Chapter 14
Increasing Shipping in the Arctic and Local Communities' Engagement: A Case from Longyearbyen on Svalbard

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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*[1] 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 (Eguíluz 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 Nenasheva 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

[1] 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

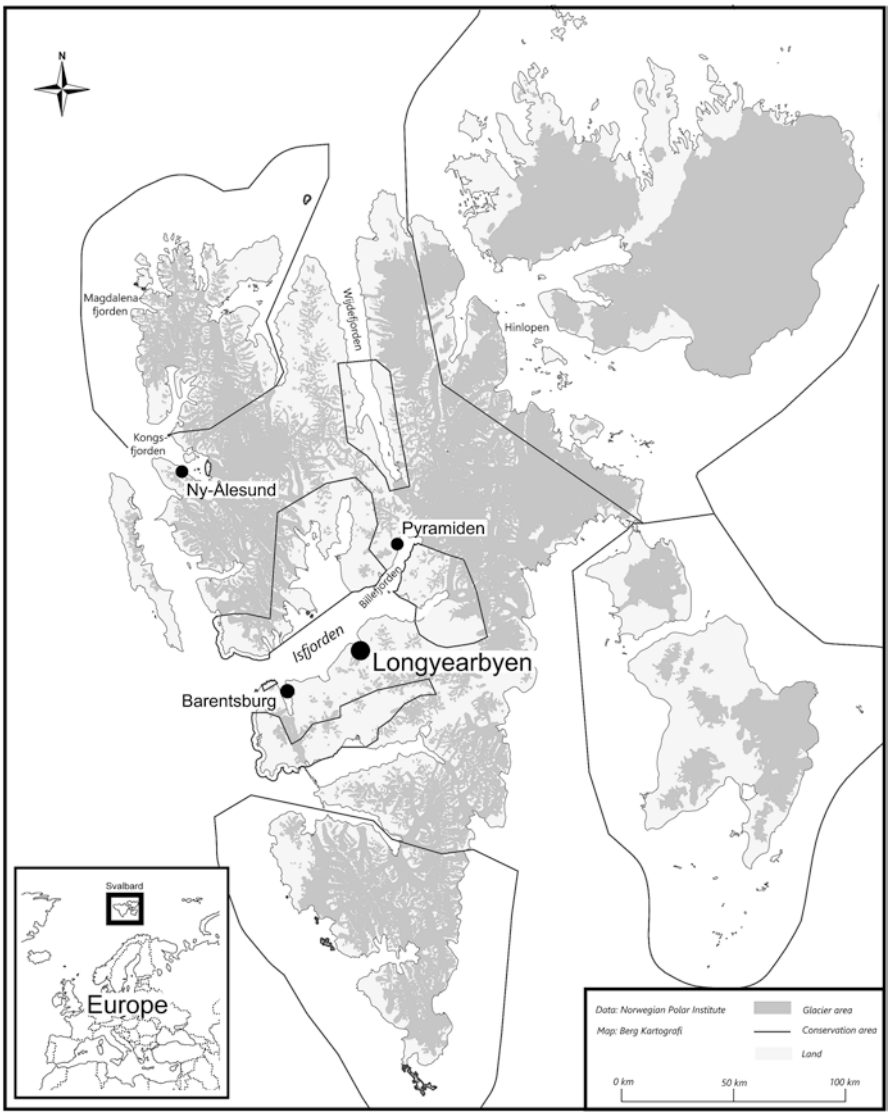

Fig. 14.1 A map of Svalbard

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[a]	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
Number of ship calls, including	**166**	**505**	**490**	**799**	**771**	**814**	**812**	**1178**	**1542**
Tourism (passenger) vessels[b]	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[c]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	96	142

[a]Statistics Norway report the population for both Longyeabyen 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

[b]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%)

[c]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.

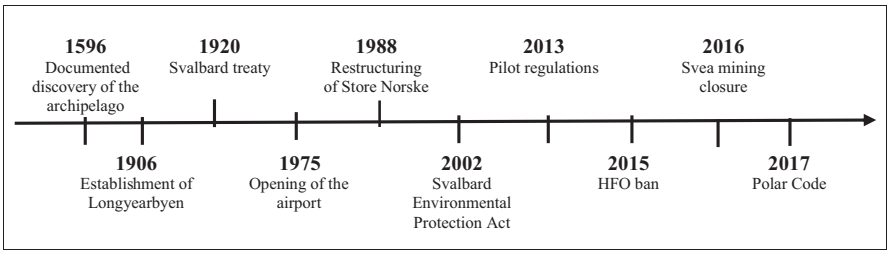

Fig. 14.3 Timeline of historical events related to community and shipping development

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 (*Sosialslitasje*), 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

Pleasure crafts (excluding day-trip vessels for under 12 passengers)	Fast-growing sector with a lack of regulations	Increases awareness about Arctic nature Participate in beach cleaning activities and in research projects	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
Other types of shipping			
Community supply	Year-round supply services Supplements tourism industry High dependence on weather conditions	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	Monopolized service leads to higher prices Goods can be damaged or lost Can be delayed in delivering crucial goods
Fishing	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	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	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

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 facilitates 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 interconnectedness (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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