis og konsekvenser for lokalsamfunn. Bakgrunnen for prosjektet er at skipstrafikken har økt dramatisk i Arktis i de siste årene. Samtidig vet vi lite hvilke konsekvenser denne aktiviteten har for lokalsamfunn og om lokale aktører kan påvirke denne utviklingen. Derfor ønsker jeg å finne ut mer om hvordan skipstrafikken påvirker lokalsamfunn og om og på hvilken måte lokale aktører er engasjert og involvert i å styre hvordan denne aktiviteten vil påvirke lokale forhold. Jeg håper at du og/eller dine kollegaer har mulighet til å delta i et intervju.

#### **Hva innebærer deltakelsen i studien?**

For å kunne gjennomføre studien er det ønskelig å intervju deg. Intervjuene tar ca 40-50 min og vil dekke spørsmål om området hvor de som intervjues bor, spørsmål om skipstrafikk, om konsekvenser fra skipstrafikk og om lokalt styresett.

Intervjuene vil bli tatt opp på lydopptak, hvis den som intervjues er enig og under intervjuet vil jeg i tillegg ta notater. Hvis du er enig vil jeg gjerne ta noen bilder som ikke kan identifisere deg.

Alle personopplysninger vil bli anonymisert og behandlet konfidensielt.

#### **Hva skjer med informasjonen om deg?**

Alle personopplysninger vil bli behandlet konfidensielt. Bare jeg og min veileder skal ha tilgang til datamaterialene. Ingen enkeltpersoner vil kunne gjenkjennes i den ferdige studien. I prosjektpublikasjoner skal jeg publisere bare bakgrunnsdata som bosted, kjønn og alder (for eks. Longyearbyen, mann, 50 år) uten at person kan gjenkjennes. Mens arbeidet pågår vil lydfilene bli lagret på PC beskyttet med brukernavn og passord. Notater oppbevares i et avlåst lokale og kun er tilgjengelige for meg.

Prosjektet skal etter planen avsluttes i mai 2019. Datamaterialet skal anonymiseres. De anonymiserte data kan bli brukt til videre forskning. Den enkeltes ønske om videre bruk/ikke bruk av opplysningene vil bli notert og respektert.

#### **Frivillig deltakelse**

Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli anonymisert.

Dersom du ønsker å delta eller har spørsmål til studien, ta gjerne kontakt med meg:

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Studien er meldt til Personvernombudet for forskning, NSD - Norsk senter for forskningsdata AS.

### **Samtykke til deltakelse i studien**

Ifølge NSD (Norsk Samfunnsvitenskapelig Datatjeneste) kan samtykke til forskningsprosjekter innhentes enten skriftlig eller muntlig. For dette prosjekt vil alle deltakere derfor bli bedt om at samtykke enten skriftlig eller muntlig før intervju. Skriftlig samtykke vil bli bekreftet ved signatur på deltaker-dokument som vist nedenfor.

Jeg har mottatt informasjon om studien «Skipstrafikk i Arktis og lokalsamfunnsperspektiv», og er villig til å delta i intervju.

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(Signert av prosjektdeltaker, dato)

**Appendix 4 – Papers co-developed by the author that reflect on shipping development (not a part of the dissertation)**

1. Nenasheva M., Olsen J. (2018). Water transport in the Arkhangelsk region: social significance, challenges and perspectives on development. *Arctic and North*, 32: 40-50.
2. Têtu, Pierre -Louis; Dawson, Jackie; Olsen, Julia. (2018). Navigating Governance Systems & Management Practices for Pleasure Craft Tourism in the Arctic. *The Arctic Yearbook 2018* s. 141-161
3. Olsen J., Nenasheva M., Wigger K., Pashkevich A., Bickford S. and Maksimova T. (in press). Cruise tourism development in the Arkhangelsk region, Russian Arctic: Stakeholder perspectives on sustainability of tourism practices. In Eva Pongrácz, Victor Pavlov & Niko Hänninen (eds.). *In search of Arctic marine sustainability: Arctic maritime businesses and resilience of the marine environment*. Springer
4. Olsen, J., Nenasheva, M., Hovelsrud, G., (in review) 'Road of Life': Changing Navigation Seasons and Adaptation of Island Communities in the Russian Arctic. Submitted to *Polar Geography*.
5. Julia Olsen<sup>1</sup>, Leticia Antunes Nogueira, Anne Katrine Normann, Bjørn Vidar Vangelsten, Ingrid Bay-Larsen (in-review). Marine littering in the Barents area: institutionalization of new attitudes and practices among fishers. Submitted to *Marine Policy*.



**PART II**



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# PAPER 1

## **Adaptive capacity in the context of increasing shipping activities: A case from Solovetsky, Northern Russia**





# PAPER 2

## Increased Shipping and Community Engagement: A case from Longyearbyen, Svalbard





# Chapter 14

## Increasing Shipping in the Arctic and Local Communities' Engagement: A Case from Longyearbyen on Svalbard



Julia Olsen, Grete K. Hovelsrud, and Bjørn P. Kaltenborn

**Abstract** Increasing ship traffic in the Arctic has a broad range of impacts on coastal communities' wellbeing and the natural environment. Despite a number of existing national and international efforts to mitigate the risks and secure the benefits of this development, the role of local initiatives and arrangements is still understudied. Focusing on the town of Longyearbyen, situated on the Svalbard Archipelago, this chapter examines the impacts of and responses to the considerable growth in shipping activities comprising marine tourism, cargo (supply), fishing, research and Search and Rescue vessels. Since the settlement's establishment in 1906, Longyearbyen has seen shipping play an important role in the community's development by serving as a vital transport link between the Archipelago and the mainland. The impacts of recent growth in ship traffic, coupled with environmental changes and an ongoing transition from a coal dominated economy toward tourism, research and education, challenge the local capacity to accommodate such growth. The analysis of empirical data indicates that local, bottom-up engagement serves as a support mechanism for institutional response strategies and enables local adaptive capacity. At the same time, community engagement is sensitive to demographic trends that influence the scope and efficiency of actions.

**Keywords** Shipping · Arctic · Longyearbyen · Local community · Local engagement · Adaptive capacity

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## 14.1 Introduction

The Barents area and its adjacent terrestrial areas (including Svalbard and Franz Josef Land) (AMAP 2017), are experiencing multiple changes, including a considerable growth in ship traffic. Europeans and *Pomors*<sup>1</sup> have navigated the Barents Sea for centuries (e.g. Arlov 2003). Recently, reduced sea ice extent and a decrease in the number of days with sea ice cover (Overland et al. 2017; Borch et al. 2016), coupled with an increasing interest in Arctic marine resources and tourism attractions, have increased shipping activities. Currently, the Norwegian and Barents Seas have the highest concentration of Arctic shipping activities (Egufluz et al. 2016), including all types of vessels operating in Arctic waters (PAME 2009, p. 3). In fact, about 80% of all Arctic shipping crosses Norwegian waters (St. Meld. 31 2015–2016).

With reduced sea ice, new areas of the Northern Barents Sea have become accessible to marine tourism, fishing and research activities. A recent evaluation of future Arctic development shows that with the opening of previously icebound areas, activity levels will continue to increase in those parts of the Arctic (Borch et al. 2016). Further growth may be possible with the emergence of a trans-Arctic shipping route across the North Pole, which, according to Smith and Stephenson (2013), may occur by mid-century (see also Farré Buixadé et al. 2014).

At the same time, these waters challenge maritime safety efforts due to a lack of supportive infrastructure, long travel distances and severe weather conditions (Marchenko et al. 2016). Increasing shipping activities require new safety and environmental guidelines and a strengthening of Search and Rescue (SAR) and emergency preparedness services, which are necessary to reduce the risk of shipping operations and to avoid loss of life, health and environmental damage. Several important steps have already been taken to address these issues, including a sectorial agreement on SAR within the Arctic Council. The Arctic Search and Rescue Agreement delimits the Arctic region between all the circumpolar states (Arctic Council 2011; ratified in 2013). As a result, significant improvements were made to the SAR-system within the Barents area, including the Svalbard Archipelago, which plays a key role in SAR operations for the Western Sector of the Arctic (Marchenko et al. 2016).

Moreover, the impacts of shipping development will be felt in the Arctic port towns and local coastal communities that provide supportive infrastructure and host increasing numbers of visitors (e.g. Davydov and Mikhailova 2011; Olsen and Nenashva 2018; Stewart et al. 2015). However, despite the general growth in ship traffic across the Arctic (e.g. Dawson et al. 2018; Borch et al. 2016) and the attention given to such activities, knowledge about the local implications of, and responses to this growth remain scarce. Little is known about whether Arctic communities in the Barents area, which was historically navigable, can benefit from

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<sup>1</sup>Russian settlers living by the White Sea.

these changes while limiting the threats to their wellbeing, local environment and natural resources.

To increase the available knowledge on this topic, this study investigates whether and how shipping activities influence the adaptive capacity of one Arctic community, Longyearbyen, a populace that also represents the administrative center on Svalbard. Based on 36 qualitative interviews with local residents, who are engaged with shipping development and exist within a framework of adaptation and adaptive capacity, we identify (1) the impacts of different types of shipping, including marine tourism; and (2) the aspects of a community's adaptive capacity that emerge in response to such impacts.

## 14.2 Background and Context

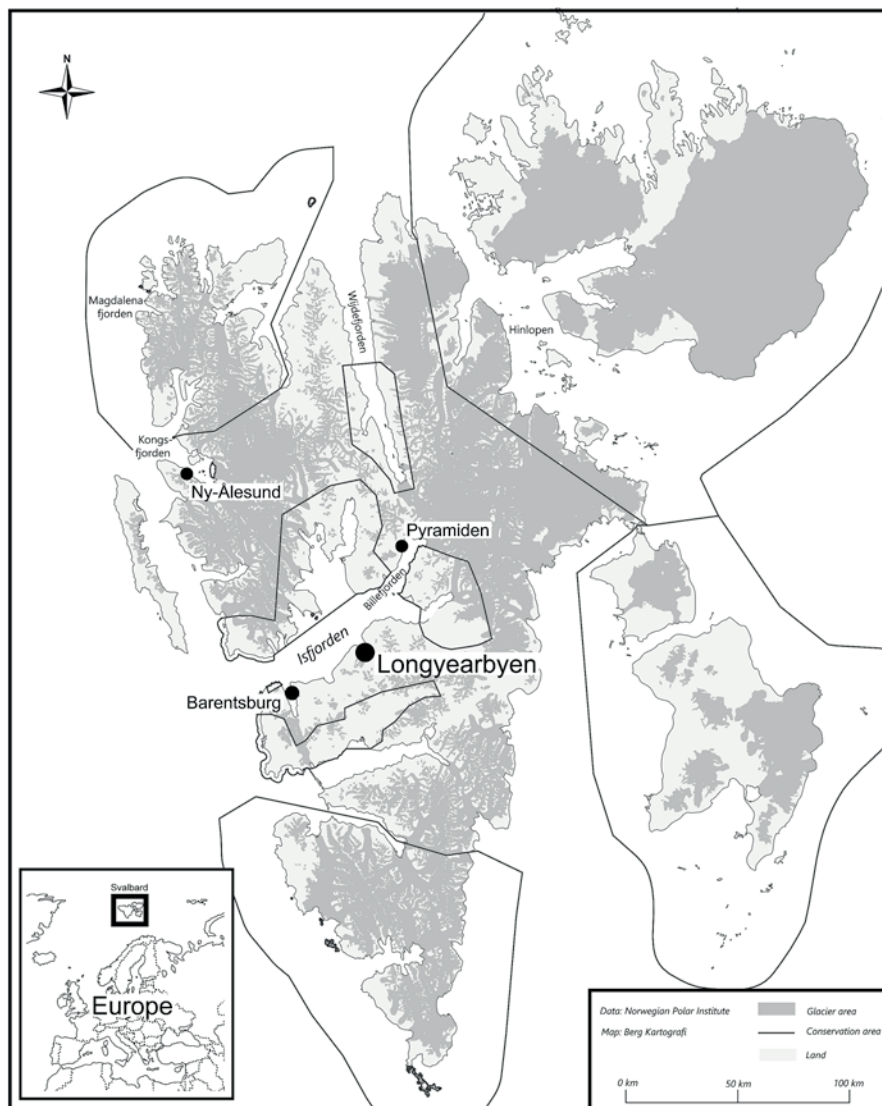
### 14.2.1 *Shipping Perspectives for the Svalbard Archipelago*

Svalbard marks the northernmost part of Norway, located between 74°N and 81°N in the Arctic Ocean (Fig. 14.1). However, compared to other areas at the same latitude, Svalbard's climate is surprisingly mild due to the presence of the Gulf Stream, a warm Atlantic Ocean current. Moreover, climate change has increased ocean and air temperatures in the Barents Sea and in adjacent areas, impacting hydrological regimes (e.g. Vikhamar-Schuler et al. 2016). Sea ice in the Barents Sea has undergone dramatic changes (MOSJ 2018), noticeably decreasing in both thickness and extent since 1979 (Vikhamar-Schuler et al. 2016). This reduction will likely affect the distribution of ship traffic in the Barents area.

The density of ship traffic near Svalbard is much lower than in the Norwegian Sea and the southern part of the Barents Sea (St. Meld. 32 2015–2016). The traffic has seasonal variations and is dominated by fishing, marine tourism, research and cargo activities (Borch et al. 2016; The Governor of Svalbard 2016). Despite the intensive fishing activities near Svalbard, coupled with the increasing biomass of boreal fish species (Misund et al. 2016), there are no landing or processing facilities for fish or seafood on Svalbard. This is due to the lack of specific regulations for the Svalbard Archipelago, which differs from mainland Norway (e.g. Marine Resources Act; Food Act) (St. Meld. 32 2015–2016). As a result, seafood products are primarily delivered from the mainland. Given the growing possibility of an interest in harvesting sea food, the Norwegian government has considered facilitating the development of seafood on the Archipelago to meet local food and tourism needs (St. Meld. 32 2015–2016, p. 92).

The growth in marine tourism is noticeable in both the number of vessels and in the volume of passengers. Despite the 150-year-long marine tourism history on Svalbard (Nyseth and Viken 2015), the development trends show that Svalbard (and the port of Longyearbyen) is approached by ever-larger cruise ships with a capacity for more than 5000 passengers (Fig. 14.2), but also by a fast-growing





**Fig. 14.1** A map of Svalbard

pleasure craft sector (Table 14.1). Moreover, the extension of the navigation season has affected the distribution of vessels in space and time, including increases in fishing vessels and cruise ships sailing northward towards the ice's edge.

A recent estimate of shipping development around Svalbard indicates that the level of activity will continue to increase into 2025 (Borch et al. 2016) and beyond (DNV-GL 2014). Due to its geographical location, Svalbard has no logistical





**Fig. 14.2** MSC Preziosa, with over 5000 passengers, arrives at the port of Longyearbyen, *Bykaia* (Town Pier). August 2017. (Photo credit: Julia Olsen)

**Table 14.1** Population and shipping trends in Longyearbyen

Year	2000	2002	2004	2006	2008	2010	2012	2014	2016
Population in Longyearbyen and Ny-Ålesund <sup>a</sup>	N/A	1570	1581	1721	1821	2052	2115	2100	2152
Number of passengers	15,899	18,757	21,837	37,085	38,569	40,123	55,091	54,808	75,201
<b>Number of ship calls, including</b>	<b>166</b>	<b>505</b>	<b>490</b>	<b>799</b>	<b>771</b>	<b>814</b>	<b>812</b>	<b>1178</b>	<b>1542</b>
Tourism (passenger) vessels <sup>b</sup>	78	345	374	550	550	566	558	806	1099
Fishing vessels	50	43	20	27	21	8	15	30	32
Cargo vessels (incl. community supply)	5	29	20	78	54	60	52	67	51
Research	28	47	23	64	41	92	108	70	84
Coast Guard and the Governor's vessel	5	41	45	68	89	74	72	74	110
Pilot <sup>c</sup>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	96	142

<sup>a</sup>Statistics Norway report the population for both Longyearbyen and Ny-Ålesund. Ny-Ålesund is an international research community with 43 residents, as of 2015. The statistics are not available (N/A) for the year 2000

<sup>b</sup>The number of passenger vessels includes overseas cruise vessels, expedition cruises, day-trip cruises and pleasure crafts. The last two groups stand for the major portion of number of ship calls (approx. 50–80%)

<sup>c</sup>The pilot boat started operating in 2014

Sources: Port of Longyearbyen (2018) and SSB (2016)

function for shipping operations along the Northeast Passage (NEP). According to Smith and Stephenson (2013), the prognosis for an ice-free Arctic Ocean by the mid-century will place the archipelago on the Trans-Polar Route, the new Arctic route between East and West (see also Farré Buixadé et al. 2014). This area is characterized by a lack of supportive infrastructure and services, long travel distances, severe and unpredictable weather conditions (Marchenko et al. 2016) and the long polar night in winter. In the event of accidents, response times may vary from a few hours to a few days (The Governor of Svalbard 2016).

The Norwegian government has applied several local measures to reduce the risk of unwanted events and to avoid loss of life and environmental damage. They entail strengthening emergency preparedness, developing maritime services around the archipelago (e.g. Marine Automatic Identification System (AIS)-stations), and issuing regulations. For example, since 2012, shipping has been locally regulated by restrictions on vessel type and fuel use (particularly directed towards vessels sailing in East Svalbard), as well as by compulsory pilotage services for certain types of crafts (Borch et al. 2016).

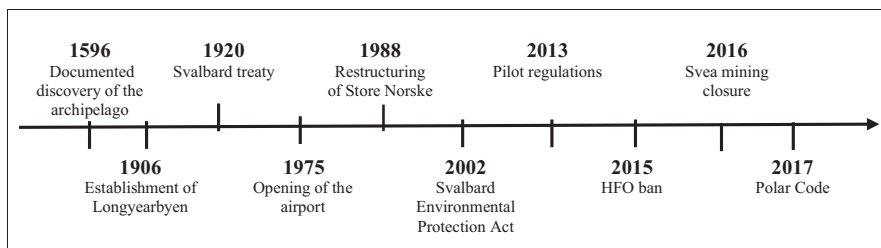
Given current shipping trends and future perspectives, Longyearbyen represents a potentially crucial port for shipping infrastructure and a SAR base. Hence, for this study, we have examined current local perspectives and impacts of shipping growth to understand whether and how the community responds and adapts to them.

### ***14.2.2 Case: Longyearbyen, Svalbard***

Longyearbyen is the world's northernmost town at 78°N (SSB 2016) and is the hub of administration, transportation, and business on the Svalbard Archipelago. It comprises the Governor's office, the University Centre on Svalbard (UNIS), diverse services and industries (Viken 2008, p. 139) and, as noted above, has a major deep-sea port with supportive infrastructure and SAR facilities. Longyearbyen is usually described as a rotation community of 2200 (Table 14.1) inhabitants from 46 nations with a 7-year average residence time (SSB 2016). This has major implications for local demographics and the community viability of Longyearbyen.

The settlement was established in 1906 as a "company town" (Fig. 14.3) where the Norwegian coal mining company, "*Store Norske Spitsbergen Kulkompani*," historically controlled most aspects of community life. With the onset of uncertainty about the future of coal production in the late 1980s (e.g. Arlov 2003), Longyearbyen began a period of transition toward tourism, education and research. A major reduction in coal mining activities occurred in 2017 due to the closure of the Svea Mine (e.g. Pedersen 2017). This politically-guided transition is evident in the port of Longyearbyen, as mining-related shipping is steadily decreasing while research and tourism-related shipping activities consistently increase (See Table 14.1).

Longyearbyen's geographical location, remoteness and logistic complexity amplify its dependence on ship traffic for socio-economic development. Since the establishment of the settlement until the opening of the airport in 1975 (Fig. 14.3.



**Fig. 14.3** Timeline of historical events related to community and shipping development

Timeline), marine vessels have been the primary transportation link with the mainland, as well as the area's main source of supplies and mobility. Today, shipping services remain crucial for local activities and development, though regular and stable year-round airline connections have substituted for some of these services. Until the previous decade, the Longyearbyen community was accustomed to marking a period between “the last and the first boat,” a span of time in which the community remained isolated through winter once sea ice created a natural barrier to shipping.

Despite yearly variations, gradual reductions in the sea ice of Isfjorden outside Longyearbyen (e.g. Muckenhuber et al. 2016, Teigen et al. 2011) has resulted in recent year-round town accessibility for supply vessels (see Bring 2016, for example). The extension of the navigation season has also become more noticeable in the port of Longyearbyen, where some expeditions and day-long cruises begin their seasons earlier and earlier in the spring (in 2017, the navigation season for these vessels commenced as early as March), though most traffic still occurs in the summer months. The increase in shipping associated with tourism is also apparent in the number of tourists and crew members, which has increased fivefold since the beginning of the century (Table 14.1). In addition to tourism vessels, the port of Longyearbyen is used for community supply, fishing and research vessels. These new trends in shipping distributions present a potential challenge for SAR and have resulted in the extended presence of the Governor's SAR vessel from 6 to 9 months (St. Meld. 32 2015–2016) in addition to the constant presence of the Coast Guard. With the new pilotage regulations of 2012, growth in the number of pilot boat calls has been linked to increased shipping in the port of Longyearbyen (Table 14.1).

Longyearbyen has four main docking facilities: Old Pier (*Gamlekaia*), Coal Pier (*Kullkaia*), Town Pier (*Bykaia*) and Tourist Pier (*Turistkaia*), the last of which is a floating dock for small passenger vessels. *Bykaia* is currently used for marine tourism, fishing, research vessels, cargo ships and the Coast Guard (Multiconsult 2014). Despite several docking options, the increasing number of vessels challenges port capacity because the relatively high volume of vessels arrives during the short summer season (St. Meld. 32 2015–2016). Further development of infrastructure and facilities is one major task for the Norwegian government on the archipelago (St. Meld. 32 2015–2016).

## 14.3 Theoretical and Conceptual Framework

### 14.3.1 *Conceptualizing Local Community*

The concept of “local community” is described, identified, approached and defined in multiple ways in the literature. In this chapter, we align ourselves with Haugen and Villa (2016) and Aarsæther’s (2014) definition of community as geographically bounded, where physical proximity facilitates interactions. “Community” includes shared perceptions of challenges and duties, experiences, and tasks, which all contribute to shaping local institutions (administrative or voluntary organizations), and the interactions between people who feel attached to a place or an area (Haugen and Villa 2016, p. 18).

Place attachment has been found to be a driving force in addressing community concerns, which in turn may enable adaptive responses (Akama et al. 2014; Hovelsrud et al. 2018). Place attachment may also be a strong motivator for living with risk of infrastructural disruptions, such as avalanches and other weather-related risks (Hovelsrud et al. 2018). Earlier research has shown that the level of place attachment in Svalbard is a predictor of how serious Longyearbyen residents consider environmental impacts (Kaltenborn 1998).

Moreover, local social relations will be affected by a number of multi-scalar processes and changes in political, economic, cultural and other systems (Haugen and Villa 2016, p. 21). Those changes are particularly noticeable in ‘company-town’ communities that are more dependent on international markets and external labour (Haugen and Villa 2016, p. 28; Valestrand 2016). Following this section’s discussion, we will address community settings and whether they shape the determinants of local adaptive capacity and responses to increasing ship traffic.

### 14.3.2 *Adaptation and Adaptive Capacity*

To understand how Longyearbyen responds to the current impacts of increased shipping, we align ourselves with the literature on human dimensions of Arctic change and employ the concepts of adaptation and adaptive capacity to describe the strategies and activities used to address current change and/or plan for changes (e.g. Hovelsrud and Smit 2010; Smit and Wandel 2006). A bottom-up approach is usually applied to study communities’ adaptive capacity in order to access community perspectives and to empirically identify how a particular community experiences changing conditions (Smit and Wandel 2006; see also Hovelsrud and Smit 2010; Keskitalo et al. 2011). Focusing on the local level, this study investigates community characteristics in order to understand which dimensions of adaptive capacity manifest in the context of increasing shipping activities in Longyearbyen. Adaptation is considered within the context of multiple stressors or factors acknowledging that climate change is rarely the only factor to which communities adapt (e.g. Leichenko and O’Brien 2008).

It is increasingly recognized in the climate adaptation literature that adaptation is a process taking place along multiple dimensions to address cumulative and interacting consequences of changing environmental, political and socio-economic conditions in a community (e.g. Hovelsrud and Smit 2010). Such processes include barriers, limits and options that emerge cross-scale and involve multiple sectors (e.g. municipalities, tourism, energy), and actors (e.g. businesses, individuals and policy makers) (AMAP 2017, pp. 219–252). These complex adaptation processes are context-dependent and vary within and between communities. The potential for conflict is clear; adaptation for one individual, business or sector may create challenges for others. In our case area, this manifests in differing interests and responses to increased shipping; a local business owner might celebrate higher rates of activity while a local individual might find it challenging to contend with hordes of cruise ship tourists in the town. Their respective adaptive responses and strategies will also vary. It is, therefore, imperative to understand the local context in which adaptation processes take place, including the local residents' perceptions and responses.

Adaptation, as an act, response or strategy, is closely connected to the concept of adaptive capacity, a dynamic, case-specific attribute that characterizes a community's ability to adapt to multiple changes (e.g. Smit and Wandel 2006, Smit et al. 2010). Brown and Westaway (2011) emphasize adaptive capacity's link to adaptation, describing the concept as "*the precondition necessary to enable adaptation to take place. [I]t is a latent characteristic that must be activated to effect adaptation.*" (Brown and Westaway 2011). Adaptive capacity comprises several determinants, usually grouped as subjective (e.g. values, perception of risk, place attachment) and objective (resources, governance, income) dimensions (e.g. Bay-Larsen and Hovelsrud 2017; Wolf et al. 2013), or as endogenous (local, individual) and exogenous (governance, decisions-beyond-individual-control) factors (Wesche and Armitage 2010).

The determinants are specific to culture and place (Hovelsrud and Smit 2010) and to scale (Brown and Westaway 2011). Adaptive capacity determinants are shaped by processes and interactions across scales and dimensions (cf. Wesche and Armitage 2010, p. 186) and will differ between communities (Smit and Wandel 2006, p. 287). Each individual determinant and their interconnections shape local adaptive capacity (e.g. Olsen and Nenasheva 2018). When combined and activated, these dimensions enable adaptive capacity (see also Bay-Larsen and Hovelsrud 2017).

## 14.4 Methods

This study is guided by a case study research design that investigates a contemporary social phenomenon in depth (Yin 2014). The primary source data for this study was generated through interviews. We began data collection by reviewing secondary sources on shipping trends in the Svalbard area in order to get an overview of

**Table 14.2** Description of the types of the interviews and participants (interviewees) in Longyearbyen

Type of interview	Residents involvement in the study
19 personal semi structured interviews with pre-defined topics and questions	Six residents involved with marine cruise development
	Five residents involved with the development of harbor facilities and other types of shipping-related activities
	Four residents involved in decision-making
	Two residents engaged with NGOs
	One seasonal worker
17 personal unstructured interviews with pre-defined topics only	Two residents partly employed in the summer tourism industry
	Six residents involved in local services that serve tourism needs (stores, museums and cafés)
	Five residents employed in the shipping industry
	Four residents with practical and/or historical knowledge on shipping development

the range of such activities. This information was then used as a basis for a research protocol and an interview guide, as well as to identify potential interviewees in Longyearbyen.

The secondary data was generated from a scientific literature review, document analysis (e.g. White papers, statistical data on Svalbard), media review (local newspapers, web pages of involved organizations) and a review of relevant maps. Review of relevant maps provided a useful source of data to gain an overview of shipping routes, historical sea ice extension trends and geographical locations and sites on the Archipelago (see for example TopoSvalbard, Marinetrafic, Polarview). Finally, social media was included in order to understand inhabitants' perceptions and attitudes toward the growth in shipping traffic, particularly in marine tourism.

Primary data was generated during fieldwork from interviews with local residents (Table 14.2). In total, the first author interviewed 36 residents through 19 personal semi-structured interviews, and 17 unstructured interviews. As suggested by van Bets et al. (2017), a marine community model guided our selection of the interviewees. According to this model, a marine community comprises a user community (industrial stakeholders, researchers, port authorities and local inhabitants) and a policy community (cross-scale institutional stakeholders). A diverse range of stakeholders were interviewed, but our approach differs from van Bets et al. (2017) in that our study was designed to interview the local stakeholders, the residents of Longyearbyen, involved and engaged in shipping and its related operations on Svalbard.

The majority of interviewees were selected during the secondary data collection process (during media and social media review). The interviewees were contacted several weeks prior the fieldwork in order to schedule the personal interviews and to provide background information about the project. In addition, a snowball technique was applied during the fieldwork (Blaikie 2010, p. 179), i.e. we asked our interviewees to identify other potential stakeholders who could participate in the study.

To ensure access to a broad range of residents, the fieldwork took place on two occasions: prior to the summer navigation season (in April 2017), and during the summer navigation season (in July–August 2017) when port turnover was at its highest. During the springtime, the research topic was discussed with residents that are most often absent or busy in the summer but are directly involved in shipping operations, including representatives from the marine tourism industry, cargo services, pilot services, Search and Rescue, local decision-making organizations, NGOs, unions and other relevant representatives within the community. In April 2017, the port of Longyearbyen was characterized by low turn-over while it prepared for the summer shipping season of May to September. However, the navigation season for the day-long cruises and a few expedition vessels had already started in March/April. During the summer season, seasonal workers, local guides, and port employees were interviewed.

Two interview guides were used during the fieldwork. The first was semi-structured with a set of open-ended questions. This interview guide was revised during and after the fieldwork in April to include more case-specific questions, which in turn were asked during the summer season. The interview guide contained open-ended questions under the following categories: changes in social and ecological systems, changes in shipping patterns (season, boat types, number of visitors, supporting infrastructure), main impacts of shipping activities, organization of decision-making systems, opportunities for future development. At the end of each interview, we invited the interviewees to provide additional comments or feedback on the project. The second guide was used to cover related local aspects of shipping development and contained topics such as perceptions and attitudes toward the growing number of vessels in the Svalbard area and the features of navigation in Arctic waters.

Almost all interviews were recorded, and detailed notes were taken during unstructured interviews when the option to record was not available. The data was collected in Norwegian, English and Russian. The interview data was thematically analyzed in NVivo, a software program (Bazeley and Jackson 2013). A set of predefined and emerging themes (codes) that correspond with the interview guide, collected data and theoretical basis were used for data analysis. To follow anonymity conventions, we employ a coding system (L1–L36) when citing our interviewees in this chapter.

## **14.5 Findings: Community Engagement and Adaptive Capacity**

### ***14.5.1 Increased Shipping: Diversity, Impacts and Responses***

Our empirical data show that the locally identified impacts of shipping activities vary depending on the type of activity and its seasonality. The increasing number of port calls is challenging for the harbor infrastructure, SAR and emergency



preparedness, town facilities, local services and community livelihoods. Local value-creation is a critical component of evaluating positive impacts of such growth. For those involved in local infrastructure and port development, it is *“important to meet the demands of the shipping industries we have today; mainly tourism, but also Search and Rescue, such as the Coast Guard and the Governor’s vessel and Norway’s new research vessel, the Kronprins Haakon. The large ships require a lot of space and capacity,”* (L22, also L25). At the same time, local decision-makers are more concerned with the impacts on environment and navigation safety: *“We get less ice, meaning tourism, fishing and transportation shipping will increase. For us, the concerns are twofold: environment and safety,”* (L12, also L4).

The main impacts associated with increasing marine tourism in Longyearbyen and Svalbard waters are over-crowding, pollution, and visitors’ inappropriate behavior on sites. Despite the extension of the navigation season for marine tourism activities, the local impact of such growth is felt mostly during the summer navigation period, when the community simultaneously hosts tourists and crewmembers from overseas expeditions, day-long cruises and pleasure crafts (L10). Several residents described the increasing number of marine tourism visitors as follows: *“The community of Longyearbyen has little capacity; few facilities for passengers. They are not suited for such a large number of tourists,”* (L33, also L19). Another interviewee suggested that local infrastructural needs should be taken into account when allocating resources for tourism development, such as signs, sidewalks and other harbor facilities: *“...there is not a lot of infrastructure for tourism...but should we use money to build infrastructure for the tourist industry or for local needs, for example, a school?”* (L18).

While the majority of marine tourism vessels operating in Svalbard waters visit the port of Longyearbyen, only a few fishing vessels approach the town (Table 14.1). This is due to the fact that there are no fish landing facilities on the Archipelago. Those who use the port are usually trying to avoid bad weather conditions in the open ocean and/or need medical assistance and services for their vessels (L22). However, despite the small volume of vessels, there are a number of potential impacts of fishing in Svalbard waters that are felt and identified locally. Unlike marine tourism, fishing occurs year-around in areas with little or no connection to the community of Longyearbyen. These activities cause concern among the local population because they provide little-to-no value creation in the community itself while also polluting the environment with marine litter (L7, L11, L34) (Table 14.3).

The number of calls by supply vessels is directly related to local economic development (including construction work and/or supply for a particular industry) and varies from year to year. From a local development perspective, the extension of the navigation season toward year-round accessibility is a positive change, as it covers community needs for food and goods deliveries, as well as asphalt, construction materials, and fuel. No impacts have been identified locally from research-related and SAR-vessels, with the exception of increasing call volume, which challenges the port’s capacity. The presence of a Coast Guard vessel is usually described as a response to the increasing shipping activities in Svalbard waters but is not usually correlated with any specific impacts. For those



**Table 14.3** Locally identified effects and impacts to increasing shipping (L1–L36)

Type of shipping	Effects	Positive impacts	Negative impacts
General shipping	Need for development of harbor infrastructure and town facilities	Co-beneficial for local needs Extends the ability to accommodate several vessels	Conflict with cultural and natural heritage Challenges current infrastructure capacity
	Constant improvement of local preparedness and search and rescue	Cooperation between local population and voluntary organizations Implementation of proactive institutional measures Development of navigation services to avoid accidents	Expensive High reliance on SAR facilities, not all of which are well-informed on response time and difficulties of SAR operations Lack of SAR facilities for bigger boats
	Marine pollution and emission/disturbance of marine species	New regulations decrease negative impacts, but also limit visiting opportunities Shift toward new types of fuel New types of vessels; constant improvement to reduce environmental impacts	Marine litter, emission and water pollution threaten vulnerable Arctic nature and wildlife Ballast water may precipitate the introduction of new species
	Increase in number of community visitors (crewmembers and tourists)	Increasing demand for more seasonal workers, especially in the tourism industry New economic and employment opportunities Focus on sustainable development Local value creation: contribution to the “Svalbard environmental protection fund” (environmental tax)	Overcrowding Threatens local environment Affects community’s lifestyle Engenders fear that the area will become a mass-tourism destination Inappropriate behavior of some community visitors

(continued)

**Table 14.3** (continued)

Type of shipping	Effects	Positive impacts	Negative impacts
Marine tourism, including Overseas cruises	Increase in number of community visitors (crew members and tourists) Direct connection between time spent in the town and local value creation (more time in the harbor = higher value creation locally and less people pollution)	Increasing number of tourism-related facilities/activities/product variety at stores that are used by locals Local engagement in hosting activities before (cleaning the town) and during the season (guides, bus drivers, helping in the stores) Established network between local actors who provide services for cruise vessels	Challenges existing infrastructure, town facilities and available human resources Concern for losing a local sense of wilderness and becoming a new destination of “mass tourism” Inappropriate behavior among some visitors (e.g. entering private houses, taking pictures of residents, blocking driveways) Low value-creation compared to other types of tourism For some stores, overseas cruise tourists are unprofitable; they spend less locally than other types of tourists
Expedition cruises	Increase in number of community visitors (crewmembers and tourists) Increase in focus on SAR in the Arctic Increase in focus on environmental impacts	Greater contributions to local value creation (visitors stay in hotels/spend more on clothing) Actively limits the impact on the natural environment (increased awareness about Arctic nature; tourists are informed on visited sites and participate in beach cleaning) Actively involved and part of SAR, preparedness	Emission and pollution due to longer sailings patterns May disturb wildlife in fjords Social wear and tear ( <i>Sosialslitasje</i> ), i.e. marine tourists that experience wild nature and isolation can encounter other vessels and tourist groups
Day-trip cruises	Became one of the main sources of local mobility in Isfjorden Offers trips and meets tourism demands outside the high tourism season (early spring-late autumn)	Increases awareness about Arctic nature Offers cheaper trips to locals and to students Increases local mobility, especially when it is impossible to drive scooters	May disturb wildlife in fjords, especially early in the season when sea ice is still present

<p>Pleasure crafts (excluding day-trip vessels for under 12 passengers)</p>	<p>Fast-growing sector with a lack of regulations</p>	<p>Increases awareness about Arctic nature Participate in beach cleaning activities and in research projects</p>	<p>Not all vessels are equipped for severe Arctic conditions Difficult to monitor vessel activities due to absence of tracking (not all have AIS) Cases of marine species disturbance</p>
<p>Other types of shipping</p>	<p>Year-round supply services Supplements tourism industry High dependence on weather conditions</p>	<p>Improves food security Cheaper delivery services compared to air transportation Major supplier for marine tourism industry (day-trip cruises) Useful for sending garbage from the archipelago to the mainland</p>	<p>Monopolized service leads to higher prices Goods can be damaged or lost Can be delayed in delivering crucial goods</p>
<p>Fishing</p>	<p>Possible economic opportunities (landing, production, distribution and tourist fishing trips) Possible increase in local food availability Possibility for Longyearbyen to be an Arctic hub for fish/other species distributions Accidents and pollution</p>	<p>Increases community access to marine resources/ possible improvement of local food security Possibility to establish local economic and employment options (including fish landing facilities and logistical organizations) Improvement of local preparedness and search and rescue</p>	<p>Limited value creation locally Increases marine litter Increases need for year-around preparedness and SAR services Possible conflicts between nations over marine resources Immigration concerns</p>

reasons, these two types of vessels (research and Cost Guard) are not presented in the table.

Table 14.3 illustrates the broad range of effects and impacts of ship traffic in the port of Longyearbyen and in Svalbard waters as identified by interviewees (L1–L36). The table is structured to capture the effects and impacts that are specific to shipping in general and to a particular type of shipping activity.

### ***14.5.2 Local Residents' Engagement in Adaptive Responses in Longyearbyen***

Given these identifiable impacts, Longyearbyen faces a dilemma in balancing the growth of shipping with protecting the natural environment and improving the harbor and town infrastructure and facilities. All of these tasks must be accomplished while also providing well-functioning preparedness and Search and Rescue (SAR) services. Moreover, several concerns derive from residents who would like to see benefits from increased shipping (e.g. local value creation), especially from marine tourism. These individuals are of the opinion that a cruise vessel arriving in Longyearbyen is worth more than the vessels that just pass by (L10, L7). They acknowledge, *"This is our source of living here. Many experienced people are involved"* (L35), referring to key stakeholders and representatives from Longyearbyen who are involved in the development.

Further analysis identifies a number of adaptive responses that have been developed locally (as bottom-up responses) in order to mitigate negative impacts while securing the benefits of ship traffic growth in the port of Longyearbyen. These responses primarily comprise anticipatory measures that directly address the increase in the number of vessels and community visitors. These measures are divided into the following categories: preventing environmental harm, strengthening preparedness and SAR, improving visitor management systems, improving infrastructure and information dissemination, mapping and evaluating the socio-economic opportunities of fishing activities.

**Preventing Environmental Harm** To prevent environmental harm, several residents who are involved in shipping and tourism industry, as well as decision-makers, cooperate and map the possible threats from vessels operating in Svalbard waters and the impacts of increasing numbers of visitors on local natural environment sites (L8, L10, L12). Still, major accidents and/or oil spills in remote areas present major environmental threats. As was stressed by one interviewee, *"If we get a bigger oil spill on Svalbard...it will be extremely challenging. Thus, both regulations and practices work to prevent such situations,"* (L12). Moreover, the fast-growing marine tourism industry adds a new dilemma to what and how Svalbard can be experienced by the tourist; *"It is difficult to find balance between experiencing and protecting,"* (L22).

Marine litter is partially compounded by increasing marine activities, especially fishing activities in the Barents Sea and near Svalbard, but it is also carried with ocean currents from elsewhere. Numerous littered beaches have been observed by both community members and tourists. To address this environmental concern, public bodies, local residents and tourist industries have engaged in beach-cleaning initiatives. Locals are highly aware of this challenge and are eager to contribute to its resolution. Cruise visitors from some expedition cruises and pleasure crafts have also been proactive, using information about environmental damage to orchestrate participation in beach-cleaning activities as a part of the cruises' itinerary (L36).

**Strengthening Preparedness and SAR** Changing patterns of vessel distribution in remote areas (i.e. places that are difficult to access in the event of an accident) (L4), but also of cruise visitors' mobility on land (sometimes on landing sites due to polar bear danger) require better preparedness systems and SAR (L6). Improvement of maritime safety is a continuous process that involves a number of international and national stakeholders, but also local residents.

Locally, over 60 community members are involved in the Red Cross, which plays an important role in SAR (L4, L6). Voluntary members are trained for different types of rescue operations and can aid in the field when the assistance is needed. A previous head of the organization designed the "*dropkit*: Arctic Survival Kit," which contains necessary equipment, water and blankets that can be used before rescue services arrive. However, the Red Cross' capacity is limited during the summer navigation period by the absence of some of members that usually take a vacation during summertime.

**Improving the Visitor Management System to Limit Societal Impacts** Although under constant improvement, the visitor management system facilitates and welcomes diverse cruise vessels with capacities of over 5000 passengers. As mentioned by one of the interviewees, residents involved in the tourism industry are usually concerned about "*the amount of time the cruise vessel spends in a port, the facilities it uses in the town and the excursions' capacity*," (L7). This management system is supported by a well-established cooperation network of over 70 local companies that aim to develop Longyearbyen and Isfjorden as tourist destinations. Much of the work targets the improvement of visitor information and services, as well as the development of supportive infrastructure.

Information distribution to ship-owners, community visitors and the local population presents another important component of this system. Recently developed "community guidelines" for Longyearbyen are characterized by local residents' involvement. In addition to community guidelines, the local population actively participates in a number of organized workshops, initiatives, public hearings and conferences. As representatives from the local tourism office noted, "*The majority [of community members] should be on the development of the visitor management system. We need this joint discussion about tourism growth*," (L7). Social media presents another source of local information distribution that informs and receives feedback and questions from residents and key stakeholders. Prior to the arrival of

an overseas cruise ship and after its departure, information is sent to residents, especially those involved in the cruise network (via e-mail and Facebook) about *inter alia*, the size of the boat, how long it will stay in the town and how the visitors are distributed to avoid “overcrowding” (L8, also L10, L30, L35).

Local host services have developed in order to limit the impacts of overcrowding (i.e. a large number of people in a particular place at a particular time). The primary aim is to support an even distribution of people in time and space while offering community services. Examples of such responses include welcoming facilities in the harbor area, where visitors receive information about the place, sightseeing options and open hours of museums and shops; tourist information in the town center, where guests can access the Internet, order excursions and learn about the city; town service facilities, which correspond their opening hours with cruise schedules. Moreover, one of the interviewees mentioned, “*When we have ‘massive visits,’ we do not have enough guides to cover the demand. Then locals are recruited,*” (L10). This is also common for bus drivers (L2) and for extra assistance in the stores (L35).

**Improving Infrastructure** Improvement of infrastructure in the port and town area has emerged in response to the growth in the number of vessels and community visitors. Several interviewees stress that there has been almost no development in infrastructure despite the rapid increase in ships using the port. “*Already, in 1996, there was a need to expand the harbor. In 2006, the port capacity reached its limit. Since then, the activities have increased by 165%,*” (L22, also L25). After national acknowledgement of a much-needed improvement in port infrastructure and capacity, a number of local residents, who are involved in local shipping and infrastructure development, began drafting a strategic plan for the Longyearbyen port. In addition, they address a need to improve infrastructure and facilities along the designated route from the harbor to the town, including sidewalks, signage and information boards (L7, L10, L22). The absence of facilities and information irritates both visitors and locals. As several participants of this study noted, mapping needs and developing solutions to better welcome community visitors is ongoing. At the same time, infrastructure development is a complex task for land management; “*...there are many processes going on [within infrastructure projects] because there are many changes in the city,*” (L10, also L22).

**Mapping and Evaluating the Socio-Economic Opportunities of Fishing Activities** The question of potential local benefits from the northward movement of fish and other marine species is critical for several local stakeholders. One of the emerging responses to the increasing fishing activities in the Svalbard area is local stakeholder discussions of scenarios around fish-landing facilities and logistical options for marine product export to global markets (L7, L9). “*I believe that the fishing industry is perhaps the only mature segment that has the power to set a new industry here, assuming that the legislation falls into place. Should we succeed, we have to make strategies around what kind of marine industry we are going to have up here,*” (L11). Even though it is ultimately a national government decision, the

possibility of Longyearbyen fish landing facilities have sparked business ideas from a number of stakeholders. The possibilities include local use of marine resources, the development of operational cycles, “*branding and developing niche products*” (L11), and distribution to global markets.

### 14.5.3 *Motivating Factors for Community Engagement*

The adaptive responses in Longyearbyen identified above are characterized by the engagement of community residents and local stakeholders. This phenomenon was described by one interviewee as such: “*Longyearbyen is known to have many people with high engagement and strong meanings and who have a clear vision of how things should be done,*” (L12).

Our further analysis of the empirical data identifies the mechanisms behind the strong engagement of the residents in this unusual remote, international and highly fluctuating community. Those mechanisms can be divided into four main motivating factors for community engagement in local responses. These are (1) a shared place connection, (2) the perception of the changing natural environment, (3) established cooperation practices (networks, voluntary initiatives) across a wide group of local stakeholders and the local population, and (4) the ability to influence decision-making. In this part, we present a summary of how these community factors manifest as motivation for response engagement.

**Connection to Place** One of the motivations for the residents' engagement in adaptive responses is their connection to place. Interviewees say that many who live on Svalbard tend to stay there longer than they planned. “*I planned to be here only one year and then return to the mainland. But it did not happen,*” (L8, similar for L11). While others explain this emotional tie to a place as getting “*Svalbardbasillen,*” “*the Svalbard virus.*” It is an expression that describes people who visit Svalbard and tend to come back. “*I come here each summer, I got Svalbardbasillen,*” (L36). Moreover, given the unusual configuration of the settlement, people who live in Longyearbyen for more than 30 days receive local status (L7, L15). One of the residents who had lived in the community for a couple of decades was joking about this fact in the following way: “*Back in 1997, I was asked by a mining worker whether I was a tourist. I told them that I had been living in Longyearbyen for 5 years. He replied that I still was a tourist,*” (L15).

**Perception of the Changing Natural Environment** Increasing environmental consciousness has been identified as another motivating factor in responding to growing ship traffic. The local population has experienced a rapid change in the local environment (e.g. sea ice reduction and disappearance, new types of fish in the fjords) and has witnessed marine litter. One of the interviewees told us, “*Before we could drive snowmobiles to the other side of Advent fjord... We have not seen sea ice in many years here,*” (L8). While another was surprised at the fact that,

“[they were] *fishing for new fish species that were not here 6 years ago,*” (L2). The residents who have been experiencing these changes in the local environment are concerned that some types of cruise vessels, driven by demand, will operate in newly opened, remote and vulnerable areas. Another interviewee told us, “*It is important that the tourists take care of their trash. We have another attitude toward nature here,*” (L22).

**Cooperation Practices** The next factor, cooperation practices, refers to the community’s setting. Being a remote, isolated community increases the need to help one another. As one of the interviewees mentioned: “*Those who live in the North are used to rough nature; people know that they are vulnerable, know that they need to help each other, and I think it develops a special culture,*” (L4). This finding also reflects established local social and institutional networks, as well as voluntary initiatives: “*I believe that we have a culture within the environment so that we get strong no matter what appears. Even though there is a new manager in a big business, the person will not be able to ‘rock’ the fundament,*” (L7).

**Influence Decision-Making** This last factor is described by interviewees as an ability to influence decision-making (L12, L2). Some residents state that the influence of local and national decision-making systems is due to the community’s size and the absence of regional political levels on Svalbard: “*It’s fun with local politics in small towns. You get to have a say and you will be heard and get more attention... We have a shorter route to the national level,*” (L2).

## 14.6 Discussion

The findings illustrate the connection between local motivation factors and community engagement in local adaptive responses for the case of Longyearbyen. To elaborate on these findings, the following discussion illustrates the way in which the empirically identified determinant of ‘community engagement’ shapes local adaptive capacity in the context of increasing shipping activities.

The concept of engagement, when applied to human responses, can take place across several dimensions, from the personal to the collective, and may differ in the way it is activated (bottom-up vs. top-down) (e.g. Udofia et al. 2015; Moser and Berzonsky 2015; Leonard et al. 2016). On the one hand, top-down engagement in adaptation frameworks (e.g. Moser and Pike 2015, p. 112) is described as an overarching process that involves the public in matters of public concern. By presenting a typology of engagement with climate change, Moser and Berzonsky (2015) argue that there are different types of engagement, ranging from personal awareness and support (cognitive) toward more concrete public actions (civic and political). This process also refers to community involvement in processes such as decision-making via consultation and public meetings (e.g. Udofia et al. 2015).



On the other hand, the conceptualization of engagement at the community level refers to bottom-up processes of community engagement, which is described in the environmental change literature as community agency (e.g. Leonard et al. 2016). According to Brown and Westaway (2011), this agency refers to a community's ability to act collectively in addressing a particular concern, also known as collective action (e.g. Karlsson and Hovelsrud 2015). This type of engagement is characterized by "*strategic thinking and action, negotiating the social landscape, and collective efficacy*," (Leonard et al. 2016, p. 18).

The discussion in this study addresses bottom-up community engagement in relation to strategies undertaken by local actors and community members contributing to effective responses (e.g. Karlsson and Hovelsrud 2015). Our analysis shows that, in addition to previously established institutional responses, local adaptive responses have been taken by stakeholders and community members in order to address the diversity of impacts from increased shipping in the port of Longyearbyen and in Svalbard's waters (Table 14.3). We have illustrated that these local adaptive responses are characterized by community members' engagement (regardless of their residence time in the community and/or their nationality and professional backgrounds) and present a supportive mechanism for institutional (top-down) responses.

### ***14.6.1 Community Engagement and Adaptive Capacity***

Earlier studies (e.g. Brown and Westaway 2011; Karlsson and Hovelsrud 2015) argue that there is a connection between community engagement (community agency) and local adaptive capacity, as the ability to engage in collective strategies determines and shapes local adaptive capacity (Karlsson and Hovelsrud 2015, p. 95). Brown and Westaway (2011) argue that agency (in our study this is community engagement), access to resources and structural aspects (contextual attributes) are three main dimensions of adaptive capacity.

Our empirical analysis indicates that the community's engagement in adaptive responses is activated by four motivating factors that derive from community settings: place connection, perception of the changing natural environment, established cooperation practices across a wide group of stakeholders and the ability to influence decision-making. In the adaptation literature, such case-specific, motivating factors are often referred to as social capital, which comprises social processes and relationships and enables community engagement (e.g. Hovelsrud et al. 2018). Because of strong engagement deriving from social capital, Longyearbyen exhibits community characteristics, despite its unusual constellation of transient labour and its international profile. In addition to the defined motivation factors, this conformity can be partially explained by the area's geographical location and remoteness; people in Longyearbyen share the notion of isolation, finding themselves "in the same boat." Although the Longyearbyen community comprises individuals from over 40 different countries, community connection is

facilitated by the citizens' love for the nature and wilderness of the Arctic and by the attractive job opportunities Svalbard offers without the need for a work visa from the Norwegian State (SSB 2016).

Longyearbyen also includes people with long-term residence, the so-called "Svalbardianere," who have been described as the "community glue" and the keepers of local, in-depth experience and knowledge. This "glue" is expressed through place attachment, a concept supported by other studies arguing that the uniqueness of place persists despite globalization, high mobility and interconnect-edness (e.g. Escobar 2001; Amundsen 2015).

Place attachment is often described as a psychological bond to a particular place that can be ranked from weak to strong (Kaltenborn 1998, p. 173). It is mostly emotional but can also contain functional dimensions such as resource dependency. Place attachment is not an expression of how people perceive and respond to changes per se, but place attachment can influence how people experience change. The role of place connection in shaping adaptive responses is discussed by several scholars (e.g. Hovelsrud et al. 2018, Amundsen 2015) and is also applicable to the community of Longyearbyen, where community members develop adaptive responses despite a short residence period. Place attachment is expressed through a shared Svalbard identity and a sense of pride in belonging to Longyearbyen (Low and Altman 1992), which contributes to quality of life and well-being (see also Adger et al. 2013). At the same time, in a contemporary, globalized world—where people are more mobile and are often part of several communities—the phenomenon of "multiple belonging" (Haugen and Villa 2016) influences interactions between people and place.

Place connection affects peoples' perceptions of the natural environment (Kaltenborn 1998) and presents another motivation for engagement in adaptive responses. The observed changes in the natural environment and the negative impacts that derive from increasing shipping activities have influenced this perception. Although an earlier study showed that increasing shipping elicited fewer concerns than other types of human activities (Kaltenborn 1998, p. 181), the growth has resulted in a focus on keeping the shipping footprint as small as possible by supporting strict environmental legislation, industry guidelines and recent community participation in developing "community guidelines" (AECO 2018). It is also noteworthy that the community's participation in beach cleaning initiatives is not a new phenomenon (Kaltenborn 1998), however the practice's development within the last year is a product of the marine cruise industry's contribution to environmental conservation, as well as the environmental awareness of community visitors and tourists.

Established cooperation practices across a range of stakeholders are closely connected to the ability to influence decision-making. These two motivating factors—cooperation and decision-making influence—represent important aspects of social capital (e.g. Hovelsrud et al. 2018) that enable adaptive responses to increasing ship traffic. Here, established cooperation practices are applicable to industrial networks (e.g. Cruise Network, which, in uniting over 30 local stakeholders, becomes an

actor with the ability to participate in and influence a decision-making process), but also to voluntary initiatives (e.g. the Red Cross).

Finally, though we describe Longyearbyen as a unique Arctic community due to its transient labor force and unique political situation, we are still able to identify local community characteristics, i.e. motivating factors that also define a social group as a local community (see Haugen and Villa 2016). Moreover, the empirical results have produced evidence that those motivations activate community engagement in adaptive responses, which, in turn, strengthen local adaptive capacity. Hence, given the integration of numerous components, we argue that the community engagement found in Longyearbyen is a dimension of communities' adaptive capacities. This dimension, according to Brown and Westaway (2011, p. 325) (described as one's agency), is "*one's independent capability or ability to act on one's will.*" Our study shows that this ability is shaped by contextual variables, such as social capital.

## 14.7 Conclusion

According to recent projections (e.g. Borch et al. 2016), shipping development in the Barents area will continue to increase and expand in space and time due to a number of changing conditions, including sea ice reduction. The same development is documented to have a broad range of impacts on coastal communities' wellbeing and the local natural environment. Both positive and negative impacts have been identified for the community of Longyearbyen (See Table 14.3).

The application of a community-based approach allows us to assess perspectives on Arctic shipping development by assessing adaptive capacity at the local level. For, the effects from increasing shipping are first and foremost felt at the local level, and it is also at this level that adaptive responses emerge to mitigate the most salient negative impacts of change, while enhancing the positive ones.

We have derived three main conclusions from our analysis:

1. Given the current scenarios for shipping development in the Arctic, it is of particular importance that plans develop proactively. The strategic role of Longyearbyen as a hub for projected activities in Arctic Trans-Polar routes, and as a hub for SAR and emergency preparedness in the Barents Sea, supports this emphasis. The expansion of marine tourism activities in the Barents area will most likely be felt on Svalbard.
2. There is a growing need to understand the complexity of possible impacts of increased shipping and its local adaptive responses. Although the current engagement in adaptive responses of Longyearbyen's local population presents a supportive mechanism for locally established institutional and industrial response, we argue that such engagement is sensitive to community fluctuation and other dynamic community settings, e.g. demographic trends.
3. Using the framework of adaptation and adaptive capacity, the analysis of empirical data reveals that local engagement in local adaptive responses strengthens the

adaptive capacity. This high engagement of such transitory community is activated by a number of motivating factors: place attachment, perception of the changing natural environment, established cooperation practices across a wide group of stakeholders and the ability to influence decision-making.

The results of this study can be used for current and future recommendations in managing ship traffic in the port of Longyearbyen and in Svalbard's territorial waters. The study may also be useful as a guideline for methodological and theoretical approaches to assessing local perspectives of shipping development in other Arctic regions.

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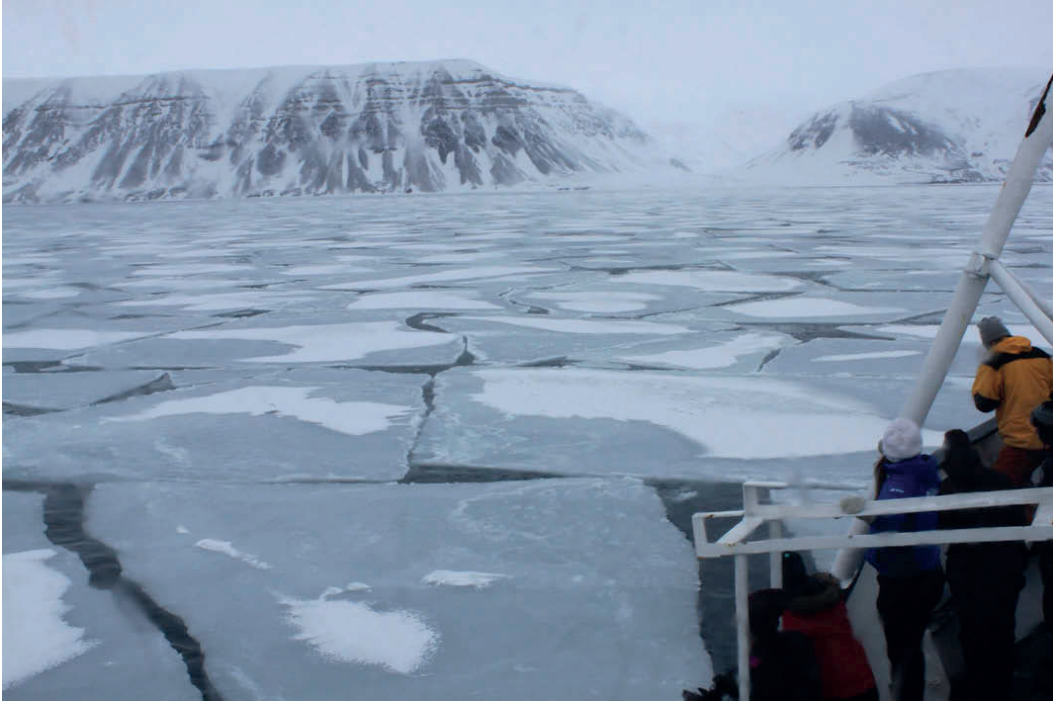


# PAPER 3

## **Community perspectives on the environmental impacts of Arctic shipping: case studies from Russia, Norway and Canada**







## GEOGRAPHY | RESEARCH ARTICLE

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# Community perspectives on the environmental impacts of Arctic shipping: case studies from Russia, Norway and Canada

Julia Olsen<sup>1\*</sup>, Natalie Ann Carter<sup>2</sup> and Jackie Dawson<sup>2</sup>

**Abstract:** Communities across the Arctic are experiencing growth in transiting, destination and domestic ship traffic. Environmental impacts resulting from Arctic shipping have been well documented, but little is known about how these impacts affect livelihoods and adaptive capacity of the local communities that are reliant on their natural landscapes. Given the heterogeneity of the Arctic, this study applied a community-based approach to empirically assess the impacts of shipping on the environment. Interviews were conducted in three island communities: Solovetsky in Russia (n = 24), Longyearbyen on Svalbard, Norway (n = 22) and Cambridge Bay, Canadian Arctic (n = 24). Despite differences in the trends of shipping activities that occur in each of the case study communities, there was consensus regarding significant environmental impacts from ship traffic on the natural environment, and that these in turn present a great concern for community livelihoods. The concerns differ greatly among the three communities and depended on the local context and perceptions and use of the natural environment. We conclude that the natural environment represents a salient determinant of adaptive capacity in the context of

### ABOUT THE AUTHOR

Julia Olsen's primary research areas are local community's vulnerability and socioeconomic adaptation to multiple changes in the Barents part of the Arctic. The main objective of her current work is to assess the impact of increased shipping activities in the Barents Sea on local coastal communities and understand what the implications are for local adaptation and adaptive capacity. Her recent publications cover the topics related to local and regional perspectives on shipping development and social impacts and responses. Julia, together with her colleagues, conducts community-based research in order to assess local perspectives on regional, national and global development. She has fieldwork experience in Russian and Norwegian communities, municipalities and primary sectors. Julia graduated from Ukhta State Technical University in 2010, received her MA degree in science of Sustainable Management at Nord University in 2011 and currently is a Ph.D. Candidate in Sociology at Nord University, Norway.

### PUBLIC INTEREST STATEMENT

Shipping activities has increased across the global Arctic. Consequently, several coastal communities have been experiencing the impacts of this rapid development on their socioeconomic and environmental conditions. In this paper, we study communities' perspectives on shipping impacts based on local use and perceptions of local natural environment. The study results are drawn from interviews conducted in three coastal communities: Solovetsky in Russia, Longyearbyen on Svalbard and Cambridge Bay in Canada. Despite the diversity in community settings and shipping trends, the study illustrates that the local engagement with the natural environment affects the way the communities are impacted. Hence, we argue that there is no 'one-size-fits-all' solution to the challenges associated with the increases in Arctic shipping. The study concludes that context-specific assessments may improve planning and decision-making surrounding shipping development in the opening Arctic.

growing ship traffic across the Arctic. Moreover, this context-dependent determinant varies in the way it is perceived across case communities.

**Subjects:** Kinship & Community; Environmental Anthropology; Transport; Sustainability; Regional Geography - Human Geography; Environmental Geography

**Keywords:** Arctic; shipping; communities; environmental impacts; adaptive capacity

## 1. Introduction

Sea ice reduction is one of the most noticeable signs of a changing climate in the Arctic (Meier et al., 2014; see also AMAP, 2017). Since the start of Arctic sea ice monitoring in 1979, the data show a downward trend in its thickness and its extent (Barber et al. 2017; Stroeve, Markus, Boisvert, Miller, & Barrett, 2014). Despite year-to-year variation, its continuing decline affects the accessibility of coastal communities by marine traffic, as well as residents' use of the marine environment. The opening Arctic seas and changes in navigation seasons coupled with industrial expansion in the North (e.g. extractive industries, fishing, tourism) has affected shipping transportation patterns in several Arctic regions (e.g. Borch et al., 2016; Dawson, Pizzolato, Howell, Copland, & Johnston, 2018a; Farré et al., 2014). Consequently, several coastal communities across the Arctic have been experiencing the impact of the growth in ship traffic, both positive and negative. Typical shipping traffic in the Arctic includes tankers, bulk carriers, offshore supply vessels, passenger ships, tug/barge combinations, fishing vessels, ferries, research vessels, and government and commercial icebreakers (PAME, 2009, 3).

Given the heterogeneity of vessel types and seasonality in operations, their distribution varies temporally and spatially across the Arctic. For example, 80% of total ship traffic across the Arctic passes through Norwegian territorial waters (Ministry of Justice, 2016). Much of the recent shipping growth in the Norwegian and Russian Arctic is associated with oil and gas service vessels and tankers, marine cruises, and fisheries (Borch et al., 2016). Ship traffic in the Canadian Arctic is significantly less than in the European Arctic (Christensen, Lasserre, Dawson, Guy, & Pelletier, 2018), but nonetheless total traffic volume roughly tripled between 1990 and 2015—from 364 179 km in 1990 to 918 266 km in 2015) (Dawson et al., 2018a). General cargo vessels, government icebreakers and research ships dominate in the region and by far, while pleasure craft (private yachts) present the fastest growing vessel type (ibid.). Most of that increase has occurred in Nunavut waters (ibid.; also see Dawson, Copland, Mussells, & Carter, 2017b).

Increased shipping is potentially advantageous for local communities by bringing new economic benefits to the region (Christensen et al., 2018; Meier et al., 2014), improving food security and community accessibility, while marine tourism development contributes to increasing awareness of natural heritage (Dawson, Kaae, & Johnston, 2018b; Olsen & Nenashcheva, 2018). However, there may also be challenges related to new shipping distribution patterns. For example, an increased risk for accidents in the vulnerable Arctic environment, the disturbance of wildlife, and icebreaking activities (Christensen et al., 2018; Dawson et al., 2017a) which may result in negative outcomes for local communities who coexist with their natural environment (Davydov & Mikhailova, 2011; Wenzel, 2009).

Despite the increasing body of literature on Arctic shipping activities, Ng, Andrews, Babb, Lin, and Becker (2018) in their comprehensive literature review argue that the implications of increased marine vessel traffic for local communities and local ecosystems has received less attention. Less is known about how local environmental impacts affect the livelihoods of coastal Arctic communities. Moreover, as suggested in earlier studies, the impact of different types of shipping is likely to vary in scale and scope between different communities in the same Arctic region (Stewart, Dawson, and Johnston, 2015).

The goal of this study is to examine this assertion by assessing local perspectives on the ways in which the natural environment is affected by shipping activities across three Arctic communities

**Figure 1.** A map of the case communities.



located in three distinct regions: (1) Solovetsky in the Russian North, (2) Longyearbyen on Svalbard, Norway and (3) Cambridge Bay in the Canadian Arctic (Figure 1). Using findings from qualitative interviews and focus groups with residents and relevant community stakeholders, this study presents a variety of ways the natural environment is perceived to be impacted by shipping development, both directly and indirectly. By applying a theoretical and conceptual framework of adaptive capacity, the study further concludes that the natural environment represents a salient determinant of adaptive capacity. However, there is a need to expand on the meaning of the natural environment by inclusion of local perceptions within this determinant. Hence, the paper contributes new insights to the literature on the human dimensions of changing Arctic by discussing how shipping's impacts on the natural environment in turn affect a community's adaptive capacity.

## **2. Theoretical framework**

### **2.1. Conceptualizing the natural environment**

The concepts of “nature” and the “natural environment” vary across the disciplines, holding a range of legitimate meanings (McIsaac & Brun, 1999), some of which are related to other concepts that describe the local environment of a particular community. The traditional

understanding of the “nature” and or “natural” refers to something untouched by, separated from and/or threatened by human culture, (Lidskog & Sundqvist, 2013) also described as “wilderness” (e.g. Corbett, 2006). Johnson et al. (1997, 528) described “*natural as used in environmental contexts almost always means that which is neither made, changed, nor otherwise affected by humans*”. In other words, there is a dichotomy between human culture and natural, usually toward the ideas of human superiority over nature (Rybråten, 2013,16).

However, this view is challenged by a number of scholars, arguing that there is no such thing as untouched nature due to various types of nature use, such as domestication, but also due to pollution, climate change and other environmental impacts from human activities on surrounding environment (Corbett, 2006; Lidskog & Sundqvist, 2013). There are only natural environments with little human impacts (Robbins, Hintz, & Moore, 2012). Referring to Ingold (2000), Rybråten (2013,16) argues that “...humans are never external to our physical surroundings...”. This point is also integrated into Johnson et al.’s (1997) definition of natural environment as “one [that is] relatively untouched or undisturbed by human culture”.

The precise understanding of “relatively untouched” nature and environment, however, differs between populations. Those differences in perception, according to Corbett (2006), are rooted in one’s belief system about the natural world and is influenced by several factors, such as childhood experience, a sense of place, and historical and cultural context. To elaborate on this point, Ween and Lien (2012) present the example of the Finnmark county in Northern Norway. From the outside, Finnmark is understood as being pristine or remote natural environment, while local indigenous and non-indigenous peoples relate to and are engaged with nature via different practices. “Here, nature and nature activities remain central to peoples’ identity, their belonging and heritage. Nature is regularly cited as the reason for staying when so many people move away” (Ween & Lien, 2012, 93; see also Freeman, 1976; Rybråten, 2013). Thus, the term natural environment can be interpreted in different ways, and as described in the example related to social construction of nature, including concept of wilderness (Robbins et al., 2012). This corresponds with Rybråten’s (2013, 247) call for inclusion of multiplicity in nature investigations to consider new ways of accounting for particularities of nature.

The idea of multiplicity in viewing the natural environment is adopted here, and further inspired by literature focusing on human-nature interconnections (e.g. Lidskog & Sundqvist, 2013). This approach presents an integrative and holistic perspective on the construction of reality, and emphasizes the role of nature in forming social practices, values, traditions, and worldviews. By applying this concept of the natural environment to our study, we assess the ways local communities perceive the natural environment that surrounds them and how it is impacted by increasing shipping activities, as well as how the local environment’s role and significance in community members’ lives shapes local adaptive capacity.

## **2.2. Adaptive capacity framework**

The rate and amplitude of climatic changes coupled with impacts from other socioeconomic shifts challenge communities’ ability to adapt (AMAP, 2011). Even though Indigenous peoples and residents across the Arctic have demonstrated high flexibility in their practices and adaptability to multiple changes, including climate-induced, (ibid.), little is known about how the impact of shipping development on local natural environments affects communities’ livelihoods.

This study adopts the conceptual framework of adaptive capacity to elaborate on earlier studies assessing the natural environment its role in shaping local communities’ capacity to adapt to growing shipping activities (Olsen & Nenasheva, 2018). This approach derives from literature that assesses communities’ perspectives on changing conditions in the Arctic, their capacities and response strategies (e.g. Hovelsrud, Karlsson, & Olsen, 2018; Hovelsrud & Smit, 2010; Smit & Wandel, 2006). This framework provides a useful tool to assess the significance of local factors that emerge in the context of increased shipping (Olsen & Nenasheva, 2018).



Adaptive capacity can be defined as one's ability (in this case, a local community) to cope or adjust to changing conditions in a certain place over time (adapted from Smit, Hovelsrud, Wandel, & Andrachuk, 2010, 5). Adaptive capacity is influenced by a range of determinants, described as aspects and capitals, such as social, natural, physical, economic, cognitive factors (Furness & Nelson, 2016). Smit and Wandel (2006, 288) underline that determinants of adaptive capacity vary in space and time and are context dependent. Hence, local communities will differ in their adaptive capacity to changing conditions.

Natural determinants are the focus of this study. Natural discourses in adaptation, adaptive capacity and resilience literature are usually related to an ecosystem domain, including ecological diversity and ecosystem health (Berman, Kofinas, & BurnSilver, 2017) and/or natural capital (Furness & Nelson, 2016). Natural capital—a stock of natural resources—is a context-dependent determinant of adaptive capacity and is linked to the concept of ecosystem services (Kofinas et al., 2013) that provide the necessary resources to sustain livelihoods (Mortreux & Barnett, 2017, 2). Such resources comprise land, water, and vegetation, but also non-renewable resources such as oil and minerals, in addition to recreational and cultural functions (Furness & Nelson, 2016; Kofinas et al., 2013; Mortreux & Barnett, 2017).

This way of conceptualizing natural determinant in the previous studies presents a starting point for this study. We challenge the dominant view on how nature is addressed in adaptive capacity literature by adding local perspectives on the significance of natural environment, and the way it is perceived and impacted by increasing shipping. By assessing the way local communities engage with the natural environment in the context of shipping growth, we aim to expand the meanings of this determinant in order to understand the way it shapes local adaptive capacity.

### 3. Methodology

#### 3.1. Community based approach

This study was designed to understand how the environmental impacts from shipping activities become social concerns and shape local adaptive capacity. The methodology follows a bottom-up approach to examining local communities' perspectives on changing conditions and impacts (Hovelsrud & Smit, 2010; Kelley & Ljubicic, 2012).

Given the diversity of the Arctic region, this qualitative case study was conducted in three island-based communities in different Arctic regions that historically have been dependent upon shipping and currently experience a dramatic growth in shipping development (Table 1). They are the communities of Solovetsky in Northern Russia, the community of Longyearbyen on Svalbard, Norway, and the community of Cambridge Bay in Nunavut, Canada. Table 2 highlights the main characteristics of these case communities.

Given the remote island location of our case communities, their socioeconomic development has been heavily dependent on shipping which serves as an important transportation link to the main land, and enables communities' supply, mobility and subsistence activities. Sea ice has been the main barrier inhibiting shipping between the islands and the main land, but it is not always prohibitive. It has been both a factor in the community's isolation, but also a platform for communities' mobility in certain circumstances. The recent changes in hydrological regimes across the Arctic have impacted sea ice extent and navigation season in our case communities (e.g. Dumanskaya, 2014; Pizzolato, Stephen, Howell, Laliberté, & Copland, 2016; Vikhamar-Schuler, Førland, & Hisdal, 2016).

Extension of the navigation season has improved the Solovetsky community's accessibility, re-supply and local mobility options. However, this extension currently has no or limited impact on the traditionally established tourism season, which remains stable and lasts for four months



**Table 1. Main indicators for marine transportation for the Solovetsky Archipelago, Longyearbyen and Cambridge Bay**

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	% Increase 2008-2016
<b>Number of ship calls in Solovetsky</b>	466	410	516	490	563	545	540	595	596	128
Number of passengers (thousands of people)	22,9	27,8	31,0	33,6	30,3	30,1	62,8	78,5	74,4	324
<b>Number of ship calls in Longyearbyen</b>	771	799	814	773	777	802	1178	1163	1542	200
Number of passengers	38,6	41,4	40,1	39,0	55,1	56,9	54,8	63,7	75,2	197
<b>Number of transits past Cambridge Bay</b>	20	25	22	32	30	28	29	31	37	185

**Table 2. Main characteristics of the three case communities**

Characteristics	Solovetsky	Longyearbyen	Cambridge Bay
Geographic location	65 °N; Solovetsky Archipelago (also known as Solovki), White Sea, Arkhangelsk region, Russia	78 °N; Svalbard Archipelago, Barents Sea, Norway	69 °N; Victoria Island, Kitikmeot region, Nunavut, Canada
Settlement type	The transportation and administrative hub for the Solovetsky Archipelago	The transportation, administrative, and business hub for Svalbard	The transportation, administrative, and business hub for the Kitikmeot region
Demography	943 inhabitants, mostly native Russian, 10% are monks	2200 inhabitants from over 40 countries. Average residence period is 7 years	1,766 inhabitants, 80% art Inuit (Indigenous Peoples)
Employment	Museum, monastery, municipality, tourism combined with subsistence economy	Tourism, research and education, public sector, and different social services	Research center, public sector (municipality), tourism, combined with subsistence economy
Transport linkage with the mainland	Shipping (seasonal) and air transportation (year-round)	Year-round shipping and air transportation	Shipping (seasonal) and air transportation (year-round).
Type of shipping	Domestic (dominated by passenger and cargo/supply)	Domestic and destination (marine tourism, cargo/supply, research, fishing, Search and Rescue)	Destination and transit (re-supply, cruise and yacht tourism, research, government vessels, fishing)
Natural environment use	Recreation; fishing for subsistence and private income (year-round); and collecting local resources (berries, mushrooms, seaweed) for subsistence during summer season.	Recreation; fishing (year-round) and hunting (seasonal) for private purposes, not subsistence.	Recreation; fishing and hunting for subsistence. See Figure 2.
Important historical facts	<ul style="list-style-type: none"> <li>• 1429 -Establishment of the Solovetsky Monastery</li> <li>• 1862—Ferry transportation with Arkhangelsk established</li> <li>• 1992- Solovetsky's Cultural and Historical Assembly on the UNESCO World Heritage list.</li> </ul>	<ul style="list-style-type: none"> <li>• 1596-Discovery of Svalbard. Marine area has been used for whaling and fishing and later marine tourism</li> <li>• 1906- Establishment of Longyearbyen</li> <li>• 2002- Gained protection under the Environmental Protected Act.</li> <li>• 2015—Heavy Fuel Oil-banned</li> </ul>	<ul style="list-style-type: none"> <li>• 1500 CE to present modern</li> <li>• Inuit 1920s RCMP and Hudson Bay Company outpost established</li> <li>• 1947 first permanent residents</li> <li>• 2012–2018 construction of Canadian High Arctic Research Station (CHARS).</li> </ul>

between June-September (Olsen and Nenasheva, 2018). Recent increases in ship traffic and the number of visitors to Solovetsky can be better explained by growing tourism interest in the Archipelago and government programs for the Archipelagos' heritage development (Solovetsky Strategy, 2013).

The sea ice thawing and disappearance was the driving force behind an ever-lengthening navigation season, moving toward a year-round open water connection with the community of Longyearbyen. Summer seasons with less ice enabled fishing, tourism, and research vessels to access new remote areas in the Northern part of the Barents Sea. This development presents a challenge, particularly in terms of the protection of the environment, emergency preparedness,

and search and rescue activities (Borch et al., 2016) in addition to local port infrastructure. Tourism operators must reserve vessel space at the harbor one year in advance.

The correlation between changing sea ice conditions and shipping activity in Arctic Canada is limited, but appears to be increasing (Pizzolato et al., 2016). For example, the case community of Cambridge Bay experienced one of the highest increase in marine vessel activity within 50 km of the community in Nunavut (Dawson et al., 2018a). The marine areas that are most significant to community members' subsistence harvesting and livelihood activities are also located where the most significant increases in ship activity has also occurred (Carter et al., 2018).

### 3.2. Methods

This research applies a case study approach (Yin, 2014), using a mixture of qualitative methods to generate secondary and primary data (Blaikie, 2010). Secondary data are derived from existing scientific literature, documents and popular media. The main purpose of secondary data collection was to develop an interview guide, identify stakeholders and increase our knowledge of the case communities (presented in the Table 2). Media reviews via available online platforms (A-text in Norwegian and Polpred.ru in Russian) were particularly relevant to assessing the contextual characteristics for the communities of Longyearbyen and Solovetsky, which unlike the community of Cambridge Bay, do not necessarily have the same historical roots to the place.

The primary data were collected in 2017 in the three case communities using semi-structured, unstructured and focus group interviews. The interview guide was designed to explore shipping development trends, seasonal changes, impacts on livelihoods, natural environment, and challenges and opportunities associated with the development. Twenty-four stakeholders and community representatives were interviewed in the Solovetsky settlement and the regional administrative center of Arkhangelsk, 22 in Longyearbyen, and 24 in Cambridge Bay (Table 3). Results were validated with research participants (member-checking draft outputs e.g. reports and maps) which took place during in-person meetings with key stakeholders and community representatives in Longyearbyen in 2017 and 2018 and Cambridge Bay in 2018 (Carter et al., 2018). Several stakeholders from the Solovetsky community commented on preliminary results that were presented in a report form.

Interview data were audio recorded and field notes taken in the native language of each case community: Solovetsky in Russian, Longyearbyen in Norwegian (some in English), and Cambridge Bay in Inuinnaqtun. Where necessary, the transcribed interviews were translated

**Table 3. Number and types of interviews**

Community/codes	Type and number of interviews	Interviewees
Solovetsky (S1-S24)	19 semi-structured and 5 unstructured	Representatives from public bodies, shipping and marine tourism industry, Search and Rescue services and local population
Longyearbyen (L1-L22)	18 semi-structured and 4 unstructured	Representatives from public bodies, shipping and marine tourism industry, NGOs, Search and Rescue services, port authorities and local population
Cambridge Bay (CB1-CB24)	One focus-group interview with 8 stakeholders and 16 unstructured interviews	Representatives from Ekaluktutiak Hunters and Trappers Organization and local residents who were current, active users of local marine areas with expert knowledge of culturally significant marine sites and the impacts of shipping

into English. Empirical data were thematically analyzed using coding software, NVivo (Bazeley & Jackson, 2013). The codes and categories were derived from the interview guide and emerging points during the discussion. In line with ethical requirements, and to secure the anonymity of the interviewees, a participant number system is used for each case (Table 3).

#### 4. Empirical findings

##### 4.1. Natural environment and shipping impacts

In this section, we present the community members' understandings on the surrounding natural environment and describe the locally defined impacts from diverse shipping activities for each community. Given the variation in navigation seasons and seasonal cycles in the case of Cambridge Bay and the impacts from shipping development on the local natural environment, the communities' livelihoods vary through the year.

###### 4.1.1. Solovetsky

According to the majority of interviewees, even though the navigation season lasts eight-nine months, the main impacts and pressure on the natural environment happens during the summer navigation season. During this time, hundreds of vessels, transporting thousands of tourists, pilgrims, seasonal workers and other community visitors arrive in the archipelago. One of the interviewees expressed concern, describing this situation the following way:

If the population of the village is slightly less than 1000...then during summer it might be up to 2500 people at the same time, including tourists and seasonal workers. This is a great burden for both infrastructure and nature (S17).

The increasing number of visitors led several interviewees to question the island's natural and recreational capacity. Some interviewees suggested that the natural and recreational capacity need to be scientifically calculated (S5). Others supported more comprehensive measures to limit the number of individual tourists, such as establishing a nature reserve (S17) that may also limit the use of the natural environment by residents (S15). At the same time, several interviewees pointed out that weather and ice conditions limiting the tourism flow (S15, S20) thus resulting in a relatively stable tourism season duration. In fact, the first domestic cruise vessel of the 2017 tourism season could not approach the Archipelago due to ice conditions (S19). This ability of the natural environment to regulate the tourism flow was described by several interviewees as:

Solovki [local weather and ice conditions] regulates the number of people themselves...we had a warm summer last year with a large number of people...Now, when it rains, there is nothing [no tourists] (S19).

One of the interviewees in Arkhangelsk accepted this natural force (weather) in their practices and the need for tourists to adjust to local weather conditions: "*The weather is another question. Sometimes tourists fly there but cannot return [due to weather conditions]*" (S12).

When talking about the potential impacts from shipping activities, the interviewees were concerned with animal disturbance, especially during private, non-organized excursions to the Beluga Cape, a migration spot for Beluga whales (S19). To limit the possible disturbance, the tourism industry underlines the importance of integration of local and scientific knowledge in planning the trips to the Beluga Cape:

... we go there [to Beluga Cape] on smaller boats. We have been doing this for a very long time...[knowing] how to approach the area and so on. I was invited by these 'belyuzhniki' [Beluga whales researchers], to present our practical point of view (S21).

Among other concerns, the local population pointed to tourists' inappropriate use of and behavior in nature that contradict the established Solovetsky visiting rules. This inappropriate behavior included polluting, leaving garbage in natural areas, and lighting a fire in a place where it was not permitted (S8, S19). In addition to individual impacts from tourism, aggregate problems such as garbage management was a huge issue. The increasing volume of generated garbage from residents and community visitors bothered the local population: *"This [garbage] is a problem. We have landfill facilities, in 2 km away from the village and nothing has been done with it... it is already huge"*. Only a small portion of the garbage generated on this island is transported to the mainland (S17).

At the same time, according to local stakeholders, international cruise vessels and tourists did not levy such impacts on the local environment. Compared to regular passenger traffic between the Archipelago and the mainland, international cruises were perceived as a form of tourism with limited impacts on the sites and nature due to organized nature of visits (S8). The sites were visited by smaller groups, all garbage was stored onboard vessels, and cruise boats usually anchored a desirable distance from the settlement (S18) thereby limiting disruption to the local population. This was also applicable to organized tourist groups, which according to one of the interviewees, compared to individual tourism thusly:

...have a structured program...Despite all worries, they do not really harm nature, they use the same road [during every excursion]. Organized tourism, in terms of conservation of nature is the most optimal. Nothing is better (S19).

During the navigation season, the island is visited by supply and cargo vessels that are vital for community well-being; however, interviewees did not mention any impacts on the natural environment from those activities. The interviewees from the shipping sector acknowledged that:

...the negative impacts from shipping has been reduced to the minimum. This is regulated by strict environmental laws, nothing can be thrown off the board...Ships themselves can deliver their waste to the port of the Arkhangelsk, for example. It is a bit harder on Solovetsky, which does not have waste facilities (S3).

Moreover, the vessels follow the recommended routes for navigation to avoid seals' rookeries and any types of mammals' disturbance (S3, S4). Mammals' locations are routinely communicated to vessels operating in the area (S4). The development of recommended routes coupled with White Sea charts lessen the chance for a vessel to be grounded (S3).

#### 4.1.2. Longyearbyen

The community's engagement with and the use of the natural environment in Longyearbyen differs from other coastal Norwegian communities. One of the interviewees described that:

It [the natural environment] is not used here as in other coastal settlements on the mainland [Norway] where you have fishing and where you have transport. Some use private boats and there are some transport options to Barentsburg and Pyramid and so on. Otherwise, we use the ocean too little here (L2).

At the same time, some from the Longyearbyen community expressed concern about dramatic changes in the surrounding natural environment. Those interviewees who had lived there for more than a decade have noticed marine environment changes, such as changes in marine species distribution and sea ice reduction nearing complete disappearance in Isfjorden and Adventsfjord (L11, L8, L21). One of the residents surprisingly told us that:

I was on a fishing trip and caught species that were not here for 6 years ago, mackerel, for example. There must have been a dramatic temperature increase in the ocean. And ... fjords, they do not freeze (L2).

The changes in sea ice conditions have led to year-round community accessibility by marine vessels. It was suggested by local residents that the past the winter season was quiet, with no shipping activities to and from community, when sea ice covered the fjords:

...we have less ice now, than for 20 years ago. 20 years ago we talked about the last boat and the first boat. We called it for the Christmas boat, the last boat in December, and it was the last, before the first one in May. It was like this because of the sea ice (L11).

Today the year-round navigation season is divided into two periods: the tourism period (also described as *cruise tourism period*), which is constantly extending, and “*the rest of the year*” described as a winter period (L2). Sea ice reduction has led to an extended marine tourism season, which in turn shortened the residents’s quiet season (a period without ship traffic) and their options for use of nature (e.g. ability to be alone in nature) (L7). This was confirmed by a representative from shipping industry, who pointed out that the navigation season for day-long cruises and expedition vessels starts early in the Spring (L21). The increasingly early start of the shipping season has awoken a new concern on the west side of the Archipelago: the potential disturbance of sea-ice dependent species. One of the interviewees reflected on the prohibited ice-breaking activities in the fjords:

They (the fjords) have dramatically less ice than usually. It affects ice-related species also polar bears and seals...icebreaking... must be avoided in areas that are important for marine species. And it’s applicable for all areas with sea ice. There are monitoring activities...in those areas during March and April (L12)

Moreover, changes in snow conditions and increased avalanche risks have shifted land-based tourism activities, such as snowmobiling tours, toward sea-based (L5). This increasing use of the marine environment has been questioned locally. Although local community members do not use the natural environment for subsistence purposes, fishing and hunting are purely recreational. Compared to Solovetsky community, all types of vessels are regarded as potential threats to the natural environment. According to the interviewees, the described negative impacts are “*potential for accident, pollution and emission, spreading of invasive species via ballast water, disturbance of wildlife and damage of the vegetation and cultural heritage*” (L12). The impacts from commercial fishing activities in Svalbard waters and in the Barents Sea were noticeable to the local residents and visitors. Some observed a significant amount of marine litter (some of which was related to fishing industry) on Svalbard’s beaches, even on those that have been previously cleaned (L8). At the same time, Svalbard’s vulnerable natural environment was largely described as a “*wilderness area, no settlement, no infrastructure, little technical intervention*” (L12).

Similar to Solovetsky, the increased number of visitors in the community and at out-of-town sites during the summer season affected the local environment. In the Svalbard case, residents reported incidents of inappropriate behavior from visitors that included littering, picking flowers—prohibited on Svalbard—and disturbing wildlife (L7, L20). As a result, local residents were preoccupied with preventing the negative impacts of increased shipping and visitors. One of the interviewees underlined that locally they focus on the prevention of any types of accidents and fuel spills. “*It is important to prevent accidents. This is why there is a Heavy Fuel Oil ban for almost all territorial waters in Svalbard. Only Icefjorden does not have it*” (L12). In addition to accident prevention, two interviewees mentioned that due to the dramatic tourism growth (including marine tourism) there is a need to determine how many tourists Svalbard can accommodate:

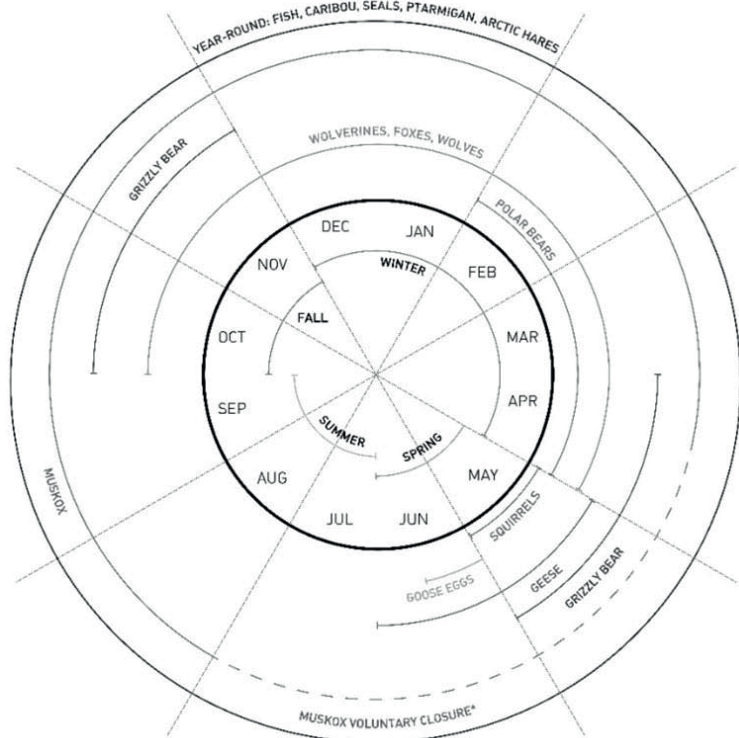
This is a debate I would like to have in Longyearbyen... Some thinks it’s probably exciting when a cruise ship with 2000 people arrives to the community. But there are maybe 20, 30, 40 vessels during the season, and if it happens every day, if we become Gibraltar then we have ruined ourselves. Then the destination is no longer exclusive (L2).

Much work has been done by local stakeholders to develop community guidelines regarding wildlife to mitigate the negative impacts, disseminating information about the vulnerability of local environment to the visitors (L4, L7, L8, L10).

#### 4.1.3. Cambridge Bay

In Cambridge Bay, compared to the previous two communities, the well-being of community members, their cultural practices, and livelihood are closely connected to and dependent on the marine environment. The ocean is used daily, year-round for fishing, hunting and travel. The community's subsistence harvesting activities are seasonal, thus the potential impacts of marine vessel traffic on the natural environment varies across these periods (see Figure 2). Community members travel by boat when there is open water, but the sea ice also serves an important function for community members' mobility, as well as for migrating caribou, and as a denning area for seals and polar bears. Thus, several concerns were raised regarding current and potential impacts from ship traffic—both in open water seasons and from icebreaking vessels during the shoulder seasons.

Figure 2. Seasonal cycles in Cambridge Bay.



\* Muskox hunting is legally open every month but at the time of publication Ekaluktutiak Hunters and Trappers Organization has voluntary closure from mid-April to July so that calves have time to grow and be strong.

Regarding ongoing impacts, the interviewees explained that marine vessels disturb fish and marine mammals (e.g. spawning, feeding, and migratory routes) and animals move away. One of the interviewees expressed this fear in the following way:

...even if we put our foot in the water they [the marine species] go! ... And that's a very small impact. But with big cruise ships that can be a big impact to the wildlife out in the waters! And it can scatter them! (CB1).

In addition to wildlife disturbances, the interviewees feared the pollution in the marine environment, describing the marine vessels as a contributor to garbage, sewage, contaminants, oil and lubricants in the ocean. Community members underlined that shipping traffic causes those substances to accumulate in the Arctic water system (oceans, rivers and lakes) which negatively affects marine and terrestrial wildlife and people (CB8).

... [vessels] discharging some fluids into the water...Grey water and things like that is diluted in the water of course, but you get any kind of oils or chemicals that go in the water, that's going to go straight into the food chain that we eat. The fish, the seals, the bears. So, thinking ahead we have to try and prevent something like that happening in our waters (CB2).

Similarly, another interviewee mentioned his fear of local food being contaminated by ships transiting the Northwest Passage:

With all the shipping anyone of them could run aground, anyone of them could have a fire, anything can happen so you know better to be prepared and save what little we can instead of losing our livelihood and I think that's a good example of food that we love to eat and we can't anymore because of modern things going on within our region (CB2).

The necessity of having clean waters to secure the quality of the country food was described in the following way:

I grew up with country food [traditional wild foods] ...And it's very important for me to see that the ocean and the land be kept clean from any contamination ... that regulations be put in place for outsiders using our traditional land and our water sources (CB1).

Certain types of ship traffic also disturb the sea ice that serves as a platform for local mobility by people. Sea ice damage, according to one interviewee posed safety risks and limited mobility:

...hunters use these ice bridges to access routes to the mainland. In the fall a couple years ago [CB3] and I were on the mainland after freezing up and no sooner had we come back and the Coast Guard [icebreaker] went through where we had driven our snowmobiles. So, to us that's a big concern. Had we been on that ice coming home after that boat had gone through, we wouldn't be here as we speak. (CB2).

In addition to safety concerns, several interviewees underlined that ships disturb the caribou migration. Caribou are an important food source for community members, and one that is currently threatened due to a decrease in the caribou population:

When ships go through in the early fall, they break up the ice and that could also make the caribou go through that. Because the caribou do migrate to and from the island to the mainland in fall time and spring time. You might already know that the caribou is declining and that could even make it worse with the ships going through in early fall; and caribou go through the ice! And that's another concern (CB1).

This idea that local coastal communities will be disproportionately impacted by the potential environmental damage from ships was evident in local resident perspectives:



My feelings towards [cruise ships] is I feel I'm not with them or for them. It just benefits whoever owns these cruise ships...The thing that I'm concerned about is that they go through our passage and there's a risk every time they come through because they're so big that somethings going to happen; maybe not now, maybe not tomorrow but eventually. And when that does happen it's going to have a huge impact on us (CB2).

This impact, according to the interviewees, is dramatic for the area since: *"it's our home; it's our life... It's all we have"* (CB5). At the same time, residents consider Cambridge Bay's location as important to emergency and incident preparedness activities, critical in limiting the negative impacts from possible accidents in the NWP: *"...our livelihood depends on the water! Fish and seals. It would be nice to have one of those fuel responses here in Northwest Passage in the Kitikmeot"* (CB1).

## 5. Concluding discussion

### 5.1. Different perceptions about the same concern

As illustrated in the previous section, the case communities experienced an array of direct and indirect impacts from increasing ship traffic on their surrounding natural environment, which in turn affected their well-being. This is in line with Stewart et al. (2015), who argue that communities even in the same region are exposed differently to a certain type of shipping activities. Our research demonstrates that communities are concerned about a range of impacts and the way they affect livelihoods, but also that these concerns vary across the Arctic regions. Based on the analysis of empirical data, we argue that this diversity in identified impacts across the case communities relates to two main factors: local context (community characteristics and local shipping trends) and the way the natural environment is perceived and used locally (e.g. community engagement with the natural environment).

The role of the first factor, the local context, relates to the location, local economy, history and trends of ship traffic. The communities of Solovetsky and Svalbard, for example have a long experience with shipping activities including marine tourism (Maksimova, 2016; Nyseth & Viken, 2015). As a result, both communities have developed knowledge on shipping operations, resulting in the development of local institutional responses such as regulations and guidelines to mitigate the negative impacts. Given the lesser extent of shipping activities around Cambridge Bay, and the very recent increase in marine vessel traffic in that area (Dawson et al., 2018a) local and federal institutional responses are limited but desired (Carter et al., 2018). Moreover, as illustrated in this study, potential risks are still creating uncertainties and spurring the need for local responses, such as preparedness activities and information dissemination on icebreaking activities.

In addition to contextual characteristics, the locally identified impacts were generally related to the way in which the natural environment was perceived and integrated into the social life of three case communities. Table 4 presents the multiplicity of views on how the natural environment is locally perceived and used. Each of those perceptions has a different linkage to shipping growth and the way the natural environment is impacted. This explains why certain impacts from shipping activities become a concern for one community, while others do not attest to the same impact. Surprisingly, interviewees from Solovetsky described impacts from shipping development that did not necessarily happen offshore (as was the case for Longyearbyen and Cambridge Bay), but on their terrestrial environment because of increasing numbers of visitors. Solovetsky interviewees also perceived the natural environment as a force for controlling the growth of passenger shipping (see also Olsen and Nenasheva, 2018).

In all of the case communities, the impact of shipping on the natural environment affected livelihood practices, thus presenting a great concern for all case communities. Maintaining aspects of traditional livelihoods became a challenge for those Arctic coastal communities who rely on the environment for things like subsistence and mobility to a greater degree. Impacts from shipping in this context present an additional stressor to already changing natural environment (see also

<b>Table 4. Local perceptions on impacts from shipping and implications for adaptive capacity (adopted from Olsen and Nenashva, 2018)</b>			
<b>Community</b>	<b>Perception and use of natural environment:</b>	<b>The impacts from shipping</b>	<b>Strengthen adaptive capacity</b>
Solovetsky	<ul style="list-style-type: none"> <li>Natural boundary for the shipping and tourism seasons (e.g., sea ice and weather conditions)</li> <li>Local natural capacity with limits for use</li> <li>Natural capital (i.e. natural resources)</li> <li>Natural heritage (an object for protection)</li> </ul>	<ul style="list-style-type: none"> <li>Animal disturbance by tourists</li> <li>Pollution and inappropriate behavior on sites</li> <li>Infrastructure development may have trade-offs with the natural environment and heritage</li> <li>Garbage collected on the island and not removed</li> </ul>	<ul style="list-style-type: none"> <li>Protective measures and guidelines reduce ecological footprint.</li> <li>Extension of the navigation season improves food security</li> <li>Sea ice and weather conditions limit the tourism season and number of visitors and thus their ecological footprint</li> </ul>
Longyearbyen	<ul style="list-style-type: none"> <li>Vulnerable environment is exposed to climate change impacts and needs to be protected. Disturbance should be limited to its minimum.</li> <li>Local natural capacity with limits for use</li> </ul>	<ul style="list-style-type: none"> <li>Potential for accident, pollution and emission, both off- shore and on sites</li> <li>Spreading of invasive species via ballast water by international shipping</li> <li>Animal disturbance</li> <li>Missing the sense of wildness, isolation and exclusiveness of Svalbard</li> <li>Marine litter</li> </ul>	<ul style="list-style-type: none"> <li>Protective regulations affect residents' use of the environment for recreational purposes (e.g. mobility restrictions)</li> <li>The pollution of the pristine environment affects people's perception of "wilderness" that in turn affect sense of place</li> </ul>
Cambridge Bay	<ul style="list-style-type: none"> <li>Integrated part of the community livelihood (need to be protected)</li> <li>Natural capital a part of food security (i.e. natural resources)</li> <li>Sea ice and open water as platforms for animals and community mobility</li> </ul>	<ul style="list-style-type: none"> <li>Vessels disturb marine species and fish (that move away)</li> <li>Breaking sea ice affects people and animals' mobility and local ability to hunt</li> <li>Noise pollution</li> <li>Pollution to the water that also affect the quality of local food</li> <li>Possibility for oil spills</li> </ul>	<ul style="list-style-type: none"> <li>Increased environmental consciousness among residents and visitors resulted in the response strategies (cleaning initiatives, knowledge sharing with community visitors)</li> </ul>
			<ul style="list-style-type: none"> <li>Protect marine environment, better information dissemination about icebreaking activities and improving of preparedness system are described as necessary to limit the negative impact on the natural environment</li> </ul>

Davydov & Mikhailova, 2011; Stewart et al., 2015). Hence, we can argue that the potential impacts can still be dramatic even in areas with lower shipping activities (see also PAME, 2009).

To elaborate on those arguments, Table 4 summarizes the communities' perceptions of the natural environment and the impacts of shipping activities, serving to assess their implications for local adaptive capacity.

### **5.2. Natural environment as a critical aspect of adaptive capacity**

This study examines different meanings of the natural environment based on its local perceptions and use. In line with Ween and Lien (2012), we argue that the perception of and engagement with the natural environment is case-specific and, according to Corbett (2006), rooted in the sense of place and historical and cultural experience. The relationship between sense of place and the perception of the natural environment is especially interesting for the community of Longyearbyen, where given the high share of foreign residents and high rotation rate of the community, newcomers to Svalbard “adopt” new environmental beliefs via the experience of dramatic change in their environment and observing pollution of the “wilderness”.

Based on the connection between place, perceptions of the natural environment and impacts on the communities' livelihoods that shapes their adaptive capacity (illustrated in Table 4), we argue that natural environment presents a salient determinant of communities' adaptive capacity in the context of increasing shipping development. This connection is also discussed in the broader literature investigating the impacts on the natural environment emerging from climate change, industrial expansion, and from increasing numbers of community visitors (e.g. Hovelsrud & Smit, 2010; Hovelsrud et al., 2018; Rybråten, 2013).

In line with those studies, we highlight how the local perceptions and use of the natural environment affect human understanding and concerns about possible impacts on the surrounding environment. Hence, not only the physical natural environment itself, but also perception and use by local communities influences adaptive capacity. Building on existing adaptation literature (Furness & Nelson, 2016; Kofinas et al., 2013; Mortreux & Barnett, 2017) our empirical evidence suggests expanding beyond conceptions of “nature” as a resource to be utilized that shapes adaptive capacity. This study illustrates that the natural environment is described in a broader, more inclusive way. The empirical evidence offers a way of understanding this phenomenon as a determinant of adaptive capacity that (1) influences, (2) is influenced by the scope of human activities, (3) presents a valuable capital for human well-being (e.g. local natural resources and enhancing the archipelago's attractiveness) and, (4) is thus an object for protection. We conclude that, the “natural environment” as a determinant of adaptive capacity presents an umbrella definition for several interconnected meanings of nature.

The study highlights the need to develop context-specific assessments of shipping impacts on the natural environment that are based on different forms of use of said environments. There is no one-size-fits-all solution to the challenges associated with the increases in Arctic shipping. Thus, such context-specific assessments may in turn improve planning and decision-making surrounding shipping development in the opening Arctic. The application of an adaptive capacity framework helped us to explore local characteristics, thereby illustrating how the impacts on the natural environments can become a social concern. The results of this study can be used to develop recommendations for managing shipping development in each case community. The theoretical and methodological approaches can be used for further studies assessing the local consequences of shipping development.

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#### Notes

1. Sources: Solovetsky Strategy (2013); Olsen and Nenasheva (2018); SSB (2016); Carter et al. (2018), Statistics Canada (2016).
2. Sources: Agency for Solovetsky Archipelago development, Port of Longyearbyen, and Cambridge Bay (based on ships transiting within 25 km of the community, no data on number of passengers is available).

#### Cover image

Source: Author.

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# PAPER 4

## **Adaptive capacity of the Arctic communities and shipping growth**







# Adaptive capacity of Arctic communities and shipping growth

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*NOT FOR PEER-REVIEW – refers to the articles that are a part of this dissertation. This is to secure a double-blinded peer-review process.*

## Abstract

Throughout the past two decades, the number of studies examining the local adaptive capacity of Arctic communities in the context of climate change has been increasing. Despite this interest, however, little is known about local arctic communities' ability to adapt to other emerging changes such as shipping growth. To address this knowledge gap, this article combines results from a systematic literature review on community adaptive capacity in circumpolar Arctic, and results from empirical studies that explore local communities' adaptive capacity in the context of shipping growth. In doing so, this study (1) investigates the development of adaptive capacity's conceptual framework by Western and Russian scholars, and (2) discusses what conditions enable community's ability to adapt to shipping growth. Arctic shipping refers here to all types of vessels operating in the Arctic and is argued to present new opportunities and new risks for coastal communities. This study concludes that the adaptive capacity framework has been developed theoretically and methodologically and is broadly used to address new types of changes in combination with climate change. However, adoption of the adaptive capacity framework in the community-based research by Russian scholars has been challenged by the use of Western terminology to describe the empirical reality. It also highlights the role of the community agency and the communities' perception of the natural environment in shaping local capacity to adapt to shipping growth.

**Key words:** Adaptive capacity, Arctic, Russia, shipping, local communities

## 1. Introduction

Arctic communities face multiple cross-scale changes in socio-economic, political, environmental and cultural systems that have cascading impacts on local community viability. Throughout past decades, Arctic scholars have been examining local responses and the local capacity to adapt to climatic and non-climatic changes occurring within and outside the Arctic region. At the same time, certain emerging changes, such as shipping development, have received less attention. In addition to the lack of knowledge on shipping impacts in Arctic communities, the Russian local communities and the Russian context are

39 still understudied by Arctic scholars (Ford, McDowell, & Pearce, 2015) and less is known  
40 about their capacity<sup>1</sup> to adapt to climate-induced changes. This disparity exists despite the  
41 fact that, Russia represents nearly half the Arctic geographically, and almost 40 % of the  
42 Arctic demographically (Shestak, Shcheka, & Klochkov, 2019). Hence, in order to examine  
43 how the adaptive capacity of Arctic communities is understood in Western and Russian  
44 literature, this study aims to (1) examine the status of adaptive capacity knowledge  
45 pertaining to local Arctic communities in the context of climate change, Russia included; and  
46 (2) understand what conditions enable community adaptation to on-going and emerging  
47 climatic and non-climatic change, such as shipping growth.

48 The existing scientific literature recognizes that the historical adaptability and flexibility of  
49 Arctic community livelihoods is strained by the complexity and pace of climatic (Meier et al.,  
50 2014 p. 205) and non-climatic changes (see for ex. AMAP, 2017; Hovelsrud & Smit, 2010;  
51 Rasmussen, Hovelsrud, & Gearheard, 2014). According to a recent IPCC report (IPCC, 2018),  
52 the Arctic region is warming two to three times faster than the rest of the globe that affects  
53 Earth's cryosphere (AMAP, 2017b; Overland et al., 2018). Sea ice reduction is arguably one  
54 of the most noticeable changes in the Arctic (Meier et al., 2014) since it retreats and  
55 migrates norward with warming global temperatures. The number of days with sea ice cover  
56 has been declining by 10-20 days per decade during the period 1979-2013 (AMAP, 2017b p.  
57 viii).

58 Discussion on adaptive capacity in literature on global environmental change has burgeoned  
59 around the topic of climatic evaluation (Engle, 2011). This literature, among others,  
60 examines the necessity to develop adaptation measures to new climatic realities in the  
61 context of economic development (Lopulenko, 2009). In studies that apply an adaptation  
62 framework, adaptive capacity is embedded in the vulnerability paradigm; however, adaptive  
63 capacity is also connected to resilience research, where adaptability is described as "the  
64 capacity of actors in a system to influence resilience" (Walker, Holling, Carpenter, & Kinzig,  
65 2004). Adaptive capacity, in vulnerability research follows an actor-centered approach  
66 (Engle, 2011). It usually refers to the conditions and abilities that enable people to adjust to  
67 changing conditions (e.g. Hovelsrud & Smit, 2010; Smit & Wandel, 2006) by minimizing the  
68 consequences and/or take advantage of new opportunities (Cinner et al., 2018). Adaptive  
69 capacity is argued to be latent in its nature and needs to be activated to enable adaptation  
70 (Bay-Larsen & Hovelsrud, 2017; Brown & Westaway, 2011). However, despite a clear  
71 conceptualization of adaptive capacity, there is still a debate on the contextual conditions  
72 that enhance and/or activate adaptive capacity. Hence, the understanding of the adaptive  
73 capacity framework as developed by Arctic scholars, and its salient elements in responding  
74 to changing conditions represents the primary research interest of this study.

75 Arctic shipping represents one example of a changing condition to which local communities  
76 may respond to in varying ways (AMAP, 2017; Christensen, Lasserre, Dawson, Guy, &

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<sup>1</sup> Some of the explanation for this disproportion are given in the discussion section 4.

77 Pelletier, 2018). As mentioned, Arctic shipping refers here to all types of vessels operating in  
78 the Arctic (AMSA, 2009), destination, transition and local. The vessels types vary from small  
79 pleasure crafts to large overseas cruises, as well as fishing, research, cargo and government  
80 vessels (Dawson, Copland, et al., 2017). Though some of the vessels have an ice class,  
81 meaning they are enabled for year-around operation in ice-covered waters (IMO, 2010),  
82 much of the traffic takes place in open waters and summer navigation.

83 Growing trends in Arctic shipping for the past two decades are often connected to climatic  
84 and socio-economic changes. Declining sea ice opens new areas in the Arctic Ocean and  
85 results in the extension of the navigation season and increases the possibility for transiting  
86 along North East and/or North West passages. Additionally, fisheries and extractive  
87 industries are moving northward, and the area is becoming more attractive to marine  
88 tourism (Dawson, Pizzolato, Howell, Copland, & Johnston, 2018).

89 Even though shipping activities have grown and will continue to increase in several Arctic  
90 regions, knowledge of how shipping growth affects local communities is rather fragmented.  
91 Sea ice decline presents opportunities for shipping development, yet we know little about  
92 these opportunities and how they should be managed (Ford et al., 2012 p. 296). A recent  
93 literature review on Arctic shipping underlined the deficit of studies that address social and  
94 environmental impacts from this growing sector (Ng, Andrews, Babb, Lin, & Becker, 2018).  
95 Existing studies that address the social and environmental impacts of Arctic shipping, have  
96 mostly covered the Canadian Arctic (e.g. Christensen et al., 2018; Dawson, Johnston, &  
97 Stewart, 2017), while socio-economic and governance aspects of marine cruise development  
98 have also been explored for several other Arctic regions (e.g. Grushenko, 2014; Olsen et al.,  
99 2020; Pashkevich, Dawson, & Stewart, 2015, Not for Peer-Review, in-press; Stewart,  
100 Dawson, & Johnston, 2015; Van Bets, Lamers, & van Tatenhove, 2017).

101 This study aims to contribute to increasing body of literature on community- based  
102 adaptation by (1) providing insight on the status of research on Arctic community's adaptive  
103 capacity and (2) expanding knowledge on whether and how the Arctic shipping development  
104 is understood as a changing condition that local communities respond and/or adapt to. In  
105 doing so, this article began with a presentation of the significance of the topic, which will be  
106 followed by detailed explanation of its methods—e.g. a description of the systematic  
107 literature review and how those results are combined with synthesis of empirical studies.  
108 The results section conceptualizes local adaptive capacity based on contributions from Arctic  
109 Western scholars, discusses the ways this framework is addressed among Russian scholars,  
110 identifies elements that constrain local adaptive capacity and examines whether and how  
111 shipping is addressed in the literature on adaptive capacity. Subsequently, the results section  
112 presents synthesized findings from three empirical papers that examine the local adaptive  
113 capacity of two Arctic local communities (one in Norway, one in Russia) to increasing  
114 shipping activities. In the discussion, I synthesize the results of the literature review and the  
115 empirical studies and present my contribution to the development of the adaptive capacity  
116 framework.

## 117 2. Methods

118 In this study, I integrate the results of two research processes, a systematic literature review  
119 and a synthesis of results from three empirical studies that comprise two island  
120 communities. This section will explain the methods applied in this process.

### 121 2.1 Literature review

122 The study is firstly rooted in a systematic literature review of peer-reviewed journal articles  
123 in order to examine the status of knowledge - developed by Western and Russian scholars -  
124 regarding local adaptive capacity in the Arctic, and whether and how shipping development  
125 is addressed in those studies. The systematic review process was developed based on  
126 guidelines for conducting literature reviews (e.g. Biesbroek et al., 2018; Easterby-Smith,  
127 Thorpe, & Jackson, 2012; Ford et al., 2012). According to Ford et al. (2011, p. 328), the  
128 systematic literature review presents an assessment of the state of knowledge on a specific  
129 topic. Such review consists of three main components: data collection (clearly formulated  
130 questions and syntaxes), full reporting on criteria for inclusion and exclusion of articles, and  
131 the possibility of using quantitative and qualitative analysis (ibid).

132 During the data collection process, the question for literature review was defined as follows:  
133 *What characterizes the local adaptive capacity of Arctic communities?* To respond to this  
134 question, the following sections discuss literature on adaptive capacity from all Arctic  
135 nations, including Russia. The inclusion of which adds novelty to this study.

136 To include peer-reviewed scientific articles from several Arctic regions, two main electronic  
137 databases were chosen: Scopus in English and eLIBRARY.ru in Russian. Though the search  
138 and selection options of those databases are similar to each other, it is important to note  
139 that Scopus includes studies on the Russian Arctic if they are published in English. ELibrary is  
140 a useful database to search for studies that are published in Russian. The ability to combine  
141 results from both databases provides a more comprehensive overview of published studies  
142 on adaptive capacity in the Arctic than one which excluded Russian language texts.

143 The following boolean search-a keyword-searching syntax- was applied in Scopus: ( ( adapt\*  
144 AND capacity AND commun\* OR local ) AND arctic OR "high north" OR northern AND  
145 alaska OR canada OR russia OR norway OR sweden OR finland OR iceland OR  
146 greenland ) AND ( EXCLUDE ( PUBYEAR , 2019 ) AND ( LIMIT-TO ( DOCTYPE , "ar" ) ). The  
147 search protocol in eLIBRARY was similar; however, three main adjustments were necessary.  
148 First, since the search in the Russian database aimed to assess only Russian literature about  
149 adaptive capacity in the Russian Arctic, other Arctic countries were excluded. However, the  
150 application of Russian translation of the syntax in eLibrary.ru resulted in numerous and  
151 irrelevant results (n=4431). Therefore, the second adjustment was necessary due to  
152 differences in translation and the concepts use in the Russian language. To be more specific,  
153 the translation of the core concepts like 'adaptive capacity' and 'local communities'. The  
154 word "capacity" can be translated in various ways, such as 'sposobnost' (*ability or capacity*),  
155 'potencial' (potential), and 'vozmozhnost' (ability). The use of another relevant concept, local

156 community (in Russian 'mestnye soobshchestva'), retrieves the results from natural sciences  
 157 that describe communities of flora and fauna. Hence, I found it valuable to substitute it with  
 158 the concept of populace (in Russian 'naselenie' or 'narody'). Finally, the Arctic as a  
 159 geographic region, in Russian studies is usually associated with the high Arctic, mostly the  
 160 territory above the Arctic circle (The President of the Russian Federation, 2014). The Russian  
 161 geographical boarder of the Arctic is significantly smaller compare to the one defined by the  
 162 AMAP and broadly used by the Western scholars. Hence, I would argue that the published  
 163 studies by Russian authors do not necessary include the term Arctic to describe the  
 164 geographical area of their research. The most common words to describe the AMAP-region  
 165 is "high north" and/or just "north", e.g. Russian North, Northwest Russia. To address those  
 166 translation challenges, I ran three separate searches, each of them included only one of the  
 167 translations of 'adaptive capacity'.

168 Those exclusion and inclusion criteria are listed in Table 1. The systematic literature review  
 169 includes scientific articles published between 2000 and 2018. This period was chosen to  
 170 reflect the IPCC's Third Assessment Report, Working Group II, which highlighted adaptive  
 171 capacity within studies on global environmental change (IPCC, 2001).

172 Table 1. Criteria for literature inclusion and exclusion (modified from Ford et al., 2012)

Inclusion	Exclusion
Written in English, Russian	Written in languages other than English and Russian
Published between 1 January 2000 and 31 December 2018	Published outside the selected date range
Peer-reviewed	Not peer-reviewed
Reviews and scientific articles	Book reviews, conference proceedings, reports
Studies on adaptive capacity and its determinants	Mitigation, transformation, explicit focus on biophysical changes
Adaptive capacity as a social attribute	Adaptive capacity as a biophysical attribute; health studies
Studies the local levels (partly regional level for Russian studies)	Studies the regional, national and international levels
Arctic countries (Arctic area in AMAP <sup>2</sup> )	No reference to the Arctic

173 The boolean search, which involves a search for both keywords and abstracts (Biesbroek et  
 174 al., 2018), was conducted in October 2018 and updated in January 2019. The search resulted  
 175 in 118 relevant articles on Scopus and 39 in eLibrary.ru. An abstract screening was  
 176 conducted to examine whether articles addressed adaptive capacity and/or comparable  
 177 concepts within adaption studies. This process limited the total number of articles to 53 in  
 178 Scopus. To evaluate the relevance of the Russian articles, during the screening process I also  
 179 had to include articles' introductions, as some abstracts were of limited length, making it  
 180 difficult to assess the theoretical choices. In total 12 articles in eLibrary.ru were selected,

<sup>2</sup> The Arctic area is defined by AMAP and in the Arctic Human Development Report in order to address the Human dimensions of Arctic research (AHDR 2004, p18)

181 that are connected to local context and communities' abilities to adapt to climate-induced  
182 changes in the Arctic. Those selected articles present the conceptual application of the  
183 framework and the differences from Western studies, rather than an assessment of adaptive  
184 capacity.

185 I coded these selected articles in qualitative data analysis software, NVivo, using predefined  
186 coding categories, such as the conceptualization of adaptive capacity, connection to other  
187 social attributes within the adaptation framework<sup>3</sup>, adaptive capacity determinants and/or  
188 dimensions and limitations. Some emerging categories<sup>4</sup> were added during the analysis  
189 process. The results of literature review are presented in the section 3.1.

## 190 2.2 Summary of the empirical studies\*

191 \*XXX and YYY are the codes for case communities in the empirical studies used in the results part. This  
192 is to secure double-blinded peer-review.

193 The results of the literature review are combined with the synthesis of the results from three  
194 published empirical studies on adaptive capacity in the context of shipping growth (section  
195 4.2). Those three studies were designed by the author of this paper to examine local  
196 adaptive capacity in the context of shipping growth, and to understand what local elements  
197 enhance communities' adaptive capacity. The findings from those three studies are  
198 compared with those from systematic literature review in discussion part 4.2.

199 Those three explorative studies applied community-based approach. The data analysis in  
200 those papers is based on primary data collected through qualitative semi-structured and  
201 unstructured interviews with residents and key stakeholders in two island communities: XXX  
202 (n=24), and YYY (n=36). The interview data was inductively analyzed, and emerging  
203 categories were added to examine the determinants of local adaptive capacity.

204 Each of three published papers identifies the diversity of the impacts of shipping growth on  
205 coastal communities, the way those impacts shape the adaptive capacity and what  
206 determinants of adaptive capacity are salient in the context of this development. Hence, the  
207 synthesis of their individual findings, presented in this study, contributes to further  
208 discussion on local adaptive capacity, also in the context of other changes. Additionally, to  
209 avoid repetitions in the literature and synthesis results, one of the author's papers - which  
210 met the literature search criteria - was excluded from the literature review process and  
211 included in the latter synthesis.

## 212 3. Results

213 This section comprises two independent sets of research results. The first presents the  
214 results from the systematic literature review, beginning with the conceptualization of  
215 adaptive capacity by Arctic scholars, and the ways Russian scholars have interpreted and  
216 used this framework. It also examines aspects of adaptive capacity, as well as shipping

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<sup>3</sup> E.g. vulnerability, resilience, adaptive responses

<sup>4</sup> E.g. the type of change, region and study methods

217 development and its treatment in selected studies. The second presents a more detailed  
218 synthesis of three specific empirical studies by the author regarding shipping activities and  
219 local adaptive capacity.

#### 220 4.1 Literature review on the adaptive capacity of Arctic communities

221 Within the literature on global environmental change, the concept of adaptive capacity  
222 (earlier described as 'adaptability') has its origin in the vulnerability approach highlighted in  
223 the Third AR IPCC report (Smit and Philifosova, 2001 in Ford & Smit, 2004). The reviewed  
224 studies that examine adaptive capacity employ vulnerability as a central concept.

225 *Vulnerability* is defined as a susceptibility to changing conditions (Keskitalo & Kulyasova,  
226 2009) and is a function of both exposure-sensitivity to impacts of a changing condition and  
227 the adaptive capacity to deal with those impacts (Ford & Smit, 2004).

228 Exposure-sensitivity relates to one's susceptibility to impacts of changing conditions in a  
229 particular place over time (e.g. Risvoll & Hovelsrud, 2016), while *adaptive capacity refers to*  
230 *one's (in this study community) ability to address, plan for, or adapt to these impacts* (Ford et  
231 al., 2009; Ford, Smit, & Wandel, 2006; Ford, Smit, Wandel, & MacDonald, 2006) *and take*  
232 *advantage of new opportunities* (Debortoli, Sayles, Clark, & Ford, 2018). This or a similar  
233 definition of adaptive capacity is commonly used in reviewed literature.

234 The reviewed studies suggest that the relationship between adaptive capacity and exposure-  
235 sensitivity is context-dependent and varies over time and scale (Debortoli et al., 2018), while  
236 an increase in a communities' adaptive capacity and/or resilience leads to a decrease in  
237 vulnerability (e.g. Kvalvik et al., 2011). Hence, some scholars argue that in adaptation  
238 studies, adaptive capacity can be approached as a synonym to resilience (Turner et al., 2003  
239 in Risvoll and Hovelsrud, 2016). In adaptation research, resilience is described as another  
240 attribute of socio-ecological systems associated with coping mechanisms, where the term  
241 "adaptive" refers to the evolutionary/ecological description of responses that increase the  
242 probability of survival (Berkes and Jolly, 2002).

243 Adaptive capacity, in the vulnerability approach, is socially constructed. Adaptive capacity is  
244 approached as a dynamic attribute that varies across communities (Ford, Smit, & Wandel,  
245 2006; O'Brien, Eriksen, Sygna, & Naess, 2006). Assessments of adaptive capacity tend to  
246 place emphasis on the local level (e.g. Keskitalo, 2008; Risvoll & Hovelsrud, 2016), as it is  
247 dependent on political and economic settings, scientific and traditional knowledge, as well as  
248 resource distribution, involved stakeholders (Adger, Brown, & Tompkins, 2005 in Keskitalo  
249 and Kulyasova, 2009) and communities' ability act collectively, also described as human  
250 agency (e.g. Hovelsrud et al. 2018). Additionally, it should be noted that due to uneven  
251 distribution of resources and power across scales, the enhancement of adaptive capacity for  
252 one group of stakeholders may reduce the adaptive capacity of another (Keskitalo &  
253 Kulyasova, 2009).

254 In line with Debotoli et al. (2018), this review indicates that there is a long tradition of  
255 vulnerability and adaptation research in Canada. From a geographical perspective, Canadian

256 Arctic communities are represented most prominently in the captured studies, followed by  
257 Alaskan communities and communities in Scandinavian countries. Less knowledge has been  
258 accumulated on Russian communities. While the majority of these studies use single case-  
259 study research designs, a few establish multiple cases within and outside the Arctic region.  
260 One of these comparatively analyses local adaptive capacity in Nordic countries and Russia  
261 (C. Keskitalo, H. Dannevig, G. K. Hovelsrud, J. West, & A. Swartling, 2011), illustrating the  
262 contextual differences between those communities.

263 Compared to Western scholars, who apply the adaptive capacity framework to several place-  
264 based case studies (Ford et al. 2009), only few of the captured Russian studies focused on  
265 the study of local Russian communities (Lopulenko, 2009; Riabova & Klyuchnikova, 2018,  
266 p.101). At the same time, adaptation studies of the Russian Arctic population have a long  
267 history extending back to the 1930s, a period marked by intensive development in Arctic  
268 territories and by the opening of the Northern Sea Route (Maximov & Maximova, 2007).  
269 During the past decade, the topic of community adaptive capacity has received more  
270 attention and has been studied in the context of climate change, especially after the  
271 adoption of a Climate Doctrine of the Russian Federation in 2009 (Rybakova, 2010, see also  
272 Riabova and Klyuchnikova, 2018). In adaptive capacity studies, by Russian scholars, the unit  
273 of analysis is usually an individual or diverse sectoral and regional levels and fewer  
274 community-level cases (Riabova & Klyuchnikova, 2018, p. 91-92).

275 The existing studies on Russian communities also indicate that though Arctic residents are  
276 exposed to impacts of climatic and climate-induced changes (Boyakova, Vinokurova,  
277 Ignatjeva, & Filippova, 2010; Filippova, 2011; Oparin, Kulikova, & Shchigreva, 2011), several  
278 changes require adaptation measures. The literature describes the changes that followed  
279 the collapse of the Soviet Union and a transition toward the market economy that, taken  
280 together, negatively affected traditional livelihoods of several Arctic indigenous and local  
281 communities (Perevalova, 2015). Other changes that are discussed in the reviewed literature  
282 are changes in ecosystem services (Leksin & Porfiryev, 2017; Medvedkov, 2016), industrial  
283 expansion to the North (Perevalova, 2015) and, as a result, demographical changes of the  
284 Arctic population (Tomaska, 2015). Less attention is given to direct impacts of climate  
285 change. Referring to AMAP (2018), Riabova and Klyuchnikova (2018) argue that this  
286 complexity of change will require adaptation at a variety of levels—local, regional, national  
287 and global. Leksin & Porfiryev, 2017 suggest that in the context of the climate change  
288 impacts, indigenous communities might need to adjust their methods for maintaining  
289 traditional lifestyles such as reindeer herding, fishing and hunting, but also their mobility  
290 options.

### 291 *3.1.1. The elements of adaptive capacity*

292 The development of the adaptive capacity framework reveals that several aspects and  
293 contextual factors influence a community's ability to adapt to climatic and non-climatic  
294 changes. The literature recognizes that local adaptive capacity depends on a set of available



295 and interdependent aspects: different forms of capital, distribution and access to resources,  
 296 as well as the structure of institutions (e.g. Bay-Larsen, Risvoll, Vestrum, & Bjørkhaug, 2018;  
 297 Pearce et al., 2010; Smit & Pilifosova, 2001 cited in Keskitalo et al., 2011). These aspects are  
 298 also described in the literature as determinants, indicators and/or capitals of adaptive  
 299 capacity. They can be grouped in objective and subjective dimensions (e.g. Nechiporenko,  
 300 2015) or, as described by Armitage (2005), as fast-moving and slow-moving attributes,  
 301 respectively (Armitage, 2005, p. 707).

302 While objective aspects, such as infrastructure, technology and economic assets, were  
 303 already identified in the Third Assessment IPCC report (Smit & Pilifosova, 2001 in Keskitalo et  
 304 al., 2011), the role of subjective and/or socio-cognitive ones in shaping adaptive capacity  
 305 received greater attention in more recent years (Bay-Larsen et al., 2018; Blennow & Persson,  
 306 2009; Goldhar, Bell, & Wolf, 2014). Local adaptive capacity can now be *“conceptualized as*  
 307 *the sum of objective and subjective dimensions, where the adaptive capacity is latent under*  
 308 *the former and activated under the latter,”* (Berman, Kofinas, & BurnSilver, 2017 in Tiller and  
 309 Richards, 2018).

310 Those aspects of adaptive capacity, here referred to as determinants, vary over time and  
 311 location. Table 2 presents those determinants that were identified in the literature,  
 312 describes their meanings and presents references to the reviewed literature. Following the  
 313 presentation of those determinants, they were grouped under ten categories such as social  
 314 capital, flexibility, worldviews, institutions, natural capital, human capital, technology,  
 315 infrastructure, equity, and economic resources

316 Table 2. Categories of the determinants of adaptive capacity, their definitions and references  
 317 to the literature

Determinants	Definition	References from the literature review
Social capital (incl. networks, social norms, trust, place attachment, perception of risk or change)	Refers to cooperation and ability to act collectively in order to achieve mutual social and spiritual benefits (Armitage, 2005), but also to practices that evolve shared perception of change (Bay-Larsen et al., 2018)	(Armitage, 2005; Bay-Larsen et al., 2018; Biesbroek et al., 2018; Blennow & Persson, 2009; Crate, 2007; Ford et al., 2009; Ford et al., 2008; Ford, Smit, Wandel, et al., 2006; Hovelsrud, Karlsson, & Olsen, 2018; Tiller & Richards, 2018; J. J. West & Hovelsrud, 2010)
Flexibility	Refers to communities' ability to adjust their (subsistence) practices and <i>“is based on environmental knowledge and land skills”</i> (Ford & Goldhar, 2012)	(Ford & Goldhar, 2012; Ford et al., 2009; Ford & Pearce, 2010; Ford, Smit, & Wandel, 2006; Ford et al., 2008; Ford, Smit, Wandel, et al., 2006; Goldhar et al., 2014; Hovelsrud et al., 2018; Rattenbury, Kielland, Finstad, & Schneider, 2009; Risvoll & Hovelsrud, 2016; Tyler et al., 2007)

Values, beliefs and worldviews	Psychological and cognitive aspects of community viability. Also refers to beliefs in climate change and adaptive capacity	(Bay-Larsen et al., 2018; Blennow & Persson, 2009; Goldhar et al., 2014)
Institutions and governance system	Refers to a decision-making system that facilitates or hinders local flexibility and adaptation strategies within or outside a given community Also refers to regulation and market mechanisms (Keskitalo & Kulyasova, 2009)	(Angell & Stokke, 2014; Brattland, Eythórsson, Weines, & Sunnanå, 2018; Buchanan, Reed, & Lidestav, 2016; Budreau & McBean, 2007; Ford & Goldhar, 2012; Keskitalo & Kulyasova, 2009; E. C. H. Keskitalo, H. Dannevig, G. K. Hovelsrud, J. J. West, & A. G. Swartling, 2011; Tiller & Richards, 2018)
Natural capital	Usually refers to biophysical conditions and natural resources that support local communities and their subsistence	(Bay-Larsen et al., 2018; Risvoll, Fedreheim, & Galafassi, 2016; Risvoll & Hovelsrud, 2016)
Human capital Information, knowledge and education	Refers to various types of knowledge that help to better understand impacts, i.e. traditional, local and/or ecological knowledge that is <i>“the cumulative body of knowledge, practice, and belief evolved through adaptive processes and handed down from generation to generation”</i> (Berkes, 1999 in Tremblay et al., 2008).	(Brattland et al., 2018; Buchanan et al., 2016; Budreau & McBean, 2007; Dale & Armitage, 2011; Ford et al., 2009; Ford, Smit, & Wandel, 2006; Ford et al., 2008; Goldhar et al., 2014; Hovelsrud et al., 2018; Keskitalo & Kulyasova, 2009; E. C. H. Keskitalo et al., 2011; Lundmark, Pashkevich, Jansson, & Wiberg, 2008; Pearce et al., 2010; Tremblay et al., 2008)
Technology	Availability and access to technology and equipment that support local viability	(E. C. H. Keskitalo et al., 2011; Lundmark et al., 2008; Pearce et al., 2010)
Infrastructure	Refers to the physical infrastructure and available maintenance services that support local viability	(Ford & King, 2015; Ford & Pearce, 2010; Keskitalo & Kulyasova, 2009; E. C. H. Keskitalo et al., 2011)
Equity/access to resources	Refers to <i>“Social institutions and arrangements governing the allocation of power and access to resources ... [that] assure that access to resources is equitably distributed”</i> (Smit & Pilifosova, 2001 in Keskitalo et al., 2011)	(Baehler & Biddle, 2018; Ford, Smit, & Wandel, 2006; Ford, Smit, Wandel, et al., 2006; E. C. H. Keskitalo et al., 2011; Lundmark et al., 2008)
Economic resources and/or financial capital	Relates to commodities (Armitage 2005), including <i>“economic assets, capital resources, financial means, wealth, or poverty”</i> (Smit & Pilifosova, 2001 in Keskitalo et al. 2011)	(Armitage, 2005; Biesbroek et al., 2018; E. C. H. Keskitalo et al., 2011)

318 It is important to note the complexity of the relationships between adaptive capacity and  
319 adaptation (e.g. O'Brien et al., 2006), as the presence of any particular determinant does not  
320 necessarily strengthen local adaptive capacity and/or lead to adaptation (e.g. Ford & King,  
321 2015). For example, Keskitalo et al. (2011) suggest that economic resources, infrastructure  
322 and technology may be made inaccessible by high maintenance costs. In fact, determinants  
323 can even be a barrier to adaptation. For example some scholars have argued that while  
324 financial resource and/or technology can enhance the adaptive capacity, they may  
325 simultaneously not be available for some households (Ford & Pearce, 2010) and can increase  
326 the dependency on those determinants (Keskitalo et al. 2011).

327 The question of enhancing adaptive capacity, and more specifically its translation into  
328 adaptive actions, was further developed by Ford and King (2015) and Ford et al. (2018), who  
329 examine and identify the necessary of governance factors that enable adaptation to take  
330 place. They present interdependent institutional factors that lead to adaptation: political  
331 leadership on adaptation, institutional organization, decision-making and stakeholder  
332 engagement, availability of usable science, funding and public support (Ford & King, 2015).  
333 Yet, even with this knowledge, policy mechanisms, dilemmas and trade-offs in the  
334 implementation stages can weaken local adaptive capacity (Risvoll et al., 2016).

335 In addition to determinants and adaptation readiness, literature identifies several contextual  
336 factors and cross-scale processes that are not strictly a part of adaptive capacity, but can  
337 complicate the effectiveness of community's ability to adapt to changing conditions (C. T.  
338 West, 2011) and may also affect local exposure to changing conditions (Ford, Smit, &  
339 Wandel, 2006). The following factors are identified: demographic trends like gender and its  
340 societal roles (Buchanan et al., 2016; Bunce, Ford, Harper, Edge, & Team, 2016; Goldhar et  
341 al., 2014; Tomaska, 2015), population structure (Lundmark et al., 2008), youth participation  
342 and engagement (MacDonald, Ford, Willox, Mitchell, & Productions, 2015), the type of  
343 community (Armitage, 2005) and the area's political and socio-economic situation (Keskitalo,  
344 2009; Kvalvik et al., 2011), including market conditions and globalization (Keskitalo &  
345 Kulyasova, 2009). Wesche and Chan (2010) underline that food security also influences local  
346 adaptive capacity (see also Fillion et al., 2014).

347 Several scholars stress the scale and/or variables of adaptive capacity, stating, "*adaptive*  
348 *capacity is nested ... in cross-scale societal processes that may hinder or enable action,*"  
349 (AMAP, 2017 in Hovelsrud et al., 2018). Here, O'Brien et al. (2006) argue that local adaptive  
350 capacity may differ from national adaptive capacity due to the diversity between these  
351 scales. The scale of change itself and the scale of decision-making can influence the scope of  
352 adaptation (Armitage, 2005; J. J. West & Hovelsrud, 2010), while Tiller and Richards (2018)  
353 argue that stakeholders and stakeholder groups will have to adapt to different levels of  
354 change.

355 *3.1.2. Shipping as an emerging change*

356 This literature review indicates that many selected studies examines adaptive capacity in the  
357 context of climatic and non-climatic change. It is also acknowledged that communities do  
358 not adapt to climate change in isolation from other changes (e.g. J. J. West & Hovelsrud,  
359 2010). Thus, in describing adaptive capacity, focus is given to the interplay of multiple cross-  
360 scale changes (e.g. Rattenbury et al., 2009). Prno et al. (2011, p. 17), describe climate  
361 change as an additional factor in societal changes already occurring, and argue that the  
362 impacts of climate change present “*a minor concern, outweighed by [other] social issues...*”.

363 In relation to this study, shipping growth is also approached as a changing condition in  
364 reviewed literature. However, little is known about local adaptation and adaptive capacity in  
365 regard to this changing trend.

366 About 15% of selected articles for this literature review refer to shipping a developing  
367 industry in the Arctic. The majority of these studies were published during the last decade  
368 and connect shipping development to changing ice conditions (e.g. Andrachuk & Smit, 2012;  
369 Christie, Hollmen, Huntington, & Lovvorn, 2018; Ford et al., 2012; Ford & Goldhar, 2012) as  
370 well as industrial activities, including tourism (e.g. Andrachuk & Smit, 2012). In reference to  
371 assessment reports (ACIA, 2005; AMAP, 2011), Riabova and Klyuchnikova (2018) explain that  
372 rapid changes in the cryosphere enable better navigation in previously sea-bounded areas.

373 Shipping in this context is described as an “economic opportunity” of climate change (Ford  
374 et al., 2018; Ford & Goldhar, 2012) with the potential to influence economic systems of  
375 northern settlements (Christie et al., 2018) and provide employment opportunities (Angell &  
376 Stokke, 2014). However, few studies have examined these opportunities and how they  
377 should be managed (Ford et al., 2012). Moreover, not all coastal communities will benefit  
378 from this development as port infrastructure and local water deepness present crucial  
379 aspects of accommodating shipping during the ice-free season (Andrachuk & Smit, 2012).

380 In addition to opportunities, scholars underline that there are some risks associated with  
381 growing shipping trends. Riabova and Klyuchnikova (2018, referring to Davydov &  
382 Mikhailova, 2011) provide the example of risks from ship traffic passing through Vaigach  
383 Island in the Russian Arctic. They argue that the community is becoming more accessible to  
384 ship traffic and to an increasing number of visitors that exchange imported goods (including  
385 alcohol) for local natural traditional resources. This trend has resulted in the changes of  
386 traditional economy and exploitation of natural resource use (ibid). Shipping can also have  
387 negative impacts on sensitive ecosystems (Ford et al., 2018; O'Brien et al., 2006) including  
388 those inhabited by marine mammals (Bunce et al., 2016; Christie et al., 2018).

389 Ford et al. (2012) refers to Cameron (2012) and argue that “*shipping and resource*  
390 *development are likely to be major factors affecting vulnerability and adaptation in Arctic*  
391 *communities.*” Moreover, shipping is prognosed to increase in regions with projected sea ice  
392 decline and increasing demand for shipping operations (Smith & Stephenson, 2013 in Ford et  
393 al., 2018). This uncertainty in the future of Arctic shipping operations might challenge the

394 examination of future adaptive capacity and local adaptation to ship traffic. Ford et al.  
395 (2012) argue that more knowledge is needed to understand how changes in industries like  
396 shipping affect communities' experiences and responses to climate change.

397 The next section presents the results of the empirical research that investigates the way the  
398 local adaptive capacity is shaped by growing ship traffic.

### 399 3.2. Results from the empirical studies on shipping and adaptive capacity

400 In this section, I synthesize the results from three empirical studies on shipping development  
401 in two communities: XXX, and YYY. This section summarizes and discusses the ways locally  
402 identified impacts from shipping activities affect local adaptive capacity, and the salient  
403 determinants of adaptive capacity in these communities.

404 Given the remote location of both communities, their socio-economic developments have  
405 been connected to shipping operations that serve transportation, mobility and re-supply  
406 needs. Despite support from air transportation, domestic and destination vessels have  
407 grown in studied communities over the past two decades. These include community re-  
408 supply ships, marine tourism, cruises, research vessels, and, in the case of YYY, fishing and  
409 government vessels. Though the increase in some shipping operations is directly connected  
410 to sea ice retreat, NOT FOR PEER-REVIEW (2018) argue that this is not the case for  
411 community re-supply vessels, whose operations depend on local demand. Similarly, marine  
412 tourism vessels operate mostly during the summer period, despite the extended navigation  
413 season. The growth in number of passenger vessels has led to a significant increase in the  
414 absolute number of passengers, e.g. tourists, community visitors and residents, arriving on  
415 those vessels.

416 The impact of Arctic ship traffic varies between and within the communities depending on  
417 the type of shipping operations, their density over space and time, seasonality and the  
418 community's contextual characteristics. The communities experience a high turnover of  
419 vessels landing in communities during summertime, a period when the communities are  
420 approached by tourism vessels, such as pleasure craft, passenger/day-trip cruises, overseas  
421 vessels and expedition cruises. This growth creates concerns about overcrowding and the  
422 negative impacts on the natural environment.

423 The main impact associated with overcrowding in communities and surrounding  
424 environment is the pressure it places on local infrastructure, which is often not yet able  
425 accommodate the increased traffic. Anthropogenic pressure on the natural environment  
426 takes the form of local species disturbance and 'trampling' of the landscape of roads and  
427 paths (NOT FOR PEER-REVIEW 2018, 2019). The community of XXX points to unresolved  
428 issues with waste facilities. Locally collected garbage, also from many thousands of tourists,  
429 remains on the island and only a small portion is transported to the mainland (NOT FOR  
430 PEER-REVIEW, 2018). The community of YYY concerns that overcrowding creates social  
431 disturbance. Local community members described cases of inappropriate behavior from  
432 some visitors which resulted in social disturbance. It should be noted that NOT FOR PEER-

433 REVIEW (2019) indicate that such environmental impacts are perceived differently across  
434 communities depending on local engagement with surrounding environments.

435 According to NOT FOR PEER-REVIEW (2018, 2019), both communities' can also benefit from  
436 increasing shipping and marine tourism opportunities when this development is properly  
437 managed. The management practices in YYY follow network principals that enhance  
438 cooperation between local stakeholders (NOT FOR PEER-REVIEW, 2020). These cooperative  
439 practices result in the distribution of tourism income between several competing  
440 organizations, while also assuring greater involvement of community actors in the visitor  
441 management system. Moreover, leaders in the same network are in constant dialogue with  
442 shipowners to negotiate cruise traffic throughout the season in order to avoid situations  
443 where several vessels approach the community simultaneously. Based on these results, the  
444 study identifies the resident's engagement in adaptive responses as a latent determinant  
445 that strengthens adaptive capacity and is activated by local place attachment, perceptions of  
446 the natural environment, cooperation practices and the ability to influence decision-making.

447 NOT FOR PEER-REVIEW (2018) also identify several salient determinants of adaptive capacity  
448 for the community of XXX, such as local involvement in shipping decision-making,  
449 infrastructure, local values, natural environment and economic resources (ibid.). The role of  
450 natural environment in strengthening adaptive capacity is also discussed in NOT FOR PEER-  
451 REVIEW (2019) who argue that there is a need to evaluate shipping impacts on said  
452 environment at the local level in order to integrate local use and engagement with the  
453 surrounding environment.

454 The study identified 6 determinants (see table 3). While four of six identified determinants align  
455 with those identified earlier, the conceptualization of two of them—local engagement in  
456 adaptive responses and the natural environment— is expanded based on the empirical  
457 results. The next table (Table 3) summarizes those determinants of adaptive capacity in the  
458 context of shipping development, as well as their implications and delineations, to compare  
459 them with those identified via literature review (section 4.1.1). For example, local  
460 involvement in the decision-making system and the resident's engagement in adaptive  
461 responses can be described as components of local governance systems.

462 Moreover, another novel aspect of these empirical studies is in the analysis of how these  
463 determinants shape local adaptive capacity. NOT FOR PEER-REVIEW (2018) concludes that  
464 adaptive capacity is also shaped by the interlinkages of the determinants, as they may lead  
465 to tradeoffs and or co-beneficial support (see also Table 3). For example, the infrastructure  
466 development presents an important determinant of adaptive capacity to meet shipping  
467 growth. However, it may weaken local adaptive capacity when nature is threatened by  
468 disturbances occurring as a result of increased accessibility or new construction on  
469 historically important locations (ibid).

470

471 Table 3. Identified determinants of adaptive capacity in the Barents Arctic.

Determinant of adaptive capacity	Implications of the determinant in relation to shipping development	How determinant shapes local adaptive capacity
Infrastructure	Supportive physical infrastructure: offshore and on-shore installation and construction that support safe navigation, on-land facilities that accommodate shipping and tourism activities (such as piers, buildings and waste facilities) and transport infrastructure that provides access to tourist sites on the island	Strengthens adaptive capacity when co-benefitting local needs and improving accessibility  Weakens adaptive capacity if threatening local values and/or nature and creating disturbances
Local values	Community attributes important to local viability and well-being such as notions of isolation and place-connection	Strengthens adaptive capacity when respected by community visitors and shipping stakeholders
Economic resources	Income from municipality taxation; Access to wage employment that comes with the growth of shipping and tourism activities	In general, strengthens local adaptive capacity if properly managed and kept in the community; some income leaves communities and job markets become dominated by seasonal workers (loss of income weakens adaptive capacity)
Local involvement in decision-making	A dimension of local governance; refers to the active engagement of community and relevant stakeholders in decision-making systems that enable collective responses to shipping development	Strengthens adaptive capacity when local values and needs are integrated into the decision-making system. May weaken adaptive capacity if it fails to address local dependence on shipping
Determinants from empirical studies		
Local engagement in adaptive responses	Residents' participation in adaptive responses and/or decision-making. The role of local community can be defined by external agents and/independently from them.	Strengthens local adaptive capacity by enabling collective action  Influenced in the long-term by demographic trends
Natural environment	An umbrella determinant referring to local nature when discussing shipping distribution. Influenced by the scope of ship traffic. Offers valuable capital for local communities. Object of protection. (NOT FOR PEER-REVIEW, 2019)	Strengthens adaptive capacity if able to provide provisions via natural resources Changes in natural conditions that increase community accessibility are beneficial from a food-security standpoint and can strengthen adaptive capacity. Adaptive capacity weakened when nature is overused and/or polluted

## 472 4. Discussion

### 473 4.1. Development of the adaptive capacity framework

474 In this study, I have illustrated that the adaptive capacity framework (at the community  
475 level) has developed significantly during the past two decades (Ford et al., 2018) after its  
476 establishment by Arctic Western scholars and its later recognition by Russian scholars  
477 (Riabova & Klyuchnikova, 2018). As such, this framework is useful for understanding  
478 community aspects that support, activate or hinder local adaptation in response to impacts  
479 from changing conditions, a fact illustrated by the case studies in XXX and YYY.

480 In Russian studies, in contrast to Western studies, adaptive capacity has been mostly applied  
481 to social or economic units that are not considered in this review – that is, local level  
482 communities. Studies by Russian scholars pertain mostly to individual capacity (usually refers  
483 to health conditions) in the context of harsh Arctic climatic conditions and to the regional or  
484 sectorial capacity to adapt to climatic changes. The local community level, where the  
485 impacts are often first felt, is not yet thoroughly explored by Russian scholars (Lopulenko,  
486 2009; Riabova & Klyuchnikova, 2018, p. 110). One explanation for this may be that Western-  
487 developed vocabulary of adaptation studies is not always used in studies that describe the  
488 impacts of changes taking place in Russian local communities. Hence, it is important to  
489 mention that even though the adaptation framework has been used by Russian scholars  
490 throughout recent decades, the results of this research yet to be integrated in the pan-Arctic  
491 research.

492 Adoption of the adaptive capacity framework in community-based research by Russian  
493 scholars has been challenged by the use of Western terminology to describe the empirical  
494 reality (Stammler-Gossmann, 2010, see also NOT FOR PEER REVIEW, 2018). Even though the  
495 selected studies describe communities' abilities to adapt to multiple changes, a standard  
496 framework of terminology is not necessarily applied. As described in the methodological  
497 section, the term adaptive capacity can be translated into Russian in three different ways. A  
498 test search identified that all three translations are used by Russian scholars. For example,  
499 the Russian translation of the IPCC's AR5 Synthesis report (IPCC, 2014) uses at least two of  
500 these variations ('sposobnost' and 'potencial') to refer to adaptive capacity. A concept of  
501 adaptive capacity as a social attribute of local communities is not explicitly used in Russian  
502 studies. Hence, I would argue that several community-based studies in Russian might be  
503 framed and analyzed using of the adaptive capacity approach.

504 Moreover, in line with Ford et al. (2012), I would also argue that a systematic literature  
505 review that includes only peer-review journal articles overlooks important resources, such as  
506 government reports, technical papers and conference proceedings. The last category in  
507 particular could offer a unique source of information, especially in the Russian case (many  
508 research results from eLibrary's database were published in the form of conference  
509 proceedings). Moreover, a significant portion of scientific results are published in  
510 assessments reports (e.g. AMAP, 2011; AMAP, 2017; IPCC, 2001, 2007, 2014; Rasmussen et  
511 al., 2014) and anthologies that provide a stronger synthesis of adaptive capacity's theoretical



512 development (e.g. Fondahl & Wilson, 2017; Hovelsrud & Smit, 2010). This type of literature  
513 may also present several determinants, capitals and/or factors of adaptive capacity that are  
514 not listed in the Table 2. However, some of these results and conclusions were cited by  
515 authors in the selected literature, and thus partly included in the analysis of this study.

516 In general, the adaptive capacity framework applied to study Arctic communities has been  
517 developed methodologically and theoretically throughout the past two decades. This  
518 framework has been advanced significantly by Western scholars (and later adapted by  
519 Russian scholars) since its emphasis in the Third Assessment Report by IPCC in 2001. In line  
520 with Mortreux and Barnett (2017), I argue that the development of adaptive capacity  
521 framework can be divided into two overlapping paths, developed parallel rather than  
522 sequentially. The first is characterized by the development of the concept and its  
523 relationship with other community characteristics, such as vulnerability, resilience,  
524 adaptation and sustainability. It is also defined by its establishment of methodological  
525 perspectives and by its examination of local aspects (also known as determinants and  
526 capitals) and their roles. The second questions the role of determinants in enhancing a  
527 community's ability to adapt to new and emerging cross-scale changes, both climatic and  
528 non-climatic, such as shipping growth. I align myself with earlier scholars' findings that the  
529 determinants are context-dependent, and that there is a need to examine those  
530 determinants and their interrelations to assess local adaptive capacity.

#### 531 4.2. Understanding adaptive capacity through shipping growth

532 It must be reiterated that shipping development is described in the reviewed literature as a  
533 result of climatic and socio-economic changes in the Arctic, but also as a contributor to  
534 changes in local communities. As such, the Arctic shipping development presents new  
535 opportunities and risks for Arctic communities. The studies document both positive and  
536 negative impacts on environmental, socio-cultural and economic realities. To illustrate how  
537 shipping development, affect local communities, the results section presents the possible  
538 impacts from this international and national industry, underlining the importance of  
539 assessing contextual variables that influence the way communities perceive these impacts  
540 (see NOT FOR PEER-REVIEW, 2019).

541 The results also align with earlier studies that describe increasing shipping in the opening  
542 Arctic as a new concern for coastal communities (see for example Christensen et al., 2018;  
543 Davydov & Mikhailova, 2011; Dawson, Stewart, Johnston, & Lemieux, 2016; Stewart et al.,  
544 2015). Shipping development brings new (usually seasonal) economic opportunities to  
545 communities, which, in combination with other factors, may present a trade-off. Hence, we  
546 can use these studies to discuss the risks and opportunities that Arctic communities  
547 experience in the context of multiple changes.

#### 548 5. Conclusion

549 In this paper, I have identified several determinants of adaptive capacity that derive from  
550 both an extensive literature review, and a detailed analysis of three recent empirical studies

551 which apply a more contemporary and up-to-date understanding of the adaptive capacity  
552 framework to examine shipping growth in the Arctic. This combination of results leads to  
553 three main contributions to literature on local adaptive capacity. Firstly, the empirical  
554 studies suggest expanding the meaning of the natural attributes of adaptive capacity -  
555 natural capital - toward the natural environment, referring to both biophysical conditions  
556 and communities engagement with the surrounding environment, in addition to community  
557 perceptions on environments modified by human cultures (see also NOT FOR PEER-REVIEW,  
558 2018, 2019). The term, “natural environment,” integrates several meanings of nature that  
559 might also be crucial in the context of other changes. Communities may refer to the natural  
560 environment not only as resources to be utilized, but also as a force that influences shipping  
561 distribution; as an object that is influenced by the scope of ship traffic; as valuable capital for  
562 local communities e.g. by providing natural resources or enhancing a community’s  
563 attractiveness to tourists and as an object of protection that requires conscious mitigation of  
564 negative impacts (see also NOT FOR PEER-REVIEW, 2019). Secondly, it contributes to the  
565 exploration of community engagement in decision-making and adaptive responses as salient  
566 determinants of adaptive capacity. Local communities are often the first to feel the concrete  
567 impacts of global and national changes, making them important stakeholders in adaptation  
568 responses that mitigate the impact of multiple changes.

569 Finally, it illuminates the diversity of determinants of adaptive capacity, arguing that their  
570 availability might strengthen adaptive capacity and lead to adaptation when activated.  
571 Therefore, I support earlier findings on the context-dependency of local adaptive capacity.  
572 However, the relationship between determinants of adaptive capacity may result in trade-  
573 offs that weaken a community’s overall adaptive capacity (see also NOT FOR PEE-REVIEW).

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This dissertation examines how shipping development in the Barents area affects coastal communities. Arctic shipping, which comprises all types of vessels operating in the Arctic waters, has historically been covering transportation and supply needs. The recent Arctic shipping growth has been influenced by the interplay of multiple changes in the socio-economic, geopolitical, environmental, and climatic conditions. This increase brings new risks and opportunities to the region and have many cascading impacts on coastal communities. To understand this connection, this case study inquiry employs a community-based approach and an analytical framework of adaptation and adaptive capacity. The empirical results derive from qualitative interviews with stakeholders and residents in two island communities: Longyearbyen on the Svalbard Archipelago and Solovetsky in Northern Russia.

The results of the study are disseminated in four interrelated scientific papers. They identify the impacts of shipping growth, illuminate the aspects of adaptive capacity and adaptive responses, analyze the way the framework is applied in the Russian context and describe the framework development by the Arctic scholars. My findings indicate that the perceptions of impacts of shipping development are context dependent, as the same type of impact may receive different interpretations. The aspects that shape local adaptive capacity, such as the natural environment, infrastructure, local values, economic resources and community agency, are interlinked. An analysis of the interlinkages between those aspects reveals possible trade-offs that may weaken adaptive capacity and hinder adaptive responses. Furthermore, this study indicates that, despite conceptual differences, the adaptive capacity framework presents a potential to examine the Russian context that is still understudied in the Arctic adaptation studies.

With the disappearing sea ice and globalization of the Arctic, shipping development will continue to increase. Hence, I conclude that the community agency – the community's ability to act – is crucial for the development of adaptive responses that support and correct institutional responses.