



UiT The Arctic University of Norway

Department of Social Sciences

Investigating climate resilience in Longyearbyen

How can the community in Longyearbyen foresee, prepare for and respond to climate-related challenges

Laura Nurmi

Master's thesis in Nordic Urban Planning Studies SPL-3901 September 2021



Coverpicture - Haugen, Longyearbyen. Photograph by Laura Nurmi.

Table of Contents

- ABSTRACT6
- 1. INTRODUCTION1
 - 1.1. THE WIDER ARCTIC CONTEXT2
 - 1.2 LONGYEARBYEN3
 - 1.3 GOVERNANCE IN SVALBARD8
 - 1.4 CLIMATE RESILIENCE9
 - 1.5 PERFORMING THE STUDY9
- 2. THEORETICAL OVERVIEW11
 - 2.1 IMPACT OF CLIMATE CHANGE ON ARCTIC COMMUNITIES11
 - 2.1 RESILIENCE IN SPATIAL PLANNING13
 - 2.2 ADAPTIVE PLANNING AND GOVERNANCE15
 - 2.3 PLANNING AND CONFLICTS20
 - 2.4 KEY TERMS24
- 3. METHODOLOGY, DESIGN & METHODS27
 - 3.1 RESEARCH DESIGN27
 - 3.1.1 PURPOSE OF THE STUDY & RESEARCH QUESTIONS27
 - 3.1.2 THEORY28
 - 3.1.3. LIMITATIONS29
 - 3.2 QUALITATIVE RESEARCH29
 - 3.3 CASE STUDY METHODOLOGY30
 - 3.3.1 DATA SOURCES31
 - 3.3.2 INTERVIEWS31
 - 3.3.3 CONTENT ANALYSIS33
- 4 CLIMATE RESILIENCE IN LONGYEARBYEN33

4.1 ENVIRONMENTAL PROTECTION	36
4.1.1 REPLACING COAL WITH RENEWABLE ENERGY SOURCES	39
4.1.2 SAFETY MEASURES AND DISASTER PREVENTION	40
5.1.3 IMPROVING WASTE MANAGEMENT AND REDUCING POLLUTION	43
4.1.4 PROVIDING INSPIRATION FOR CLIMATE ADAPTATION.....	44
4.2 DEVELOPMENT & ECONOMICAL INTERESTS	45
4.2.1 RESPONSES TO CURRENT CHALLENGES	45
4.2.2. SUSTAINABLE TOURISM?.....	51
4.3 SOCIAL RESILIENCE & LOCAL PERSPECTIVE.....	54
4.3.1 SHARING RESPONSIBILITIES	55
4.3.2 PARTICIPATION	56
5 FINDINGS & DISCUSSION	60
6 CONCLUSION	66
7 BIBLIOGRAPHY.....	67
7.1 FIGURES.....	75

List of Figures

Cover picture. Haugen, Longyearbyen. Photograph by Laura Nurmi	
Figure 1 Map of Longyearbyen. Safety zone marked in pink. Retrieved from Visit Svalbard ...	5
Figure 2. The elusive border between the urban and the wilderness. Photograph by Laura Nurmi.....	6
Figure 3. A diagram of my study process. Own illustration.	10
Figure 4. The planner's triangle. Own illustration, based on Scott Campbell's vision	23
Figure 5. A diagram of stakeholders in Svalbard. Own illustration.	26
Figure 6. Longyearbyen seen from Platåfjellet. Photograph by Laura Nurmi	49
Figure 7. Map of Management Area 10 by Norwegian Polar Institute	52
Backcover picture. Sukkertoppen and avalanche protection fences. Photograph by Laura Nurmi.....	82

ABSTRACT

This thesis examines the adaptive capacity of Longyearbyen, in other words, how the community of Longyearbyen can foresee, prepare for and respond to climate-related challenges. I chose a case study methodology since my aim was to understand Longyearbyen as a living space, and how climate change is experienced across the environmental, economic, and social sectors. I used qualitative methods for data collection, where primary data comes from interviews and observations, supplemented by various secondary academic and non-academic sources. Based on a somewhat revised triangular model, the study examines resilience policies and plans in Svalbard, especially in the context of Longyearbyen. Derived from my findings, the key policies and plans addressing resilience include building emergency preparedness, emphasizing participatory methods, and developing climate-smart technologies while negotiating space for environmental protection. The locals are already involved in planning processes, but if more arenas for participation could be provided, their input could be increased, and thus more valuable knowledge would be available for political decision-making. There is also a strong, collective will to transform Longyearbyen from a former mining town into a modern research hub for sustainability.

1. INTRODUCTION

Climate change has become a growing concern in the past decades. The Arctic region can be seen as a global stage for climate change, where the impacts on weather, permafrost and ice-free seasons can already be felt. The Arctic also referred to as the high North, is located north of the Arctic Circle at 66° northern latitude. The climate reports estimate that global warming will occur at double the speed compared to the rest of the globe, which raises the urgency of rapid actions. Located in the high North, the archipelago of Svalbard is amongst the places where the physical and socio-economical changes caused by global warming can be observed. In Svalbard, the air temperature may rise as much as ten degrees in the next 80 years (Norwegian Centre for Climate Service, 2019). While the rapidly rising temperatures cause physical changes in the archipelago, the socio-economical structures are also influenced by the upcoming challenges. Longyearbyen is the main urban settlement in Svalbard, with a population of 2459 residents including people in Ny Ålesund (Statistics Norway, 2021). The town of Longyearbyen relies on tourism, research, and education when the mining industry is slowly declining. My interest in the Arctic and how the area is responding to climate change led me to investigate Svalbard and especially Longyearbyen. I ended up looking at climate resilience policies and adaptation strategies in Longyearbyen since I wanted to understand how well-prepared the town is to face global warming and the changes coming with it.

The aim of the study is to look into how climate resilience policies have evolved throughout the years, what kind of stakeholders structures are behind the decision-making processes and how does resilience planning currently looks like in Longyearbyen. The reason this study is based on climate resilience planning is the fact that climate change is a growing threat to the whole planet and we as a society need to come up with new solutions and technologies so that we can keep on developing our urban spaces when the environmental conditions are changing. As a concept, *climate resilience* corresponds most accurately to what I want to investigate in my thesis: how the Arctic settlements can not only survive but thrive despite external disturbances. I have chosen Longyearbyen as my case study since I find the high North intriguing with its special characteristics, rough climate, beautiful wilderness, and people who can endure living three months in total darkness. I am curious to see what kind of

plans have been made and if they are extensive enough to preserve the unique landscapes and ensure a good quality of life for the community.

The thesis discusses first the context and background of Longyearbyen. In the theory section, the aim is to carefully define climate resilience, and also look into adaptation policies and stakeholder hierarchies. Finally, the thesis analyses the findings from primary and secondary data sources. In the thesis, theory matched by analytical terms is used to examine the data. The study seeks to give a better understanding of how the community is preparing for the coming impacts of climate change while identifying potential spaces for improvement in the current climate resilience policies.

1.1. THE WIDER ARCTIC CONTEXT

The background context for the thesis is based on climate change in the Arctic region. The Arctic region covers the northernmost part of the globe, and around 4 million people are living in the region. The settlements in the Arctic are scattered across eight different states: Canada, the United States, Russia, Finland, Sweden, Norway, Iceland, and Denmark (Greenland) (Arctic Centre, n.d.). The settlements facilitate urban areas and vibrant cities with modern infrastructure, such as Murmansk, Tromsø, Reykjavik, and Rovaniemi (Stephen, 2018). There are also rural settlements, which can be divided into permanent and semi-nomadic settlements, and around 10% of the population in the Arctic consists of indigenous people (Larsen & Fondahl, 2015). The northernmost settlement with more than 2000 permanent residents is Longyearbyen since settlements further north are research bases and meteorological stations (Nordregio, 2019). Longyearbyen represents an Arctic town and does not compare to big cities such as Murmansk with 300 000 inhabitants. Despite the small amount of urban spaces in Longyearbyen, the town is divided into several neighborhoods connected by asphalt roads and facilitating a number of modern services such as a swimming hall, cinema, and grocery stores (Norwegian Ministry of Justice, 2016).

Since the Arctic is estimated to experience an increase in air temperature which is double the global average, the impacts of climate change on socio-ecological systems are extensive (IPCC, 2019). Rapid warming possibly threatens the traditional lifestyle of indigenous people in the Arctic, destroying infrastructure and transforming both natural and human systems. The socio-ecological systems in the high North are very fragile since they have adapted to the

extreme conditions the Arctic has to offer, such as a long polar night, few local resources, low density of population, and long distances.

While there is a long list of negative impacts on the Arctic region, the rising temperatures can also offer possibilities, such as increased accessibility, more extensive resource extraction, and the migration of several species (Canosa et al., 2020; Ford et al., 2014; Heininen, 2011). Increasing global interest towards the Arctic regions can be observed due to the desire to get access to these new possibilities the high North has to offer. Climate change combined with economic globalization determines the magnitude of the societal impact in the Arctic (Stephen, 2018). Also, the societal and environmental transformation are perceived through a “Global Arctic” scope, where the Arctic and global systems are seen as inseparable, which can be seen as a way of linking the future of the Arctic to the future of the entire planet (Stephen, 2018). The connection between the Arctic and the rest of the world has been impacted by the increased strategic value of the Arctic. The connection has also suffered from competition and utilization of the natural resources in the region. The Arctic has also been seen as a research laboratory for new technologies and innovations from the global perspective (Heininen, 2011). The Arctic might even be able to showcase a good model for governance since there is an increased interest in developing governance and co-management techniques in the region, which might offer inspiration to other places (Heininen, 2011).

1.2 LONGYEARBYEN

Longyearbyen was established in 1906 in the Svalbard Archipelago to facilitate coal-mining activities in the high Arctic. Some years after establishing the settlement, Svalbard Treaty was created in 1920. Svalbard Treaty constitutes the legal baseline for the Norwegian government’s ambitious environmental management objectives (Hovelsrud et al., 2020). The goals set for environmental management have made Svalbard one of the best-managed wilderness areas on the planet, according to the Environmental Protection Act of 2001 (Ministry of Climate and Environment, 2001). Norway has sovereign but not exclusive rights, and the policy baseline has been the avoidance of Svalbard getting into the wider geopolitical conflicts. The Treaty obligates Norway to take responsibility for the environmental protection in the Svalbard Archipelago (The Svalbard Treaty, 1920). Since the other treaty members also have the right to extracting resources in Svalbard, the archipelago is under constant global

observation so that the parties can ensure that they can claim their share of the resources equally (European Parliament, 2019).

The administrative hub of Svalbard, Longyearbyen, is experiencing an economic transformation from the coal mining industry towards tourism, research, satellite services, and education. Due to the transition, the local businesses and decision-makers need adaptive responses, since, for instance, tourism is increasing more rapidly than mining is declining (Hovelsrud et al., 2020). Significant changes have occurred in Svalbard over the past years, especially in environmental management, economic and employment structure, and also in geopolitical significance. Economic activity, research, and higher education are based on the archipelago's inherent natural conditions. While these three pillars have been strengthening Longyearbyen's position amongst the research centers in Svalbard, the pillars also shape the local community and the demographic features, the population being rather young and international. In 2020, there were researchers from 35 different nations, and more than 750 active research projects were listed in the Research Svalbard portal (Svalbard Science Forum, n.d.). Alongside Longyearbyen, research communities can also be found in Ny-Ålesund, Barentsburg, and Hornsund. On top of the active research network, a significant part of the residents in Longyearbyen are students, covering 28% of the population (UArctic, 2021). Also, the tourism industry is growing in the bigger picture. Around 30 000 tourists are visiting the archipelago normally, but the covid-19 pandemic has restricted the number of visitors in the past two years. Since Svalbard is outside the Schengen area, no visa permit is needed, which also shows in the community as diverse nationalities, while the age distribution has less variation, given that majority of the population is between 20-44 years old (Nikel, 2019; Statistics Norway, 2021).

Longyearbyen possesses the modern public infrastructure and a wide range, diverse economy, despite the limited services compared to the mainland. The town hosts two kindergartens, a school, a university, diverse sports facilities, and shops. While there are asphalt roads, street lights, traffic signs, and parking lots, the urban infrastructure is concentrated on a fairly small area (Lokalstyre, 2017). One of the most striking features of Longyearbyen is that the raw wilderness starts straight from the backyard - the urban network is fading into the untouched

landscape. The safety area, where no rifle is needed, covers only the very central Longyearbyen (figure 1). Apart from the polar bear signs, which indicate where the rifle-free zone ends, there are no visible boundaries between the rural and the urban (figure 2). One must keep an eye on the surroundings all the time since the polar bears can approach the town without a warning. Since polar bears are roaming around freely in the archipelago, it is not unusual that the bears come close to the settlements, they have also been seen walking in the main streets of Longyearbyen (Ylvisåker, 2020). From my observations, the core of Longyearbyen is the center of the town; most events and services are facilitated on a relatively small surface area, and the residential areas are scattered around the services and shops.

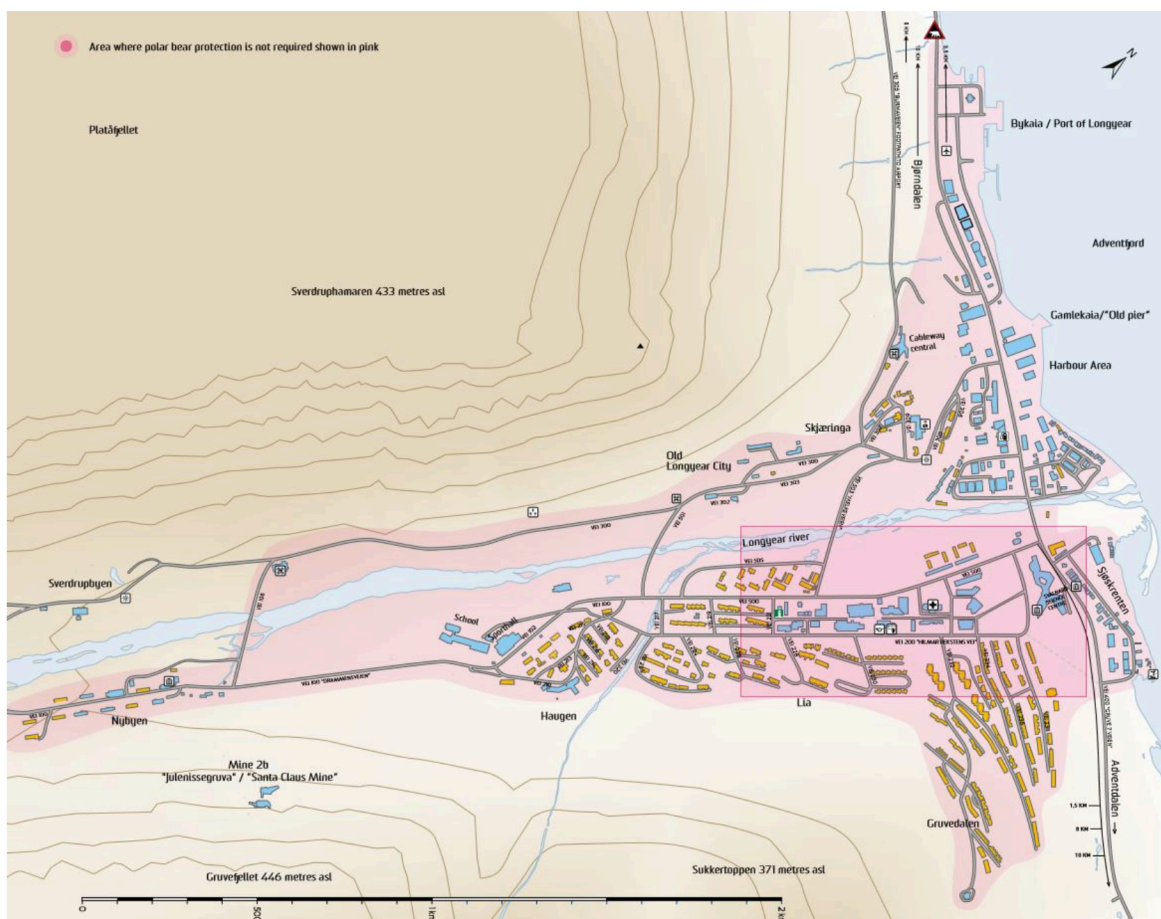


Figure 1. Map of Longyearbyen. Safety zone marked in pink. Retrieved from Visit Svalbard.



Figure 2. The elusive border between the urban and the wilderness. Photograph by Laura Nurmi

The geographical features and limited amount of suitable places for developing infrastructure set a challenge for future planning. The long time objective for development is to maintain the character of the community, with its width and variety, in order to make life in Longyearbyen attractive and thus ensure the presence of Norwegian communities in the archipelago (Norwegian Ministry of Justice and Public Security, 2016). However, the Government avoids making rapid and large-scale investments in new infrastructure, since establishing and maintaining infrastructure in the high Arctic has huge expenses, and the Longyearbyen Community Council, Lokalstyre, already struggles with the current level of maintenance costs. The energy provision sector has received significant investments to stabilise the production of heat and electricity. A well-functioning infrastructure is in a key position in creating value, security and a sufficient level of managing environmental risks while also contributing in job creation and activating economic development (Norwegian Ministry of Justice and Public Security, 2016). The Government stresses the importance of developing the town of Longyearbyen in a step-by-step manner; assessing reorganisation of the Store Noske Spitsbergen Kulkompani (SNSK) from mining-related activities to other sectors such as tourism, while considering what other additional development is necessary in order to maintain the infrastructure capacity (Norwegian Ministry of Justice and Public Security, 2016). Longyearbyen is not designed to serve the needs of a cradle-to-grave community, which means that people with reduced capability of taking care of themselves will be sent

back to the mainland, since there are no required resources to provide more extensive treatment in Longyearbyen. These policies naturally affect the structure of the population, and young adults present the majority in Longyearbyen (Norwegian Ministry of Justice and Public Security, 2016).

The turnover of the population is significant, with the average residence time being around 6 years (Hovelsrud et al., 2020). Despite the turnover of the population, the residents form a tight group which share a strong sense of place identity (Ylvisåker, 2020). The archipelago is characterised by extreme weather conditions, remote location, hostile mountains and a long dark season contrasted with midnight sun in the summer. However, the air temperature is rising significantly faster in Svalbard compared to the rest of the world, permafrost is thawing, precipitation levels are increasing and sea ice is disappearing (NCCS, 2019). After a fatal avalanche in Lia in 2015 when two persons lost their lives and another major avalanche in 2017, the community's sense of security was shaken, and the community had to gather their strength in order to prevent similar future events (Ylvisåker, 2020). The avalanche of 2015 directed the focus of the community; the goal was to increase the capacity to endure shocks and developing new security measures. After the avalanche, climate-related land development was speeded up, while clearing out space for residential purposes in the town centre. These organised actions have a beneficial effect on the community while boosting economic growth. (Norwegian Ministry of Justice and Public Security, 2016). The growth of the community is not an essential priority, but maintaining the level of attractiveness and supporting the Norwegian communities in Svalbard remain as central objectives, which calls for some expansion and development in certain areas (Norwegian Ministry of Justice and Public Security, 2016). For Longyearbyen to maintain its attractiveness, the residents should have access to a range of premium cultural activities like the rest of Norway (Norwegian Ministry of Justice and Public Security, 2016). This resonates with the Norwegian cultural policy; the culture has both inherent value and value to individual community members. The environment and climate set a certain amount of restrictions for the residents to act and express themselves in a desirable way, which emphasises the importance of providing a variety of cultural services in improving the quality of life in Svalbard (Norwegian Ministry of Justice and Public Security, 2016).

1.3 GOVERNANCE IN SVALBARD

In 1916, the state-owned Store Norske Spitsbergen Kulkompani AS (SNSK) bought properties and facilities in Svalbard from the Arctic Coal Company. Longyearbyen has been known as ‘company town’, mainly focusing on coal mining. After the 1980s the town gained more residents, shifted towards a family community from a male-dominant mining settlement, and started welcoming other activities, such as tourism (Norwegian Ministry of Justice and Public Security, 2016). In 1920, the Svalbard Treaty was signed in Paris. The Svalbard Treaty recognizes Norway’s sovereignty in Svalbard, regulates the demilitarisation of the area, and guarantees equal rights for commercial practices for the treaty members (Spitsbergen-Svalbard.com, 2020). According to Svalbard Act, the law of Norway which governs the majority of actions in Svalbard, Lokalstyre can only take part in activities of general interest in Longyearbyen and not addressed by the state of Norway, while following the guidelines from the Norwegian Svalbard policy (Norwegian Ministry of Justice and Public Security, 2016). Longyearbyen Lokalstyre contributes to building a sustainable and responsible community, which takes the local’s needs and wishes into consideration and promotes participatory design. While Lokalstyre receives guidelines from the Ministry and other authorities, the council has responsibility for certain areas within the land use planning area in Longyearbyen. Lokalstyre also presents a more up-to-date local level of authority. One of the council’s main tasks is energy supply, which is also one of the most expensive ones. Currently, a major expenditure is the maintenance and renovation of the power plant, which runs of coal from Mine 7 (Norwegian Ministry of Justice and Public Security, 2016).

The management and administration in Svalbard have changed from the overriding control of the authorities towards a more decentralized approach since the scope and diversity of economic activities in Longyearbyen have increased - which calls for more tailor-made solutions. Svalbard has never had a fully self-sustaining economy, which is why the archipelago is dependent on the government’s support and state funding for developing a viable community and delivering public services (Kaltenborn et al., 2020). The increasing amount of activities in Svalbard further complicates the coordination of Svalbard affairs, which also means that the government has to discuss new laws and regulations. The Governor of Svalbard is the government’s highest-ranking representative in the archipelago, taking care Additionally, the Governor participates in developing the Svalbard policy and takes care of

planning activities that do not fall under the responsibilities of Lokaltstyre. (Norwegian Ministry of Justice and Public Security, 2016).

1.4 CLIMATE RESILIENCE

The thesis focuses on climate resilience and the assessment of resilience-related approaches on different scales, such as the global and local scopes. The reason for choosing climate resilience as the carrying theme for the thesis is that I have a personal interest in understanding how urban settlements around the world can learn to cope with climate change. From my viewpoint, the term climate resilience is well-suited to address not only the challenges brought by climate change but to understand how the physical and social structures can survive and even thrive in altering conditions. In the theory chapter, ‘climate resilience’ is defined more accurately in order to give the reader a better understanding of the theme of the thesis. Since the study is based on examining climate resilience in the town of Longyearbyen, I find it important to define climate resilience in an Arctic context in this case. For the purpose of this thesis, climate resilience is presented as a concept that refers to the ability to foresee, prepare for, and respond to threatening events or disturbances related to climate (Folke, 2006). Resilience means that the social-ecological structures have the capacity to face the coming impacts, absorb the shocks, and eventually bounce back, in order to create a transformative approach to coping with the climate crisis. The word ‘sustainability’ is closely linked to climate resilience and is used in parallel to resilience since it also implies how a system is able to sustain its ability to function in the present, without damaging the future possibilities (Grant, 2020). However, since resilience looks at a longer time period in a system’s life cycle and evolvment, the main emphasis remains on looking at climate resilience in Longyearbyen.

1.5 PERFORMING THE STUDY

I knew from early on that I wanted to focus on looking at the impact of climate change in the Arctic. Initially, my plan was to do a comparative study between climate adaptation in the Finnish Lapland and adaptation measures in Svalbard, but since Svalbard has a lot of unique features, like it’s geopolitical position and the rural-urban connection, I wanted to examine the town of Longyearbyen more profoundly. I spend time in Longyearbyen talking with the residents and exploring the surroundings, so it felt reasonable to look at Svalbard in detail as a

case study, in the context of climate change. After going through the thought process (figure 3) from focusing on climate change and the Arctic, I decided not to make a comparative study after all, and I landed on the conclusion that I wanted to study the unique and remote community in Longyearbyen. I looked into reports and articles from Svalbard and noticed that climate change was a reoccurring theme in the reports so I decided to dig deeper in climate resilience planning and how it is carried out in Longyearbyen. I have studied theories about adaptive planning and climate resilience extensively. I also read a book by Line Ylvisåker about living with climate changes in Svalbard and conducted interviews with locals to gain a better understanding of the complexity of resilience planning in Longyearbyen. The research articles and official reports I read, have been analyzed with the help of content analysis and interpreted through a theoretical lens. The analysis of the empirical material is divided into three sectors inspired by Campbell’s model of the planner’s triangle, which enabled me to construct a coherent analysis and provide different viewpoints of how resilience is built across the three sectors in Longyearbyen.

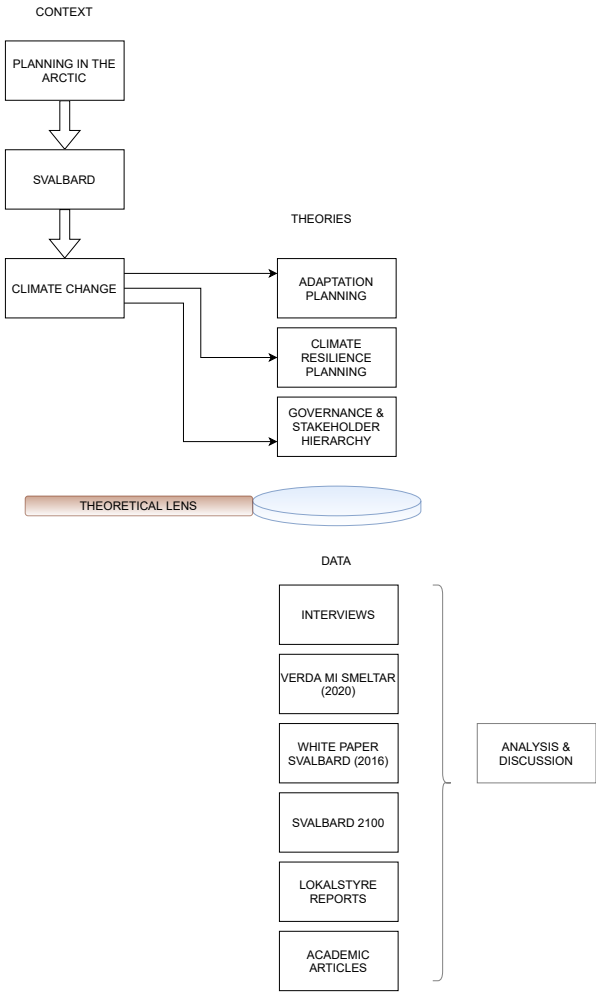


Figure 3. Diagram of my study process. Own illustration.

2. THEORETICAL OVERVIEW

The theoretical overview gives insight into literature about climate resilience planning, governance of adaptive planning and explains more of the background of how adaptive responses and resilience can be understood and worked with. Also, conflicts and obstacles in the adaptive planning sector are discussed in the chapter. The theoretical overview provides analytical tools and a lens for the analysis in the thesis.

2.1 IMPACT OF CLIMATE CHANGE ON ARCTIC COMMUNITIES

The remote location in the high North introduces a set of challenges not only in Svalbard but across different settlements in the Arctic region. The settlements in the Arctic have evolved their own identities, but they share common features such as facing similar environmental challenges and sharing interests over national borders (Schweitzer et al. 2015, as cited in Kenny, 2017. p. 134). There are also several groups of indigenous people spread across the region, most of which practice hunting, while pursuing a nomadic lifestyle. The Arctic indigenous people cover 10% of the Arctic population (Arctic Council, n.d.) and they are involved in a variety of economical adaptations, ranging from modern occupations in the real and urban communities, to traditional and semi-traditional pastoralism (Crump et al., 2016; Little, 2015). The flexible lifestyle provides a tool for the indigenous people to adapt to the changing environment. For instance, Inuit have been able to establish self-sustaining communities through acquired knowledge of nature and available food sources, while constantly adapting to the climate conditions (Pearce et al., 2012, as cited in Kenny, 2017. p. 134). Kenny (2017) explains that the impact of modern development and establishing land use plans have been destructive to the flexible lifestyle of the indigenous communities, for example in Canada's Northwestern Territories. Since climate change is changing our environment and urban settlements around the world, Kenny (2017) argues that there is a growing need for adaptive planning to keep on building more resilient physical and social structures in Arctic cities. Kenny (2017) explains that the Arctic regions are likely to become more urbanized due to climate change, growing industrial actions, and increasing accessibility.

Climate change can have a very different impact depending on the geographical context and the scale of the disturbance. On a macro level, climate change can be observed, for instance, as a general rise in temperature and sea-level rising, while on a more local scale climate change can cause drought or wind disturbance due to specific spatial circumstances. According to the Climate in Svalbard 2100 report from the Norwegian Centre for Climate Service (NCCS) in 2019, several climate change aspects will affect the archipelago in the next few decades. The report identifies some threats on medium to high scale emission rates as following:

- Increased annual temperature by 7 degrees on average in the medium scenario and 10 degrees in the worst-case scenario
- Increase in the annual precipitation by 45% in the medium scenario and 65% in the worst-case scenario
- Increased river flow, which is affected by the precipitation and the meltwaters from glaciers
- The snow season becomes shorter
- Increased erosion and sediment transport
- Thawing permafrost, especially on lower altitudes and close to the coastal line, in case of the high emission scenario
- Glacier area is reducing and the net mass is decreasing, which alters the landscape and accelerates the sea level rising
- Sea ice concentration in the Northern Barents Sea are is significantly reduced

Some of the changes have irreversible negative effects, but simultaneously some of Arctic flora and fauna can also benefit from the effects, hence two sides of the same phenomenon can be observed. Ramboll's report (2013) about *Sustainable Society Development in Arctic Cities* explains that global trends such as scarcity of natural resources, demographic transformations, urbanization, and environmental changes can provide new opportunities for the Arctic region. Extracting new natural resources provide a source of income, opening more trade routes ensures better accessibility to the remote regions while growing geo-strategical interest turns the global attention to the high North (Ramboll, 2017. p. 4).

2.1 RESILIENCE IN SPATIAL PLANNING

Resilience has become a more trendy topic in spatial planning, first taking a role as a complement for, and later replacing the buzzword ‘sustainability’ more frequently in discussions. However, the two terms are not synonyms but yet they are inevitably intertwined: both focus on socio-ecological system properties and trust in transparent processes in addressing, for instance, climate change (O’Hare et al., 2013). According to Davoudi (2012) several theorists have questioned the meaning of resilience in planning: is it just another empty box that can be filled with anything fitting one’s needs, or could it become a useful approach? According to Campbell (1996), the current vision of sustainability is vague and romanticized; the concept of sustainability builds on pre-industrial and indigenous cultures, which are inspiring visions but have limited applications in modern society. Sustainability can still become a useful principle in planning if the concept is redefined and integrated into a wider framework of political conflicts in modern society (Campbell, 1996).

Resilience can be defined in several ways, depending on the context the term is used in. *Engineering resilience* refers to a system's ability to bounce back to a steady-state after a disturbance (Holling, 1996). *Ecological resilience* considers the variable characters of ecological systems while taking into account that the systems face different challenges and have divergent stable states. A definition for ecological resilience can be seen as the amount of disturbance the system can endure before changing its structure (Holling, 1996, p. 33). *Evolutionary resilience* can also be linked to socio-ecological, transformational, or adaptive resilience. Resilience from an evolutionary perspective means the ability of the system to recover, adapt and transform when facing challenges. The concept also covers the core quality of a system: changes can occur and a system may evolve even without external disturbances (Scheffer, 2009). While the system keeps on changing due to inner or outer circumstances, the actual cause of a disturbance in the system is not as important as how the system will react at the end (Rega et al., 2020). Also, Duit et al. (2010) argue that the way a system has previously behaved does not give valid information about how the system will behave in the future, even under homogenous circumstances. In the case of Longyearbyen, the system refers to the community and the different sectors revolving around it; the economical, environmental, and social equity areas. Hence, when the system experiences an external shock, the consequences are difficult to foresee, when the networks between the sectors are

impacted in different ways. Since the sectors are interconnected, a shock experienced by the environmental sector also spreads out to the social and economical functions of the community.

In climate-related events, the link between the event and the system is evident, since climate change is directly connected to greenhouse gas emissions, pollution, and other factors which are a straight cause of the cities being in function. When the town of Longyearbyen is functioning, the coal power plant producing energy and lack of proper waste management cause a direct impact, especially on the environmental sector. Simultaneously, the social sector is influenced when people are concerned about the pollution, experience potential physical effects of the pollution and experience reduced attractiveness of their living space. The economical sector can benefit from a functioning town if profit is generated, or suffer if the costs of maintaining the functions are too high. A straight causal relation can be observed between the 'normal' functions of a system and external shocks directed to the system. Thus climate-related disasters can not be seen only as of the result of having a weak point in the system: the core reason why a system is experiencing an external shock is rooted in previous planning choices, such as establishing urban settlements in flood-prone areas or developing low-density urban areas which increase soil sealing (Rega et al., 2020). For instance, in Longyearbyen the lack of adequate avalanche prevention caused by insufficient planning measures lead to the external shock of a severe avalanche in 2015 (see chapter 1.2).

Spatial and temporal scales of actions might also cause tension between resilience and sustainability. The two concepts have different ways of approaching both the timeline of planning actions and also the spatial scale of the planned measures. Resilience thinking tends to highlight the 'local' aspects in the action phase while emphasizing local knowledge and entrepreneurship. The 'local approach' has been criticized for weakening the position of public planning and adding fragmentation in planning systems since the local authorities are acting uncoordinatedly (Lord et al., 2018). Another difference between sustainability and resilience is that sustainability tends to focus on long-term responses, while resilience thinking puts more effort into short-term solutions. Resilience can also be seen as a form of elasticity. Also, resilience ought not to be confused with resistance, since the latter implies a system's ability to remain unchangeable when it experiences a disturbance. Hence, a system

can have resistance without being resilient. After several resilience studies and careful analysis, Rega et al. (2020) conclude that some of the main challenges in including resilience thinking in planning actions is the inadequate level of addressing inequalities and justice while also disregarding the ecological limitations to human development. Rega et al.(2020) explain that instead of using resilience as a descriptive concept, resilience thinking can be adopted to the broader frame of planning which suggests a retreat from normative planning to a more technical process with the focus on the process rather than the results.

Evolutionary resilience, which contains resilience in spatial planning, can be associated with recurrent concepts such as “the capacity of communities to learn by doing and self-organize, and the importance of stakeholders’ involvement, public participation and capacity building” (Rega et al., 2020. p.6). The usage of resilience-based approaches spreads across disciplinary boundaries, contributing to trans-disciplinary research methodology and building a platform for research policies and practices. In climate adaptation studies and policies, building resilience can act as a bridging concept, opening up a discourse between researchers and other stakeholders (Davoudi, 2012).

2.2 ADAPTIVE PLANNING AND GOVERNANCE

According to Driessen et al. (2011), the complexity of climate change, the unpredictability of the outcomes, and the controversial tone of the climate debate set certain requirements for adapting spatial planning to the climate crisis. Despite fact that climate mitigation is central in responding to climate change, mitigation processes alone are not enough. The society also has to adapt to the potential impact and unexpected events caused by climate change when we can no longer prevent the changes. When the weather conditions are changing, the spatial structures of the society need to be considered: the environmental risks are growing, and the ways we have been using our environment are no longer possible or desirable (van Buuren et al. 2013).

Since the word ‘adaptation’ comes with a multitude of different definitions, a commonly used definition from IPCC’s describes adaptation as following: “the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2007 as cited in Driessen et al., 2011 p. 3). Hence adaptation seeks to minimize potential damage, cope with the consequences

of disturbances and take advantage of possibilities. Since the changes in the environment and weather can be extensive, such as stronger winds, increased precipitation, sea-level rise, and ice-free winters, spatial planning needs some significant adaptation strategies. van Buuren et al. (2013) are doubting whether the current methods of doing spatial planning in design, decision-making, and implementation, allow or promote climate adaptation. To map out the set of demands climate adaptation is asking from spatial planning, the characteristics and the consequences of climate change should be analyzed. The characteristics of climate change include uncertainty, a level of disagreement in the planned actions, and the complex nature of the climate change impacts. These characteristic factors affect at least three main pillars of spatial planning: the institutional structure of planning, the governance of processes including the position of public-private initiatives, as well as the financial instruments balancing costs and benefits (Willows et al., 2003).

The governance of adaptation is seriously challenged by the level of uncertainty concerning the consequences of climate change (Giddens, 2009). It is utterly challenging to take into account the whole scale of changes followed by the climate crisis, which further complicates decision-making in climate adaptation processes. The contingent nature of climate change calls for additional safety measures, building more margins as well as a change for readjustment under changing conditions. The debate about the level of severity and the actual outcomes of climate change further complicates the processes of realigning consensus in climate adaptation measures. Even if there was a higher level of certainty about the impacts of climate change, value-based conflicts and differences in interpretation would persist (van Buuren et al., 2013).

Because of the unpredictable nature of climate change, many theories highlight the role of adaptive spatial planning, especially in terms of experimenting and doing simulations to define the most valuable and effective actions (Folke et al., 2005; Giddens, 2009). To maintain a level of flexibility in adaptation planning, the approach should be safe but robust enough. Ensuring legal certainty and a clear distribution of duties across private and public partners are vital in assuring legitimate climate adaptation policies. Spatial planning involves co-creative processes from public regulation and private investment solutions, which is why it is necessary to formulate criteria and mechanisms how responsibilities and allocation of costs

and benefits would be distributed between the private and public sectors (van Buuren et al., 2013). Also, if the legal principles are too detailed, the adaptive initiatives get frustrated and creative processes are suffering. A suggestion to improve the governance and make legal processes more flexible is to establish guidelines that guarantee a minimum level of protection for the most fundamental needs of society and supports legitimate adaptive planning (Driessen et al.,2011).

van Buuren et al. (2013) question whether climate adaptation falls under the responsibility of the government and if it does, how central is the role of the government? The authors clarify that a supportive role for the government is formed by individual citizens since the individuals have the responsibility for the most part in adaptive behavior. The government is mostly responsible for setting guidelines, following the rule of law, and ensuring a democratic society that respects individuals' rights. The level of protection offered by the government should be carefully defined so that individuals know where they have to step in and take responsibility themselves. A minimum level of protection and ensuring public participation are needed from the government to secure the basic needs of individuals and a sufficient level of environmental protection. However, establishing general principles should start with defining legal meaning so that the principles can act as a replacement of strict technical and detailed requirements, which do not allow creative solutions and flexible actions under changing circumstances (van Buuren et al.,2013).

The actions by the government should balance between being sufficient and not being too extensive when it comes to climate change adaptation. The strategies for climate change adaptation are based on dealing with uncertainties. From the viewpoint of the *precautionary principle*, actions will be taken only when it is certain that no harm will be caused (Commission of the European Communities, 2000; Sadeleer, 2007). From a more adaptive perspective, if some damage was to happen, it should be clear which stakeholders take the responsibility for the actions. There should be space for individual actions so that the strict governmental policies do not imply that the individual undertaking the action would be fully responsible for the outcomes, but rather sharing the responsibility. van Buuren et al.(2013) explain that two demands should be fulfilled to implement climate adaptation in spatial planning practices on a concrete level:

1. decisions regarding spatial planning actions should be in line with the assumed demands set by climate change
2. Decision-making concerning adaptation measures should be flexible enough to link them to other plans and ambitions

In short, the actual measures regarding the governance of adaptation should be sufficiently robust to react determinately, but simultaneously maintain a level of flexibility for suitable interventions and creative innovations (van Buuren et al., 2013). The planners should also be mindful that attempts to increase the stability of a system ultimately expose the system to unexpected changes and increases the system's vulnerability. Hence, the objective should be to understand the dynamics of a system as a whole, and not to search for detailed information about the system (Folke et al., 2002, p.445).

A growing number of regional and local governments are turning into participatory planning processes to increase the potential of finding new measures to cope with climate change, and climate adaptation measures are used more extensively also in the Arctic context (Canosa et al., 2020; van Buuren et al., 2013). While more equal, participatory approaches are already integrated with the planning systems, there is an increasing need to renew the top-down governing models in social-ecological systems: to make adjustments in the current governance regimes dealing with uncertainty and change, it is necessary to alter the way people currently relate to social-ecological systems (Olsson et al., 2006). While the general legal principles are based on socially accepted values, adaptive governance often avoids highly specified legalism, leaning more towards informal policy-making strategies, and finally getting the legal arrangements back as a boomerang (van Buuren et al., 2013).

The planned adaptation measures should be aligned to other development strategies to address the coming challenges more effectively. To respond to the complexity of climate change, open dialogue and flexibility are needed to build consensus between the stakeholders involved in the adaptation processes. Building the fundamentals for adaptation governance requires flexible and inclusive collaboration between public, private, and societal sectors (van Buuren et al., 2013). Climate change affects a wide range of actors, and even though most adaptive responses are guided by the government, in some cases private initiatives can be more beneficial - such sectors might be for instance tourism, which will experience a change in the

length of seasons, number of visitors and quality of activities. In climate change measures which concern the safety of the public, such as floods, avalanches, and mudslides, the government has a bigger responsibility to support adequate decision-making and guard the execution of development plans (van Buuren et al., 2013).

Olsson et al. (2006) describe an example of how social-ecological transformation can be achieved by linking together several stakeholders and creating a platform for conflict management and knowledge sharing. An example of managing transformation through a social network is Kristianstads Vattenrike, where the intention was to collectively find inspiration for landscape-level solutions. Individuals from local groups, such as farmers' associations and environmental organizations, gathered together with other organizational actors, such as representatives of the municipality and a national research council. By gathering the expertise of all the participants, the network was able to connect multiple sources of knowledge while also contributing to trust-building and sense-making. Through the process of bringing several representatives together for discussions, the level of common knowledge was increased and practices for ecosystem management were developed (Olsson et al., 2006).

Olsson et al. (2006) shed light on the role of leadership in creating transformation in social-ecological systems. The authors tell about an example where a key individual acknowledged that the problems concerning the development of Kristianstads Vattenrike were interrelated. The individual started gathering stakeholders who already worked with the development project, to increase the common knowledge, to find integrated solutions, and to match the magnitude of the issues. The groups of stakeholders consisted of people working on different organizational levels and representing a wide range of interests. The key individual directed the process of establishing a common knowledge platform by creating a clear framework and a vision for ecosystem management in the area. The individual was able to activate the local media to support his idea for a new management approach in developing Kristianstads Vattenrike. With broad support in the background, the individual was able to connect key actors, develop a vision and motivate others to participate in creating an alternative approach for solving a multitude of problems. It is not excluded that these types of active individuals could be found in Longyearbyen. This type of approach could initiate changes in a shorter

timeframe if an individual can activate other community members and get more momentum for the proposal. The power of an individual should thus not be underestimated, since leaders and initiative takers can also be found amongst the non-organized community members.

In addition to a leader's role in preparing the system for transformational processes, the leaders can also further assist the system to move through the transitional phase which requires a *window of opportunity* (Kingdon, 1995). When initiating policy changes, timing plays a key role, since changes are most likely to happen when problems, solutions, and politics come together simultaneously (Kingdon, 1995). Sudden changes, as well as ecological crises, might offer windows of opportunity which spark the emergence of networks and promote new governance structures (Folke et al., 2005). The avalanche of 2015 activated the whole community, where the non-organized members got a significant role in arranging rescue measures, thus the neighborhood networks got a key role during the event. Another unexpected change occurred during the Covid-19 pandemic when some of the cornerstones of the Longyearbyen community, such as research and tourism were seriously hindered by the new restrictions and protocols which decreased global mobility significantly. The community had to cope with the changes, accept external help and adapt to a new situation. The pandemic caused new tensions between the economical, environmental and social equity sectors when the sectors experienced unequal treatment when receiving support from the government (see chapter 4.2.4). The transition from a familiar situation to an adaptive approach requires skillful navigation. To navigate the transition, a certain level of preparation, flexibility, and improvisation ability are required so that the plans can fit into changing conditions and keep evolving further (Olsson et al., 2006). Through the transition phase, new social structures might emerge, which link individuals, agencies, and institutions at several organizational levels, allowing adaptive governance to take space. A central element in developing transformation lies in the dynamics of cross-scale interactions (Olsson et al., 2006).

2.3 PLANNING AND CONFLICTS

Scott Campbell's theory of the *planner's triangle* was introduced in his work *Green Cities, Growing Cities, Just Cities? Urban Planning and the Contradictions of Sustainable Development* (1996). With sustainability remaining in the center, the theory is based on the

inevitable conflicts between the three corners of the triangle; environmental protection, economic development, and social equity (figure 4). Campbell (1996) explains that the conflicts are partially caused by a language barrier between the three sectors, but translating information across the three corners is not alone enough to erase the misunderstandings and disagreements. Within the conflicts, Campbell (1996) identifies the classic confrontation “man versus nature” and the modern version “jobs versus the environment”. When extensive disagreements and misunderstandings occur in the conversations between actors groups, the capacity building for ecosystem management is decreased significantly. In a social-ecological context, conflicts might emerge between groups like environmentalists together with “silent sport” users (biking, hiking, kayaking, etc.) and advocates for activities including motorized vehicles. The arising conflicts might cause polarisation between the groups so that the stakeholders are unable to agree on what actions should be taken. When the groups risk becoming polarised, it is important to focus on finding common ground and identify mutual interest points between the stakeholders (Olsson et al., 2006). In order to create stronger commitments to achieve the mutual goals, the sustainability ambitions can be linked to the stakeholders’ own interests. The governance of climate adaptation and sustainability asks for actions and collaboration across various authorities since climate change does not care about the boundaries between administrative responsibilities (van Buuren et al., 2013).

The triangle model is used for questioning sustainable development, and whether it is a useful concept in guiding the planning practices. The triangle showcases both the conflicts between the corners, but also potential common interests. In order to create a better flow of communication and solve some of the conflicts, Campbell (1996) suggests that planners should have a role as a mediator, who translates and offer a platform for the stakeholders to share and exchange information. In the search for common interests between the three corners, the planners can be especially creative and also have a chance to create unity between the disagreeing stakeholders.

The conflicts between the three corners are following:

1. *The property conflict*: Campbell (1996) explains that the conflict is based on competing claims and usage of property, such as management vs labor, landlords vs tenants, gentrifying professionals vs long-time residents. This conflict is especially complex due to the fact that both sides are against each other, but one side can not survive without the other. Hence the private sector both needs and resists social intervention.
2. *The resource conflict*: The conflict between the social and natural resources; businesses protest against the restrictions to exploit the natural resources, but simultaneously they need regulations in order to preserve the resources for current and future demands. This conflict offers a definition for the “city limits” - the boundary between a developed city and undeveloped wilderness (Campbell, 1996).
3. *The development conflict*: The most elusive conflict, which stands in between the two above-named conflicts. When the property conflict describes the collision between the economy’s ambivalent interest in collaboration with working people, and the resource conflict is based on the economy’s ambivalent interest in creating a sustainable framework for the natural environment - the problem in development conflict is in doing both simultaneously. The core question here is how to create social equity and care for the environment simultaneously, no matter what the economical state happens to be. Campbell wonders how those at the bottom of society can get access to greater economic opportunities if the environmental restrictions hinder economic growth. Globally, environmental protection might slow down economic growth and increase inequality between rich and poor nations. On a local scale, the development conflict impacts the resource-dependent communities that are at the bottom of the hierarchical ladder. Campbell (1996) concludes that economic segregation leads to environmental segregation; the former when the resources are turned into consumer products, and the latter when the spoils of production are placed back in nature.

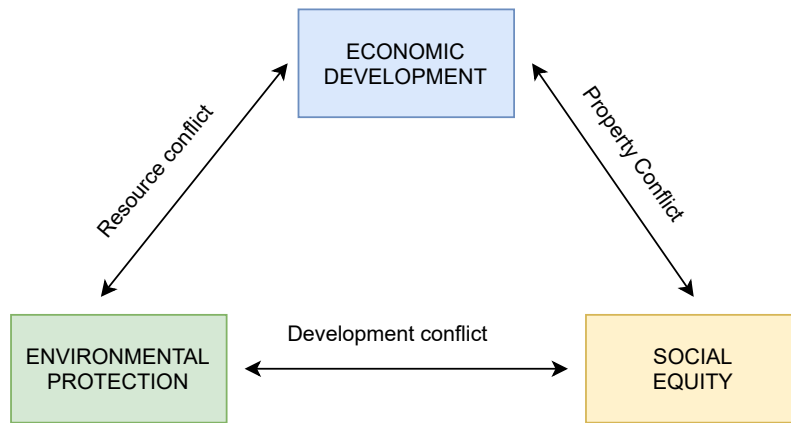


Figure 4. The planner's triangle. Own illustration, based on Scott Campbell's (1996) vision.

The planner's triangle organizes the main conflicts between the societal sectors in a comprehensive way. While the other theories are also involved in the analysis chapter, later on, the triangular model is emphasized since it offers a way of viewing both the conflicts and the sectors separately, and also as a complete unit seeking resilience. While the other theoretical approaches in the chapter look at more abstract concepts, the planner's triangle gives a tangible approach to how a system can be perceived from different angles. In order to explore the level of resilience in Longyearbyen and to answer my research questions about the extensiveness and adequacy of the current plans, I have decided to look at how resilience occurs in the three main sectors; social, environmental, and economic. This division helps me to gain a better understanding of how the community of Longyearbyen as a whole is experiencing climate change. Since climate resilience is an abstract and multi-dimensional concept, it becomes more tangible when discussed through the three pillars upon which the understanding of sustainability builds. Another reason for making this division is that conflicts between the three sectors are inevitable, so grounding my analysis in Campbell's triangle (1996) and backing up the discussion with other theories help me to give a comprehensive picture of how climate resilience and adaptive planning are constructed in Svalbard. The three sectors together form a basis for sustainability, which can be seen as a parallel concept to resilience. The difference is that sustainability looks at how the system can function in the present without ruining future possibilities (Grant, 2020), while resilience is more concerned with the system's evolution in the past, present, and future, thus covering a longer period of time. Even though Campbell's model originally focuses on interest conflicts

in the field of sustainability, my intention is to modify the model and make it applicable in the context of climate resilience. Building my analysis to this triangular framework and applying it to my data interpretation help to maintain a red thread in the storytelling line of the thesis.

2.4 KEY TERMS

Some of the central terms used in the thesis can have different meanings depending on the context. This section defines these terms and provides a tool for the reader to understand how they are used in the context of my thesis.

ADAPTATION: The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploit beneficial opportunities (IPCC, 2007 as cited in van Buuren et al. 2013 p. 30)

COMMUNITY: In this thesis, the community consists of residents of Longyearbyen who are not a part of organized groups. The community can be seen as a social unit in which the members share a sense of place, which in this case is the town of Longyearbyen. The compact size of the town, small number of residents, and the remote location all give the community unique characteristics. Authorities, such as the Governor of Svalbard and other members of the local government as well as organized groups of actors, such as Lokalstyre, are in close interaction with the community and they are strongly linked to the decisions regarding the community. However, in this context, the community consists of ‘ordinary citizens’ who look at the resilience planning process from the outside, despite the fact that they can participate in the discussions about the direction of the development.

ECONOMIC DEVELOPMENT CORNER: This corner includes stakeholders who have an interest in developing and extracting resources in the area of Svalbard. The Svalbard Treaty members have a right to claim resources in the area, and there are several state-owned companies operating in the archipelago, one of the biggest ones being Store Norske Spitsbergen Kulkompani (SNSK). There is also commercial interest in the archipelago, mainly in the form of fishing and mining. New infrastructure is also being built in Longyearbyen, and the Norwegian government has a strong desire to develop an attractive living space especially for Norwegian citizens. Also, investors and businesses who have an economic interest in Svalbard represent this corner.

ENVIRONMENTAL PROTECTION CORNER: In the planner's triangle model, the environmental protection corner covers groups, individuals, and organizations who work for the benefit of the environment. The corner consists of both active individuals, but also organized groups and authorities, such as Lokalstyre, the Governor of Svalbard, the Norwegian government, the members of the Svalbard Treaty. Also, the tourism sector tries to become more environmentally friendly, and researchers are looking for new solutions to preserve the nature of the archipelago. There is also Svalbard Environmental Protection Fund, which acts as an economical instrument to protect the environment. The actual nature and all living things in the archipelago also fall into this corner, since they are the ones whom the human representatives are acting for.

RESILIENCE: The system's ability to foresee, prepare for, and recover from a shock or disturbance. In this thesis, the system refers to the social-ecological systems in Svalbard.

SOCIAL EQUITY CORNER: This corner consists of the residents in Longyearbyen, but also policymakers such as the Governor of Svalbard, Lokalstyre, and the Norwegian government have a role in the corner. The authorities and organized community members monitor the well-being of the citizens and strive for creating platforms where the locals can be heard. Also, laws and regulations ensure equal treatment, and they are put into practice through the authorities. The corner takes the social perspective when addressing conflicts in the usage of the property and the right to extract resources.

SPATIAL PLANNING: Methods and strategies utilized by governmental agencies, with possible cooperation with private stakeholders, to direct the distribution of activities in spaces in different sectors.

STAKEHOLDERS: Becoming a stakeholder means having a certain position in the planning process, to take part in decision-making in a particular context (see figure 5). An actor becomes a stakeholder when a relationship is established between at least two actors, so that information can be communicated between the two. Stakeholders thus exist for solving a planning issue, but actors continue to exist as individuals even though they would be liberated from their responsibilities as a stakeholder. Stakeholders can be representatives of one or more corners in the triangular model. Individuals, who participate in the process of creating

climate resilience in Longyearbyen are considered as stakeholders in this case, and they collectively represent mostly the social equity corner. The governmental representatives such as the Governor of Svalbard and organized groups like Lokalstyre cover all the three corners of the model, and their role is to facilitate discussions between the corners and see that protocols are followed in the planning processes. Investors, Store Norske, the Norwegian government, and all other actors who play a role in the decision-making processes of how to develop infrastructure and finance actions in Longyearbyen represent the economical corner. All creatures living in Svalbard and experiencing the changing climate represent the environmental sector. Environmental protection is facilitated by organizations and initiatives such as the Svalbard Environmental Protection Act, Svalbard Environmental Law, Greenpeace, and individuals promoting the well-being of the local flora and fauna. The decision-makers on the mainland, the members of the Svalbard Treaty, and organizations such as the EU have their role in developing policies concerning Svalbard, and they can be involved in all three sectors (see figure 4).

SUSTAINABILITY: In this case, sustainability is divided into three different sectors; economic, social and environmental. Sustainability focuses on building the capacity of existing systems and meeting the requirements of present development, while avoiding to compromise future development and hindering the next generations’ aspirations to fulfil their needs.

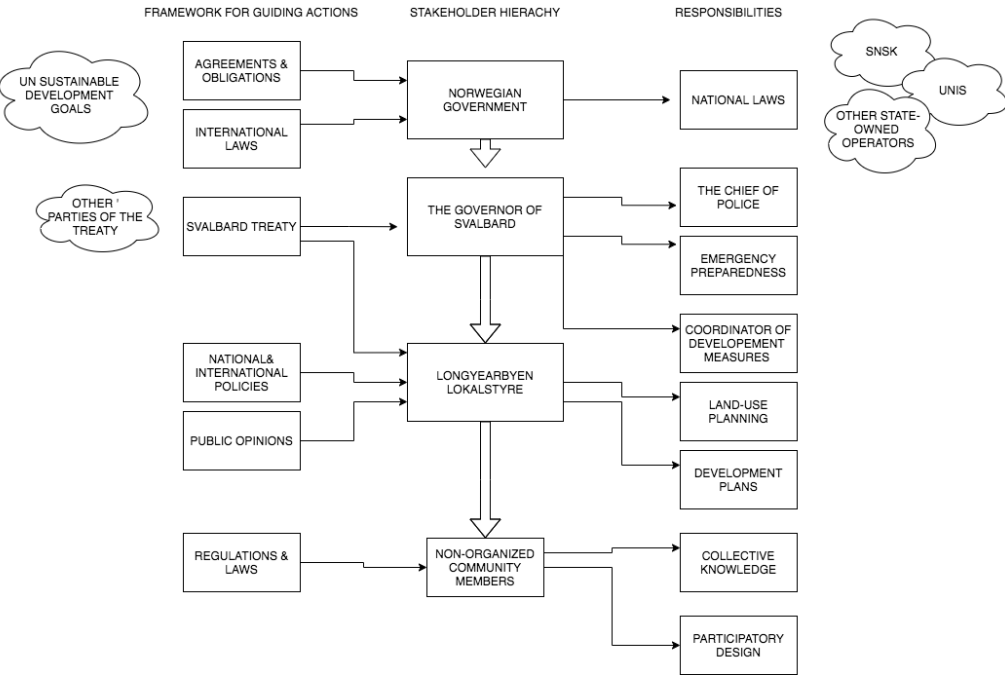


Figure 5. A diagram of stakeholders in Svalbard. Own illustration.

3. METHODOLOGY, DESIGN & METHODS

This chapter explains more in detail which methodology and methods have guided this thesis. The purpose of the chapter is to tell more about the chosen methodology, why qualitative research is suitable for the purposes of the study, how the data has been collected and how the study has been carried out.

3.1 RESEARCH DESIGN

This thesis focuses on case study research, where the main sources of information are interviews with stakeholders representing both organized and non-organized members of the community. I have conducted semi-structured interviews in order to gain more detailed and in-depth information about climate resilience in Longyearbyen. Secondary data sources consist of reports from the Norwegian government and the Governor of Svalbard, Lokalstyre, and environmental experts. With the help of theories about climate resilience and adaptation planning, the study aims to shed light on the current climate resilience policies, the stakeholder structures behind decision-making processes and identify possible places for improvement in planning for climate resilience. After collecting all the necessary information, the study focuses on discussing the current planning strategies through a theoretical lens, while also analyzing whether the current measures are sufficient when facing the disturbances occurring from climate change.

3.1.1 PURPOSE OF THE STUDY & RESEARCH QUESTIONS

The reason for writing the thesis about climate resilience is that since the global society has to face the consequences of climate change, there is also room to choose what the general response to the upcoming changes will be. Since the term ‘resilience’ means to both endure and recover from a shock, it suits well for my purposes to investigate what kind of a future Svalbard is preparing for, and if the community is able to maintain the qualities which makes Longyearbyen a vibrant and liveable town. The reason for writing about Svalbard comes from my interest in the Arctic and curiosity about the special features in living in the high North; such as extreme weather, scarcity of local resources, and remote location. The aim of the thesis is to provide information and different perspectives about preparations for climate change in Svalbard. Hopefully, the observations from the study will be able to contribute to building climate adaptation in the future.

The purpose of the study is to investigate how the community in Longyearbyen can prepare for and recover from climate change-related challenges. Through interviews and content analysis, the thesis seeks to understand what makes the community sustainable and resilient when facing the climate crisis, what is the role of local people in resilience-related planning, and what kind of potential improvements can be identified in order to increase resilience in the community. There is some existing literature and studies about future challenges in the environmental management of Svalbard, especially in a larger geopolitical and societal context, and the amount of literature is growing. My study aims to summarise existing knowledge and reflect upon the current situation of managing climate change in Svalbard while giving new insights into the direction Svalbard is heading in when facing the upcoming challenges. The thesis looks at current the level of planning, in the context of policies, since the policies determine the course actions, while the actions are based on the plans. Hence, in order to make a difference in how Longyearbyen is currently gearing up for climate change, the whole chain of events from a policy framework to strategy, plans, and finally actions, ought to be examined. This approach has also guided my choice of research questions since my intention is to understand the current level of resilience and how resilience planning is being carried out, while also analyzing the adequacy of the plans. The *comprehensiveness* of the policies and plans indicates how well the wide range of climate change-related issues are addressed, whether the most important tools for preparing for climate change are covered and if some relevant aspects in climate change adaptation have gone unnoticed. The research questions are following:

- *Which key policies and plans concerning Longyearbyen currently address resilience and to what extent was the community involved in the planning?*
- *How comprehensive are the current climate resilience policies and plans from the viewpoint of environmental experts and the community of Longyearbyen?*

3.1.2 THEORY

The theory chapter of this thesis consists of theories about climate resilience in spatial planning and adaptive planning. The theory section investigates how the social-economical sector is influenced by climate change. The section also looks into the roles of different stakeholders in order to give a better insight into the hierarchical ladder behind the planning processes. I have done comprehensive literature searches and reviewed both planning-oriented studies of general importance and arguably of relevance to my case. On top of

careful investigation of the theoretical background, I have applied literature in my study which concerns especially Svalbard.

3.1.3. LIMITATIONS

The current Covid-19 pandemic has complicated the data gathering and planning of the study. Due to travel restrictions, it was not possible to follow the original plan to do interviews in June. The summer holidays further complicated the data gathering process since a lot of people are unavailable for doing interviews. Ideally, more interviews with different community representatives and authorities would have been conducted, but given the circumstances, it was not possible. During the writing process, some prioritization in terms of the focus of the thesis and the amount of gathered data had to be made, due to the limited timeframe and the length of the thesis. Until this early summer, my intention was to do a comparative study between the Finnish Lapland and Svalbard, but since there were uncertainties in the data gathering process and my time for fieldwork was shorter than the initial plan was, I decided to focus on one case and put my efforts into studying Longyearbyen on a more detailed level. Since I decided to write my thesis alone, the study is not as extensive as it might have been if there were more people sharing the work.

3.2 QUALITATIVE RESEARCH

The thesis focuses on investigating climate resilience in Longyearbyen. Qualitative research is suitable for my purposes since my intention is to perform an in-depth study of climate adaptation and resilience planning in Longyearbyen. According to Creswell (2009), qualitative research enables the researcher to gain a better understanding of the social phenomena and make sense of the roles of the stakeholders in a given context, which in this case is building a more resilient community. Qualitative research builds on the investigation of how a certain phenomenon is constructed and developing a theory based on the findings related to the phenomenon. The researcher also uses a theoretical lens extensively which has an influence on how the data is being analyzed and what kind of research questions are asked. Qualitative research can be particularly useful if the topic is new or there are relatively few studies about the topic, or if existing theories are not applicable with a certain sample or group during the study (Morse, 1991, as cited in Creswell 2009, p.35). Morse's argument supports the reason for conducting this study, since there are relatively few studies about

resilience planning in the Arctic, especially in the context of Svalbard. According to Creswell (2009), qualitative research looks at social relations, which is relevant for my study since I will be looking at the level of community participation, how the insights of different stakeholders play a role in the decision-making in climate resilience discussions and how the governance structures affect which actions are taken in adapting to climate change. The study will also describe the social relations through the hierarchical ladder of the stakeholders participating in resilience-related planning.

3.3 CASE STUDY METHODOLOGY

This thesis is based on a case study of Longyearbyen, Svalbard. Case study methodology allows me to dig deeper and get a more profound understanding of the observed phenomenon (Rashid, 2019). In this case, the phenomenon covers the state of climate resilience in the town of Longyearbyen. According to Yin, case study methodology can be particularly useful when answering ‘how’ and ‘why’ questions, when the researcher has little or no control over the studied phenomena (Yin 2015, p.55). “The core of a case study is that it tries to shed light on a decision or set of decisions: “why they were taken, how they were implemented, and with what result” (Schramm, 1971, as cited in Yin, 2015 p.86). The idea of the study is to gain more insight and a deeper understanding of climate resilience and adaptation planning, which are more from the abstract end of the scale in terms of phenomena. Since the central phenomena of the thesis are conceptual, the researcher has little control over them, which makes case study methodology a well-suited approach for the purposes of this thesis. Also, the aim is to understand the level of resilience in one particular place, so doing a case study lets me investigate the special characteristics of climate resilience in the particular context of Longyearbyen. Another reason for choosing case study methodology is that the studied phenomena and the context are closely connected (Yin, 2015). In this case, climate resilience and adaptation planning are relevant concepts when preparing for climate change, and Svalbard is one of the most rapidly warming places on the globe. Hence, the case is tightly linked to the context, as it is evident that climate change and developing climate resilience are essential topics to address in the context of Longyearbyen. In order to gain a better understanding of how the level of climate resilience looks like in Longyearbyen, I have divided the investigation of the case into three sectors according to the planner’s triangle (figure 3). This division helps me to gain a deeper understanding of how climate resilience

shows across the three sectors, and further assists me in constructing a case about climate resilience policies and plans appear in a real-life context.

3.3.1 DATA SOURCES

Primary sources of data are interviews with representatives from organized groups such as Longyearbyen Lokalstyre and the Svalbard Social Science Initiative. The interviews give deeper insight and new information, which can help me to make connections between the studied phenomena. Some perspective from the non-organized stakeholders' side comes from an interview with a guide and tourist company owner living in Longyearbyen and from a book written by a local journalist who has lived in Svalbard for a decade, Line Nagell Ylvisåker. She has written a book, *Verda mi smeltar* (2020), with a detailed description of the experiences of living with climate changes in Svalbard and how it shows in the daily lives of the people. Some authors, such as Kaltenborn, Rega et al., van Buuren et al. and Olsson et al, have a more significant role compared to other voices in thesis, due to their extensive and informative research papers, which have helped me to gain a better understanding of the current situation in Svalbard and Arctic in general. Other sources of information are websites and articles related to climate change adaptation, resource conflicts, and resilience building in Svalbard, which have further assisted me in constructing a more comprehensive thesis and given me new thoughts and ideas during the writing process.

The secondary data sources are reports from Longyearbyen Lokalstyre, Governor of Svalbard, the Norwegian government as well as environmental reports concerning Svalbard, such as the report *Climate in Svalbard 2100 (2019)*. These reports have allowed me to gain detailed information and a more profound understanding of policies and planning in the context of Svalbard. I consider these reports as liable sources of information since they have been published by authorities, they are based on scientific facts, and the observations are made by professionals.

3.3.2 INTERVIEWS

For primary data collection, I have conducted semi-structured interviews with different community representatives. By doing semi-structured interviews, I was unable to mix closed- and open-ended questions, accompanied by how and why questions. By asking some predetermined questions but leaving space for spontaneous exploring of the topic, semi-

structured interviews provide the advantages of both structured and unstructured interviews (Pollock, n.d). Adams (2015) explains that semi-structured interviews might require more effort, but in the end they are very valuable considering the number of insights and information gained from the interviews. Since semi-structured interviews are time-consuming due to planning, conducting the interviews, transcribing, and analyzing the content, it is also challenging to conduct a huge number of such interviews. Since the amount of interviews tends to be more limited, getting accurate information about a larger phenomenon of being able to make broad generalizations is not realistic. However, semi-structured interviews are highly useful when the aim is to gain understanding about the necessity of the research, identify additional issues regarding the topic, and maintain flexibility in the data collection (Adams, 2015). Semi-structured interviews suit well for my purposes since I wanted to gain more specific knowledge about how some of the community members experience the current planning measures in terms of climate change, but I was also able to gain information that I was not aware of I was missing out on.

The first interview was conducted on the 14th of July, with Person 1. S/he works at the department of planning and development at Longyearbyen Lokalstyre. From her educational background s/he is a surveyor, and s/he has competencies in planning, property right as well as mapping. Person 1 has worked and lived in Longyearbyen between 2000 and 2008, and after ten years in the mainland, she moved back to Svalbard in 2017.

Person 2 who was interviewed on the 27th of August is an owner and a guide at a tourist company in Svalbard. S/he has lived in Longyearbyen for 11 years and is an active member of the community, taking part in political decision-making and keeping himself/herself up-to-date on changes and plans concerning Svalbard. Since s/he also works as a guide, s/he has a chance to educate and influence the visitors coming to experience Svalbard.

The third interview was done on the 30th of August with Person 3, a member of the Svalbard Social Science Initiative (SSSI). S/he is studying the environmental and socio-economic changes in the Arctic. Person 3 has extensive knowledge about how climate change impacts the community of Longyearbyen.

3.3.3 CONTENT ANALYSIS

Content analysis is a useful research tool when the intention is to analyze the meaning and connection of particular words and concepts. Content analysis can be applied to several different types of data sources, such as interviews, books, and documents. The reason for using content analysis as a tool is that it enables the researcher to reveal patterns and identify the intentions of an individual or a group. Content analysis also allows a qualitative approach (Macnamara, 2018) and according to W. Lawrence Neuman (2006, p.323), “there are qualitative or interpretative versions of content analysis”, which is suitable for my purposes. The advantage of using content analysis is that it can complement other methods, such as interviews, and thus act as a powerful tool when examining, for example, trends over a longer period of time (Krippendorff, 1980). Utilizing content analysis helps me to bring in knowledge from textual data sources, and thus build a study with several different data sources which can be analyzed together in order to identify patterns. I have applied content analysis to the planning documents from Lokalstyre, research reports about climate change in Svalbard, and governmental publications about policies and planning strategies concurring Longyearbyen. After collecting data from books, articles, and research papers, I carefully read through the literature, while taking notes and assembling the most relevant information for the purpose of my thesis. When I had conducted my interviews and done extensive literature reviews, I started sorting out my data according to the main topics of the thesis. I started finding connections and conflicts between the three corners of the planner’s triangle. I looked at interest conflicts between the corners and found different voices and opinions of the stakeholders when I was arranging my data into cohesive chapters. I analyzed my through the theoretical lens and discovered patterns and links between the theoretical models and the data I collected.

4 CLIMATE RESILIENCE IN LONGYEARBYEN

In this chapter, I take on the analysis of my primary data sources which are the interviews I have conducted. I am also doing a content analysis of my secondary sources which are academic papers, research articles, and books. I am looking at the data sources through my theoretical lens and providing my observations and notions of the gathered material. In this chapter I am looking to answer my research questions *1) Which key policies and plans*

concerning Longyearbyen currently address resilience and to what extent was the community involved in the planning? 2) How comprehensive are the current climate resilience policies and plans from the viewpoint of environmental experts and the community of Longyearbyen?

I have divided the analysis into three subchapters which show the three perspectives of the three corners from the triangular model. I am looking at the data first through an environmental protection perspective, then move on to analyzing the economic characteristics of resilience planning and adaptation policies. To answer my research questions, I will offer information about how the experts are experiencing the current policy and planning measures and if they think that the police and plans are sufficient. Towards the end of the chapter, I analyze the collected data from a social resilience perspective and provide insights into how the current planning situation looks from the side of the non-organized members of the community.

From a more general viewpoint, building climate resilience in Svalbard is largely guided by the Svalbard policy objectives, which are 1) Consistent and firm enforcement of sovereignty, 2) Proper observance to the Svalbard Treaty & control to ensure compliance with the Treaty, 3) Maintenance of peace and stability in the area, 4) Preservation of the area's distinctive natural wilderness and 5) Maintenance of Norwegian communities in the archipelago. To me, the key aspects of the policies are continuity and predictability. Predictable administration of Svalbard works parallel with the central goals while providing security for the population and increasing stability in the region. On the other hand, I think that striving for stability might increase vulnerability since a static framework leaves less time to react to an unexpected event (see chapter 2.2.).

A challenge in developing new climate adaptation approaches and testing innovative solutions is the timeline from ideas to action in the planning sector. As Person 1 (Interview, 14th of July, 2021) explains, since the development plans need to be discussed with authorities and local representatives, there is usually a minimum of one year planning cycle, which in my perspective gives less time to react to unexpected events. Person 1 tells that while the plans are not very flexible, there is a purpose to it: the development plans need to be based on facts, which are the result of several reports coming in. I find it relevant that the plans are based on scientific knowledge, but I can also observe that the slow planning cycle might include

outdated information and some relevant information can still go unnoticed. I agree with Person 3 (Interview, 30th of August, 2021) who claims that regulations and standardized procedures help people to orientate themselves, but then again, the planning processes might not be as rapid as they could be. Also, I claim that ensuring a democratic decision-making process increases the citizens' trust in authorities when they feel like they can influence the planning processes. However, I also identify a collision between the theories about building adaptation planning and the current planning ideologies in Svalbard. The current models are based on facts and the planning cycle is relatively slow since the plans are rather comprehensive, but the general desire of the theorists (Hovelstrud et al., 2020; van Buuren et al., 2013) asks for plans and strategies which can quickly be turned into actions when necessary. It is not only the timeline but also the more comprehensive structural renewal that is shaping the planning processes. Person 3 (Interview, 30th of August, 2021) explains how the shift from a coal mining settlement towards a more evolved and regulated 'municipality-like' place has affected the planning in Svalbard. From my viewpoint, there is a fine balance between having enough regulations, so that non-experts can understand the planning framework, without making the setup too rigid and ready-made.

In analyzing reports from Lokalstyre (2017a; 2017b) and data from my interviews, I find it relevant to note that there appears to be a continuous feedback loop in the process. The feedback loop goes between reports from the state of a system, plans to improve and develop the system, and finally turning the plans into actions and evaluating the process. As Person 1 explains, the feedback loop has to maintain a certain structure, and it takes time to go through the whole chain of events, discussions, and decision-making. These observations tell that the theories about resilience are much more complex when they are applied to real-world scenarios. According to Person 1, Lokalstyre is adjusting future development plans after the worst-case scenario, which is described as the highest emission rate in the Climate in Svalbard 2100 report, indicating 10 degrees warmer air temperature (NCCS, 2019). From my perspective, aiming for the maximum amount of preparedness is better than aiming too low, since it is easier to cut down on extra resources than obtain new ones on short notice. Then again, more resources and more extensive preparations require more finances. But since the trust of the locals towards the authorities is already shaken, and the Norwegian government is

eager to invest generously in the archipelago, I see room for reaching towards a high level of preparedness.

4.1 ENVIRONMENTAL PROTECTION

This chapter covers the environmental protection corner of the triangular model and explores extensively how climate resilience shows in environmental protection in Svalbard. In the chapter, climate resilience is observed from an environmental viewpoint, while looking at the type of policies and plans which aim to minimize the impact and help nature recover from climate change. The chapter provides answers to both research questions from an environmental perspective.

From my viewpoint, the environmental sector has the most straightforward connection to climate resilience, since there is a direct causal relationship between the changes in the climate and the environment seeking ways to adapt to these changes. According to the Government, environmental protection has been one of the overriding policies guiding the actions in Svalbard. The aspiration to preserve the vulnerable nature in the archipelago is also a result of the Svalbard Treaty, which obligates the members to respect the environment. Even though Svalbard offers unique settings for environmental research and the nature-based tourism industry, the activities need to be balanced out with the environmental protection requirements. Currently, 65% of the land area and 87% of the territorial sea is protected (Norwegian Ministry of Justice and Public Security, 2016). Due to new development plans, in the forms of commercial cabins and facilitating vessel disembarkation, more extensive management actions are required from the authorities to ensure a sufficient level of environmental protection. The authorities are investing resources and effort into creating a better dialogue with the visitors in order to provide a deeper understanding of the protection (Norwegian Ministry of Justice and Public Security, 2016). Even though the government has ambitious plans to protect the environment, I find a mismatch between the current policy objectives and the environmental and socio-political realities. From my viewpoint, the environmental policies of Svalbard aim for ambitious goals and extensive measures to protect nature, but the goals are not fully in alignment with the economic development plans. I have observed that the environmental legislation in Svalbard is debated in the context of how it restricts or hinders economic development. I find another difference between the planned

strategies for development and the actual direction where Svalbard is headed, which is the nature of the world: the strategic plans promote predictability and stability, but in reality, the changes Svalbard is facing are characterized by unexpected and variable outcomes. Striving for stability under changing circumstances can be problematic in terms of the outcomes of the adaptation plans; increasing stability can add vulnerability to the system, which means that the planners might benefit more from understanding the dynamics of the system and focusing less on details (Folke et al., 2002).

When more knowledge about climate change has been gained, and the vulnerability of the ecosystems has been recognized, new studies show that climate change is the most significant threat to the species and ecosystems in Svalbard and the whole Arctic region. IPCC (2019) points out in their latest report that the risk of significant, long-term changes is considerably high in the Arctic region. From the data, I can constitute that where climate change is happening most rapidly, species will disappear when their habitats are reduced. There are no real winners in the battle against climate change - even though a longer ice-free period allows maritime traffic to continue longer, a lot of species like the polar bears and ringed seals suffer from the loss of the sea ice. Ylvisåker (2020) points out that since the protection of the polar bear has led to an increased bear population, the bears are moving closer to inhabited areas and the encounters with the bears are more frequent, which poses a threat to the people and the bears. Ylvisåker (2020) sees a conflict between the government's wishes to welcome more Norwegian families and increase tourism, with the simultaneous policy of protecting the polar bears which are the climate icons of Norway. I agree that it seems contradictory to invite more visitors and new residents to the archipelago when one of the main objectives is to protect the bears and other creatures living in Svalbard. The restructuring process of Longyearbyen possibly leads to increased activities and also increased traffic; to maintain balance, future management of local activities must take into account the species and habitats which suffer the most under the pressure of climate change (Norwegian Ministry of Justice and Public Security, 2016).

From my perspective, a major environmental paradox can be found in Svalbard: the archipelago is amongst the most rapidly warming areas in the world, but simultaneously the carbon dioxide emissions caused by the housing in Svalbard is significantly higher compared

to the global average: the CO₂ emissions per resident in Svalbard is 75 tons, while the global emission rate per person is 4,8 tons (Ylvisåker, 2020). The most important factors causing high emissions per individual are coal-powered energy production, flight traffic, and the fact that there are so few residents sharing the emissions. When the average carbon footprint of a resident is 15 times bigger than the global average, I find it difficult to justify why operations, such as tourism, should be scaled up. Since close to all operations in Svalbard can be considered unsustainable, it raises the question, what is the maximum capacity the town can facilitate in terms of development and the number of residents, so that the environment is not damaged too extensively. I see another noteworthy point in the fact that nature always seeks balance, and can recover if only left alone. From an environmental perspective, the flora and fauna of the archipelago can only tolerate a certain amount of stress and changes, before their capability to adapt comes to a limit and the damage becomes permanent.

The threats and environmental risks concerning Svalbard have been examined and reported by Lokaltstyre (2017b) in a ROS-analysis (Risiko- og Sårbarhetanalyse). Due to the vulnerability of the archipelago, several factors can jeopardize the safety of the people and the stability of nature. According to the ROS-analysis, the following risks concerning Longyearbyen can be identified: the likelihood of avalanches increases when the precipitation levels are growing, the erosion near the Longyearbyen river threatens the nearby infrastructure, the density of wooden houses may be hazardous in the case of fire, also flooding and excess water under buildings may harm the constructions and permafrost in the area. To respond to these possible threats, there are several policies and plans developed to minimize the impact. I can see that there are several high and low-risk factors, some of which can cause unexpected harm on short notice, such as a fire or an avalanche, while other risks are slowly developing, such as thawing permafrost and eroding riverbanks. I argue that preparation and preventive methods, such as establishing conservation areas and national parks, restricting human activities, and decreasing pollution alongside emissions give the environment a better chance to cope with the changes caused by global warming. With increasing temperatures, erosion, retreating sea ice, and thawing permafrost, the flora and fauna are already facing massive obstacles, but the external pressure can be relieved at least to a certain extent when environmental protection measures are comprehensive and strict enough.

4.1.1 REPLACING COAL WITH RENEWABLE ENERGY SOURCES

The general level of activities in the mining operations in the archipelago is declining. Currently, SNSK operates only one mine, Mine 7, which produces 150 000 tons of coal in a year, of which 20% is used to keep the Longyearbyen power plant running and the rest is shipped to Germany for the metallurgical industry. Even though a new coal mine was opened in Svea's Lunckefjellet, the activities were shut down a few years ago, and the whole area is assigned to be restored so that the environment can recover to its natural state (Grydehøj & Grydehøj, 2012; Ylvisåker, 2020). Instead of using the equipment for mining coal to help to manufacture solar panels and electric cars, the equipment is used in creating more extensive emissions when mining brown coal elsewhere. For me, it seems highly contradictory that a source of pollution would be shipped to another place to create even more emissions. Ylvisåker (2020) constitutes that shutting down mining activities in Svea is mostly symbolic politics; coal mine operations are not good for the image, no matter what the coal is used for.

When the mining activities are planned to shut down, new sources of energy need to be found. I have discovered from my data that the overall energy consumption of the town is significant, which requires the usage of close to the maximum capacity of the power plant. Since the maintenance costs are considerably higher in the Arctic, the government does not support the idea of rapid growth and development which would quickly increase energy consumption. Even though the power plant's life-cycle is being extended with renovations and upgrades have been made to decrease the pollution caused by the power plant, the carbon dioxide levels produced by the power plant are relatively high in comparison to the produced energy. If Svalbard wants to avoid importing coal to the archipelago, rapid actions are needed to develop well-functioning alternatives for energy supply, says Bjørn Holsen from Statkraft (Statkraft, 2018). From what I have learned, it is very challenging to come up with better solutions since even renewable energy sources have their downsides. For solar panels, there is no daylight for three months and wind power might be potential but the turbines can disturb the wildlife.

Potential renewable energy sources are a gas-fired power plant based on liquid natural gas, a thermal power plant based on pellets, and gas power combined with solar power. I agree with Holsen who points out that the remote location of the archipelago and limited opportunities

for independent energy production in Svalbard are significant challenges. According to the report, Svalbard will not be able to rely solely on local energy production, which is why gas and pellets can be shipped from the mainland. A possible future solution would be to generate electricity with wind power in Finnmark and produce hydrogen, but the technology is still fairly expensive. From these notions, it seems to me that no low-cost energy solution for Svalbard is currently in sight. The report does not include all the possible options for energy production, which still leaves room for innovating local renewable energy solutions in the future (Statkraft, 2018).

4.1.2 SAFETY MEASURES AND DISASTER PREVENTION

I have discovered that the environmental changes in the archipelago, like in other places of the Arctic, increase the likelihood of heavy floods, avalanches, more extreme weather phenomena, and bigger storm surges because of rising sea levels (see chapter 2.1). Due to the new kinds of challenges caused by the climate crisis, the infrastructure such as roads, buildings and ports are more exposed to external stress. Climate change adds the vulnerability of the already scarce infrastructure in the Arctic, which calls for action in the form of upgrades and adaptation strategies.

Based on my data, it is evident to me that one of the pressure points of emergency operations in Longyearbyen has been the avalanche of 2015, where two people were killed. Despite the Governor of Svalbard being in charge of the rescue operations, and getting assisted by a designated emergency preparedness council, I have observed that the system has not been functioning properly. I discovered that the residents in the avalanche danger zone were not fully aware of the risks associated with the area (Ylvisåker, 2020), and despite the previous warnings from experts and the upcoming storm, the area was not evacuated in time. I acknowledge that the reaction time and sensitivity in taking evacuation measures have probably improved after the disaster, but with bigger storms and more precipitation, some unexpected disasters might still occur. Based on the data, the emergency preparedness council and other actors involved in disaster management had enough capacity to react to the upcoming avalanche, yet people were not evacuated in time. Person 1 tells that the general atmosphere after the avalanche had a sense of concern and fear, but due to the population turnover, the ones who experienced the avalanche moved away and got replaced by new

residents who did not share the same concern. Person 3 (Interview, 30th of August, 2021) confirms that the events have left a mark in the minds of the locals, and some people have started to fear the mountains and stormy weather. Perhaps the biggest issue here is that these people have a subjective experience of being unsafe in their living environment. Since 1992, there have been reports about the avalanche danger in the residential area of Lia in Longyearbyen (Ylvisåker, 2020). At the beginning of the 21st century, the authorities were informed by the climate reports which were indicating warmer winters and heavier snowfall, leading to an increased risk of avalanches in the Longyearbyen area. During the time, it was unclear whether Lokaltstyre or the landowner, SNSK, should be held responsible for the preventative actions (Ylvisåker, 2020). Hence, I can observe the authorities were lacking coherence in a crucial situation where they should have had clear roles in preventing and navigating the avalanche of 2015.

According to a general plan for avalanche prevention, published by Lokaltstyre in 2020, new measures have been planned to prevent the fatal disaster from 2015 happening again. More extensive danger zones have been defined, avalanche fences have been built on the nearby mountain of Sukkertoppen, and iron nets have been installed in the valley of Vannledningsdalen to prevent slush and mudslides from entering the town of Longyearbyen. The data also shows that 13 new rows of avalanche fenced are under construction, and an extensive moat is being built in Lia which was the area the avalanche destroyed in 2015 (Lokaltstyre, 2020). Other measures in disaster prevention have been the general risk and vulnerability (RAV) analysis by Lokaltstyre, which includes mapping, systemizing, and assessing the probability of unexpected events in Longyearbyen land use planning (Lokaltstyre, 2020). To contribute to research, societal safety, and emergency preparedness, while taking into account the Arctic framework and climate adaptation strategies, the government has established a new Arctic Safety Centre in Longyearbyen (unis.no, n.d.). My observation is that there are a lot of plans and physical implementations to ensure the disaster does not happen again. Then again, Person 3 points out, that the extensive measures can also be seen as a way to assure the locals about the safeness of the place, which I see as an interesting viewpoint. “— there's no data that shows that if you demolish enough houses and you put up enough fences that people will actually feel subjectively safer” (Person 3, Interview, 30th of August, 2021). On the other hand, in my opinion, the notion is in alignment

with the fact that the climate models are inaccurate and that it is highly challenging to predict the true magnitude of any upcoming disasters (chapter 2.2) which is why the authorities are taking action according to their best judgment.

I have discovered from the data that the government's priority is to reduce vulnerability, so that society is better equipped to handle incidents and crises while quickly restoring societal functions if unexpected events occur. In recent years, both prevention and response to the crisis have been improved in Svalbard, but the development of emergency preparedness is seriously challenged by the geographical location of the archipelago. After the severe disaster has already impacted the communities in Svalbard, it seems relevant from my perspective to invest resources in improving the weak points of the current security measures (see chapter 2.1). Person 1 highlights how lucky Svalbard is to receive external help and gives an example of a community in mainland Norway where they had to wait 10 years before any actions were taken after a fatal mudslide. I acknowledge that external funding gives the community more freedom to develop infrastructure and plan for preventive measures when the environment is changing. When reflecting upon the planning cycle in Svalbard, after the avalanches in 2015 and 2017, some short-term solutions were provided when clearing up the avalanche sites, but even in the summer of 2021, the prevention measures were not fully completed. To me, this raises questions about the sufficient flexibility of plans, and the ability to respond rapidly to sudden events which require immediate attention.

René Walser, the development leader for building the new avalanche-prevention fences, explains that everything is over-scaled and calculated for much greater forces than what is needed. I can see a parallel here to the plans of Lokalstyre, where they aim to prepare for the worst-case scenario (p.36). Walser explains, that this is the first time they are working with avalanche prevention fences after a fatal accident has already occurred; normally they are doing preventative work after an avalanche has happened, but before anyone has been injured. I also find it alarming that the actions came first after the event occurred, despite the existing data that the risk of avalanches is high in the area. Since Longyearbyen Lokalstyre participates in civil protection through land-use planning (Norwegian Ministry of Justice and Public Security, 2016), to me this raises the question of why adequate actions were not taken previously? Walser also points out that if the fences had been there before the avalanche

happened, the houses would still be standing today (Walser, as cited in Ylvisåker, 2020, p. 54).

5.1.3 IMPROVING WASTE MANAGEMENT AND REDUCING POLLUTION

As the reports from Lokalstyre and the climate scientists have shown, pollutants can be found in the ocean, the ground, and in the air around the archipelago (Lokalstyre, 2017a; Lokalstyre, 2017b; MOSJ, n.d.). Some flora and fauna are significantly affected by the long-range transported pollutants, such as PCBs, although the general trends appear to be downward. The reduction of pollutants measured in the Arctic is mainly due to the restrictions concerning the production and use, while concentrations of non-regulated chemicals are rising globally (Norwegian Ministry of Justice and Public Security, 2016). Marine littering and microplastics around Svalbard are a growing concern. On an annual basis, the Governor of Svalbard gathers local people to pick up trashes and clean up the beaches to make the place safer for animals and more attractive to people (Norwegian Ministry of Justice and Public Security, 2016). I find it concerning that the flora and fauna are already severely challenged by the changing environment, but human actions taking place in the archipelago and also further away put an even heavier load on the nature of Svalbard. Surely it is positive to encourage locals to participate in cleaning operations, but the majority of the waste still floating around in the sea.

Despite the efforts to reduce pollutants, more emissions and generation of waste can be anticipated when the level of activities is increasing in Svalbard which means more traffic, more extensive infrastructure, and more extraction of the natural resources. The magnitude of the impact on the environment is largely defined by the rules and regulations concerning land use, energy efficiency, traffic, waste management, and emissions. According to new studies, the impact of the local emissions is considerably bigger than previously thought, which is why the government wishes to get the local sources of pollution under control. To me, this notion is in alignment with the fact that the local carbon footprint is significantly larger compared to the global average. Hence, despite the small size of the community, I find it relevant to consider how the human-related pressure on the environment can be reduced. The magnitude of the environmental threats caused by pollution remains uncertain since pollution occurs from diffuse sources such as soil contamination and waste disposal. From my viewpoint, another alarming fact in present-day environmental protection measures is that

there is no sewage system in Longyearbyen, which naturally has an impact on Adventfjorden when sewage water is discharged into the fjord. Lokalstyre has responsibility for establishing and managing a sewage treatment station in Longyearbyen. Lokalstyre also has plans for improving the waste management and recycling protocols in the area by establishing new recycling stations and proving more efficient ways to reuse materials (Norwegian Ministry of Justice and Public Security, 2016). Person 1 (Interview, 14th of July, 2021) explains that the future visions for waste management in Longyearbyen include building a recycling center and facilitating local reuse where furniture and other items can be relocated. The reason for investing in local recycling and reducing product transport from the mainland is to cut down on the overall amount of waste. Burning waste is regulated in the Environmental law, and importing materials for the mainland increases emissions. I agree with Person 1 that the optimal approach would be to minimize importing unsustainable products to the archipelago.

4.1.4 PROVIDING INSPIRATION FOR CLIMATE ADAPTATION

On top of the increased interest in resource extraction in the Arctic, the rapidly occurring climate change sets Svalbard in another kind of spotlight. I resonate with the idea that the archipelago can be seen as a stage for displaying the effects of climate change. Both Person 2 and 3 see an opportunity for Svalbard to become a laboratory, not only for investigating the impact of climate change but to display how climate change can be coped with. I agree that Svalbard has a chance to be upfront in showing how climate change can be treated in a beneficial way. Continuing the vision to put Svalbard in the frontline of climate adaption planning, the local politicians are hoping that Longyearbyen would promote renewable energy and take a role as a pioneering testing platform for new technology (Ylvisåker, 2020). I argue that the world-class research and actively participating community have a lot of potential in testing out new strategies of how the changes in the environment can be adapted to. I also think that the small size of the community and the area of operation help with the experimenting since the implementations do not require as large-scale development as in a bigger city.

I can observe that environmental protection is possibly the most important sector in the resilience discussion, due to the strict policies to protect nature and a great number of resources are allocated to improve the environmental conditions in the area. The community

is making an effort to reduce waste and pollution while striving for a transformation towards an overall more sustainable town. Even though some conflicts remain, such as the debate about resources, I can see that the Norwegian government has clear intentions to take care of the vulnerable nature of the archipelago through policies, restrictions, and even physical implementations.

4.2 DEVELOPMENT & ECONOMICAL INTERESTS

This chapter analyses what kind of development plans have been established in order to make Longyearbyen more resilient and what is the level of preparedness when facing climate change from an economical viewpoint. The chapter explains which conflicts and difficulties hinder the current development measures and how the economical sector is involved in the resilience and climate change adaptation debate. This chapter explores the first research question about key policies and plans addressing resilience in Longyearbyen, from the economical sector's perspective.

4.2.1 RESPONSES TO CURRENT CHALLENGES

From my data, I have discovered that there are several development projects planned to take place in Longyearbyen, but the special regulations applied from planning in Svalbard restrict the planned actions. In general, developing infrastructure in protected areas is not allowed (Norwegian Ministry of Justice and Public Security, 2016). The archipelago is characterized by wide areas of untouched wilderness, with few exceptions surrounding the inhabited locations and mines. The development of infrastructure is further limited by the Svalbard Environmental Protection Act, which states that residential areas and business activities should be located in the land-use planning areas. The Svalbard Environmental Protection Act can also be applied to areas outside the established settlements so that the level of restrictions depends on the type of activity: for instance, exploratory drilling for minerals must take into account the whole impact of the actions in the long and short term. I can see difficulties in accessing the resources in the area without risking the environment. Especially large-scale operations such as establishing oil rigs can have severe, long-term negative impacts in case of an accident. Also, the Svalbard policies are built upon the notion that environmental protection should always be prioritized before economical interests (Svalbard Treaty, 1920). Decisions to allow potentially harmful activities will be evaluated individually, based on the

restrictive practice at the time and on the aspiration of preserving the extent of wilderness in Svalbard (Norwegian Ministry of Justice and Public Security, 2016). Especially the natural areas which have been identified as vulnerable are under strict regulations in terms of new or expanded development activities. I have observed from the data that each land-use planning area has a planning authority that takes care of the ongoing planning duties and makes sure that plans are followed up.

Lokalstyre (2017a; 2017b) tells about the development plans in Longyearbyen. The report states that for instance Hotellneset, which currently facilitates storage and industrial activities, will be transformed into a business hub. Other targets of investigation have been expanding the areas for dog yards near Longyearbyen, increasing accessibility for non-motorized vehicles, establishing a skiing slope on Sukkertoppen, and developing the infrastructure in the harbor areas. From my viewpoint, all of these plans might increase the social resilience of the community, but since the vulnerable nature is the arena where the development plans are turned into actions, there might be unpredictable negative consequences for the nearby flora and fauna. From my observations, the future development of Longyearbyen asks for improving the capacity of the town. On top of the delicate nature, some of the key components for a functioning town are also threatened. Even though the current freshwater supply from Isdammen is sufficient, it is also vulnerable since there is only one water source. Getting enough water from extinguishing a fire is problematic since many of the areas, such as the town center, are not within the range where water can easily be transported to (Lokalstyre, 2017a).

In terms of building and updating the existing infrastructure, Lokaltyre (2017a) has plans to develop energy-efficient and safe housing in the Longyearbyen area. Many of the existing houses need to be renovated and replaced by buildings that correspond better to the modern-day energy efficiency standards. Due to the mapping of the danger zones, the areas identified as safe for developing new infrastructure are limited. The current housing structure has been favoring small apartments Lokaltyre (2017a), which from my viewpoint is not in alignment with the government's plans to make Longyearbyen attractive to families. I argue that transforming the housing sector towards safer and more attractive living standards is essential in order to reach the goal of having a liveable and varied community in Longyearbyen:

currently the town is unable to provide satisfying housing and answer the demands of the housing market, which increases the turnover rate of the population and shortens the residents time of stay in Longyearbyen.

I have observed that alongside the development plans and ROS-analysis, Lokalstyre (2017a) has also made consequence evaluations about the impact of the planned actions. First of all, the nature in the planned development area might suffer and the biodiversity might decrease. Also, cultural heritage sites can face negative consequences after development measures and modern-day buildings contrasted with old constructions affect the aesthetic of the place. I have identified that the heart of Longyearbyen is the town center, which currently does not utilize the full potential of the area, hence there are plans to establish more attractive activities near the seaside and move the industrial practices further away from the town. Increasing security is a major component in creating ease and comfort in the community, and putting special focus on the needs of the young residents of Longyearbyen increases the attractiveness of the town in the eyes of families (Lokalstyre, 2017a). I agree that creating a sense of security and developing enjoyable public spaces is essential when developing a resilient town.

On top of the debates in the infrastructure development field, Svalbard is also the subject of a heated discussion about the rights to resources and sovereignty of the archipelago. Even though the Svalbard Treaty gave Norway sovereignty, the Treaty also states that all the members of the Treaty also have equal rights for certain types of economical activities, including fishing (Svalbard Treaty, 1920). However, the Treaty currently does not address the sea areas in the proximity of the archipelago, which makes the interpretation of the Treaty more complex. The current disagreements are evolving from the fishing industry, where the size of the fishing quota for Treaty members is being debated, and the discussion has led to the members questioning the sovereignty of Norway in Svalbard (Moe, 2021). Certain topics addressed in the Svalbard Treaty, such as the extent of sovereignty, resource extraction, environmental restrictions, and military actions, are prone to interpretation (Kaltenborn et al., 2020). I find it somewhat concerning that there is room for divergent interpretations of the Treaty since Svalbard Treaty sets the baseline for most actions taking place in the archipelago. I see that one of the key reasons for disagreements over Norway's sovereignty and right to resources lies in the separation of objectives policies and planning and the true state of the

system. While Svalbard's policies tend to highlight stability and certainty, the true nature of Svalbard is mostly characterized by rapid changes in social, economical, and environmental fields, as well as high unpredictability about the archipelago's future role in the high Arctic. The environmental legislation in Svalbard causes disagreements between different sectors since it can be seen as a hindering factor in the way of promoting economical growth (Kaltenborn et al., 2020). The case over the fishing quota might even show implications of security politics if other Treaty members start demanding a different type of management in Svalbard. I agree with Moe (2021), that the arguments of the EU are contradictory, since they first claim that they are practicing more responsible resource management than Norway, but simultaneously the promote an agenda to increase fishing in the archipelago which might lead to overfishing. For me, it seems like unstructured leadership if the EU is unable to lead by an example of how environmental management should be aligned with economical interests.

From what I have observed, the debates about environmental protection and resource extraction in Svalbard between significant powers in the High Arctic set Svalbard in a vulnerable position. While Svalbard is demilitarised, no permanent defense mechanisms were developed in the archipelago according to Ulfstein (1995), but still, Svalbard stands in the middle of the debate on environmental protection, fishing industry, satellite services, and developing communication technologies - all of which make Svalbard a potential security threat especially in the eyes of Russia (Åtland & Pedersen, 2009). I observe from the data that the current geopolitical situation in the Arctic is characterized by the fact that the Arctic states are willing to cooperate mostly in order to secure their own national interests while holding on to their presence and military preparedness in case of a power balance shift. When demand for energy and mineral reserves is growing, Arctic resources become a central topic of discussion in both national and international political arenas (Åtland & Pedersen, 2009).

From my data, I have identified that the environmental legislation in Svalbard causes conflicts between the different sectors, especially when the environmental protection measures are seen as an obstacle to economic growth. This notion fits in the *resource conflict* of Campbell's model, where the economical sector protests against the restrictions to exploit natural resources (Kaltenborn, 2020; Campbell, 1996). The resource conflict also describes the boundaries between the development areas with modern infrastructure and the raw, untouched

wilderness. In Svalbard the limit is fairly evident; while there are no physical boundaries, the geographical features set limits to the areas with potential development. Looking at Longyearbyen from a distance, (see figures 1,6 and 7), it is noticeable to me that the vast, untouched areas start directly from the small urban sector on the map - the streets of Longyearbyen become gravel roads and they end to the mountains, glaciers, and valleys. The urban is fading into the rural. I observe from my data (Ylvisåker, 2020; Hovelstrud et al., 2020), that the place was never designed to be scaled up to a proper town, the location was merely a convenience and had easy access in terms of mining operations. Since the town is surrounded by mountains, restricted by the sea in Adventfjorden and glaciers in the southern end, as well as erosion near the Longyearbyen river, there are clear physical limits to development in the area (figure 6). New infrastructure is thus facilitated mostly in the town center, and in the harbor areas which are being transformed into business parks (Lokalstyre 2017a). I have identified that there is a need for new housing areas, which fits the government's plans to invite more families to Longyearbyen. Since favoring only certain types of demographic features can lead to inequalities and even gentrification, this notion resembles the *property conflict* (see figure 4). I have also discovered that conflicts inside the housing sector are arising, when there is for instance need for more student housing but the state-owned SNSK has an overflow of apartments (Lokalstyre 2017a), which creates an imbalance in the governance of the housing development.



Figure 6. Longyearbyen seen from Platåfjellet. Photograph by Laura Nurmi

From my viewpoint, the environmental protection protocols, national policies, and special regulations concerning Svalbard further hinder the establishment of new building projects. Based on the data (Moe, 2021; Norwegian Ministry of Justice and Public Security, 2016), I argue that there is still broad national and international interest towards Svalbard and the opportunities the archipelago has to offer. In the future, the scarcity of resources such as oil and minerals, turn the global attention towards Svalbard. As noted previously, there are dissimilar opinions about who has the access to the natural resource in the archipelago. I see that the interest collision between the economic and the environmental sectors has been caused by current and future resource extraction in the mountains and at the sea. However, it looks to me that in Svalbard the strict policies about environmental protection have been a top priority, and at least on paper the environment should be taken care of before any economical interests are considered.

I recognize that having a functioning economic sector is vital for the survival of a community, but especially in a place with a vulnerable nature, economical actions can not overpower the other sectors. This leads to the *development conflict* (figure 4) which essentially contrasts social equity and environmental protection, with economic functions. The main issue is in creating a system where equal treatment for society and the environment can be guaranteed, no matter what the economical state looks like. I find that the problematic part from Svalbard's viewpoint is the community's dependency on resources, which creates a vicious cycle of both economical and environmental segregation (see chapter 2.3). Economic segregation happens when resources are made into products, and environmental segregation follows when the products are tossed back to nature. I see that striving for balance in creating profit and protecting the environment is utterly challenging, but innovations like biodegradable items and environmental-friendly production chains can serve as a part of the solution when searching for economic and environmental resilience.

Svalbard is also going through a transition from a coal mining settlement towards a modern center of research and facilitator of unique tourist experiences. I see that this shift changes the balance in the socio-economical positions of the residents since fewer mineworkers are needed and new job opportunities open up for scientists and tour operators in the tourism industry. Person 3 clarifies that the structural changes affect the management of the

community when Longyearbyen is shifting from a 'company town' model towards 'municipality-like' governance: this means more bureaucratization and standardization, but can also help the locals in following designated guidelines and rules. I see that standardization brings a sense of security when people have a clear framework to operate in and they are able to follow a set of common rules. The transformation from a mining settlement towards modern-day operations also brings new business opportunities. The energy industry is looking for alternative solutions for coal, which opens up possibilities for companies working with renewable energy sources. Simultaneously, as previously mentioned, the scarcity of local resources makes Svalbard dependent on external actors, mostly the mainland of Norway. In the bigger picture, Svalbard is largely controlled by the global forces, such as the reaction of oil prices when renewable energies take a bigger role, the evolvement of logistics under climate change and how security measures, as well as strategical debates, are carried through in the Arctic region (Grydehøj & Grydehøj, 2012). From my perspective, another factor shaping the future of the archipelago is the extensive research and the information gathered which helps to develop more accurate climate models. Person 3 (Interview, 30th of August, 2021) explains that there is a lot of detailed models available of how specific sites in Svalbard will be affected by global warming. I argue that doing extensive research and producing more knowledge can both increase awareness and speed up preventative actions. By developing more environmentally friendly solutions and investing in businesses that genuinely contribute to more sustainable services, I think that Svalbard can see both economic growth and a healthier environment.

4.2.2. SUSTAINABLE TOURISM?

Tourism in Svalbard has increased in recent years, and the tourism industry is an essential part of employment in Svalbard. With the current restructuring processes occurring in Svalbard, tourism will also get a share of the development, which in this case means new services and products for tourism, as well as more adapted information. I argue that the development should occur within the environmental goals, safety policies, and other regulations in the archipelago. The local actors in the tourism industry have sketched up a master plan for the future development of tourism in the archipelago; one of the strategies is the expansion of activities, which would make the visitors stay longer and thus increase the revenue per visitor and benefit the economical sector. Simultaneously, the ratio of revenue to environmental

impact connected to traveling to and from the archipelago would also become better (Norwegian Ministry of Justice and Public Security, 2016). I agree that a potential option to boost the finances and decrease the carbon footprint to some extent would be to promote longer trips while providing environmentally friendly activities, such as dog sledding and skiing trips which have become more popular recently.

The Governor of Svalbard has been asked to initiate a development plan for Management Area 10 (figure 7), which covers all the inhabited places and their surroundings in the archipelago. The aim is to facilitate and manage the use of the area to add local value creation and create positive visitor experiences, even as appreciation for the unique environmental features of Svalbard is increased and cultural heritage assets can be maintained (Norwegian Ministry of Justice and Public Security, 2016, p.42). There are plans to improve the local food industry by promoting local products and thus reducing the environmental impact connected with importing the food from the mainland (Norwegian Ministry of Justice and Public Security, 2016). Despite the scarcity of local resources, I find it very promising that the goal is to utilize the local ingredients and offer as many local services and products as possible. I think that investing in locally produced goods is beneficial both for the local economy, but also for the social and cultural qualities of the community.

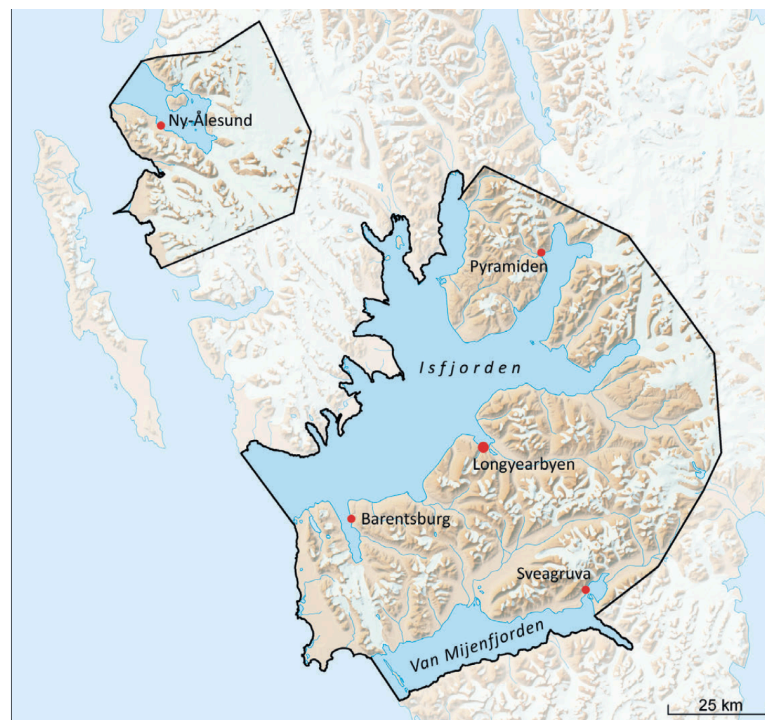


Figure 7. Map of Management Area 10 by Norwegian Polar Institute

The Master Plan Destination Svalbard Towards 2025 had been created by Visit Svalbard to provide a framework for sustainable development in the archipelago. The vision for the Master Plan is based on giving Svalbard a role as the leading High Arctic destination in the global market of tourism. Visit Svalbard aims to double the tourism-related positions by 2025, most of which will be year-round positions, giving more opportunities for the local job markets. The tourism products will be based on local knowledge, promote environmental protection, increase profitability and act for the benefit of the community (Visit Svalbard, n.d.). By reflecting upon the current situation, I find the goal of doubling tourism-related positions problematic in two ways. One is that the more people visit and live in the archipelago, the more pressure they put on the environment due to the large carbon footprint the locals have compared to the global average. Another point is that an unexpected event, such as the Covid-19 pandemic, almost completely froze the tourism industry. If something similar was to happen again, even more people would get laid off and struggle financially.

Establishing a branding strategy to promote Longyearbyen is another way to fuel up the tourism sector. I have observed that the Master Plan emphasizes the idea that Longyearbyen should be seen as a destination in itself, but also in connection to the surrounding areas as well as to the whole of Svalbard. According to the land-use plan 2016-2026, the concrete measures in increasing the attractiveness and accessibility of Svalbard and especially Longyearbyen, include investments in pedestrian and cycling lanes, increased accommodation capacity, more public spaces, developing the harbor front, walking paths, and sightlines (Lokalstyre, 2017a). I resonate strongly with the idea that walking paths and cycling lanes would be developed, since they promote environmentally friendly ways to move around, and there are only a few places in Longyearbyen where there are designated lanes for cycling.

From my perspective, the tourism industry itself has a contradictory position. I have discovered from my data (Interview with Person 1 on 14th of July 2021; Lokalstyre 2017a; Norwegian Ministry of Justice and Public Security, 2016) that some conflicts have been observed between the tourism activities and natural/cultural heritage assets due to the organized tourism activity. Based on the data, I see that the conflicts can be minimized by educating the guides and visitors about respecting the environmental regulations and emphasizing cautious traffic by the operators. Even though the growing amount of activities

related to tourism and research also require more assets and put pressure on the environment, they both offer valuable knowledge, while also creating ambassadors for environmental protection in Svalbard.

I find that several businesses, locally and globally, have an interest in the archipelago. The area has some desired resources such as oil, minerals, and fish, but the environmental restrictions hinder the extraction of these resources. While Svalbard Treaty guarantees access to the resources for the Treaty members, there have been recent conflicts about sharing the resources and the sovereignty of Norway in Svalbard has been questioned. The transition from a coal mining settlement towards modern-day operations is shaping the economics of Longyearbyen by opening up new jobs and investing in other sectors such as tourism and research.

4.3 SOCIAL RESILIENCE & LOCAL PERSPECTIVE

This chapter is built upon the social equity corner of the triangular model. The chapter seeks to answer the latter part of the first research question, about the level of participation from the local people's side, and also inform what the locals and experts think about the adequacy of current policies and plans which answers the second research question. In the chapter, I analyze my data related to creating social resilience, with the help of my interview data, Ylvisåker's book about living with climate changes in Svalbard as well as reports from Lokalstyre and the Norwegian government. I observe the data sources through the theoretical lens and investigate how theories about adaptive planning, developing resilience, and managing conflicts are shown through the social equity perspective.

As Campbell (1996) points out (see chapter 2.1), our current concept of sustainability leans on the pre-industrial era and takes inspiration from the lifestyle of indigenous cultures. I argue that while this kind of approach is not applicable as such in modern-day society, the planning sector should also acknowledge that there are ecological limitations to development, and social aspects such as equality and justice should not go unnoticed either. The environment has a certain capacity to how much resources can be exploited before the populations decrease to a level where they can not recover from, but this limit might be more difficult to perceive in cultural, economic, and social sustainability since it is more elusive (Kaltenborn et al., 2020). On top of increasing focus on the social aspects of planning, several theorists add that

instead of focusing on the normative qualities and results, the actual planning processes should have a more central role (Kaltenborn, 2020; van Buuren et al., 2013; Rega et al., 2020). I argue that improving the social qualities of planning through a process-oriented approach might help in managing conflicts when the needs and desires of the locals have a greater value than the planned implementations.

4.3.1 SHARING RESPONSIBILITIES

As discussed in chapter 2.1, I find an interesting notion from Rega et al. (2020); the main reason for a system to experience an external shock comes from previous planning choices, which have not been comprehensive or flexible enough to prevent the event from impacting the system. In the history of Longyearbyen, one of the most evident examples is the avalanche of 2015, where the risks were known, authorities were disagreeing about the distribution of responsibilities, and locals were disappointed with inadequate actions (Ylvisåker, 2020). Since the citizens have previously been concerned about the lack of actions by the authorities and unclear responsibilities in a crisis, to me it seems contradictory with the goal that Longyearbyen would be perceived as a safe and attractive living environment for families.

I argue that establishing guidelines for the common and individual responsibilities are crucial in climate adaptation policies. The government should be able to offer protection and the citizens ought to have a supporting role since they are the ones performing adaptive behavior (see chapter 2.2). I find it important that individuals should be able to take action when necessary, without facing too restrictive governmental policies, but rather getting the sense of sharing the responsibility. In the aftermath of the fatal avalanche in 2015, the community of Longyearbyen demonstrated their collective commitment in response to a crisis. The whole community was mobilized to help the victims and assist in clearing up the avalanche site (Ylvisåker, 2020). I recognize that giving space for leadership roles and distributing tasks across participants helps in managing also large-scale events. I argue that the role of a leader can also be taken by an active individual, since the support of the authorities might not always be available, and in some cases, key individuals can help in spotting issues and activating the rest of the community, as pointed out in chapter 2.2.

Continuing the debate of allocating responsibilities, Dean Kivits (as cited in Ylvisåker, 2020) brings up the attitudes and ideologies of key decision-makers in climate policies. I share

Kivit's concern about environmental policymaking when the researchers have a hard time influencing the politicians (Kivits, as cited in Ylvisåker, 2020, p. 94). The scientists are providing alarming facts but also solutions, and yet the CO2 emission rates keep on rising (Lindsey, 2020) while the current actions remain on an inadequate level. I interpret from Kivit's notions that the politicians and other decision-makers need to recognize that we have responsibility for warming up the climate and that the researchers have the evidence to prove it. Then again, Ylvisåker (2020) also points out that we only have a limited amount of information based on facts, and that the current models are based on the most likely scenarios. I find it as a relevant notion that despite extensive research and measurements, some information will inevitably go unnoticed. Despite the efforts to develop reliable predictions of the direction of global warming, the climate is still warming up faster than the previous models have anticipated, and according to scientists, the window of opportunity to avoid disastrous outcomes is closing (Fritz & Ramirez, 2021; IPCC, 2019; Wright 2021). I can identify a parallel to Kingdon's concept (1995) of the window of opportunity, which emphasizes the idea that a crisis might activate stakeholder networks when the timeline for action is limited (see chapter 2.2). As mentioned in chapter 2.1, the way a system has previously behaved is not a direct indication of how the system will behave in future scenarios, which I think supports the notion that even with more accurate climate models, the system can still react differently than anticipated. Since the system, which refers to the town of Longyearbyen, consists of different sectors, a shock impacting one sector can have different consequences for the other sectors.

4.3.2 PARTICIPATION

From my observations, the planning sector in Longyearbyen is making an effort to introduce participatory planning in their approaches, which is supported by the notion that an increasing number of local governments turn to participatory practices when coping with climate change (see chapter 2.2). Person 1 (Interview, 14th of July, 2021) tells that they arrange workshops, provide arenas for discussion and encourage locals to participate, which benefits both the organized and non-organized members of the community. The data shows that the young residents are eager to participate, sharing their wishes about building a bike park and downhill skiing center on Sukkertoppen (Lokalstyre, 2017a). I have observed that the town facilitates several types of activities and services, such as kindergartens, a school, a university, shops, a

swimming pool, and sports halls. I believe that these places also provide opportunities for spontaneous interactions between the locals. I see potential in both unplanned and planned encounters with locals since the organized members can get valuable information and insights, which helps to shape the town of Longyearbyen according to the locals' wishes. Simultaneously, I recognize that the non-organized members can get their voices heard, which increases their sense of belonging and potential to take part in common tasks and events.

I argue that including locals in decision-making processes contributes to creating a sense of belonging and has a positive effect on the local planning culture. Respecting the local's knowledge of past events and experiences can ease out future decision-making processes. The local communities of Svalbard have a long history, and cultural heritage can be found across the inhabited places. The heritage sites and environments offer a way to experiment with the different phases in the development of the communities of Svalbard. According to the Norwegian Ministry of Justice and Public Security (2016), heritage places possess a great deal of symbolic value and have a status as a source of stories. I argue that it is highly important for cultural value and identity to preserve cultural heritage, but also to take care that the stories connected to the places and items are passed forward. Currently, the cultural heritage sites suffer from climate change in the form of more extensive erosion, increasing damages from rot and rust, thawing permafrost, land- and mudslides, and other factors (Norwegian Ministry of Justice and Public Security, 2016). Person 3 (Interview, 30th of August, 2021) explains how adaptation planning and climate resilience in Longyearbyen focus on the physical changes and leave less space for the social and cultural qualities which are also affected. I can see that the notion of having less emphasis on the social and cultural qualities is in alignment with the broader Arctic context: the lifestyle of the indigenous people and other residents in the Arctic is threatened both due to changing climate and modern development (Kenny, 2017; Stephen, 2018).

Even though Svalbard has no indigenous people, some locals have lived there for decades, and have similar kinds of situated knowledge and personal experience about life in the high North. I agree with Person 3 (Interview, 30th of August, 2021) that this knowledge is not used extensively enough, but talking to the long-term residents might give new ideas and more perspective on how to improve the climate adaptation measures in Svalbard. The opinions of

the locals can be seen as a valuable asset in communal planning since they possess both situated and collective knowledge. While there might be a lot of data collected qualitatively, I argue that the qualitative information available in Longyearbyen could be utilized even more. Person 3 (Interview, 30th of August, 2021) tells that due to the general tendency of highlighting physical and scientific approaches in adaptation planning, a lot of subjective knowledge and personal experiences of the locals are left out and disregarded in the scientific reports. I argue that the organized members and authorities might also benefit from supporting private initiatives which can in some cases be more efficient than public ones, which is backed up by van Buuren et al (2013) in chapter 2.2. The roles and responsibility-sharing of the stakeholders are further discussed in chapter 4.3.1.

Person 1 explains that the residents of Longyearbyen currently have good changes in sharing their opinions at the early phases of the planning. The data tells me that Lokalstyre reads through and summarises all the incoming suggestions to maintain a good level of transparency in their actions. To me, it seems evident that the stakeholders responsible for facilitating public participation are making an effort in including the locals in the planning processes. However, I agree with Person 3 who sees room for improvement in the current way of managing the participatory planning processes. S/he tells that instead of using online platforms, it's better to call in actual meetings. S/he also points out, that Lokalstyre is already trying out some of the methods, and that there is no need for any complex and advanced tools to bring people together. From my viewpoint, the participatory qualities could be more extensive, and as noted previously, providing more arenas for the organized and non-organized community members to gather and exchange ideas is enough to increase the interactions. I argue that putting effort into developing public facilities, such as malls, schools, town halls, and sports arenas, contributes to building social infrastructure in Longyearbyen and provides valuable meeting places.

Lokalstyre tells that public participation is a requirement stated in the Svalbard Environmental Law, which in my opinion can expose the locals' participation to pseudo-participatory processes: Person 2(Interview, 27th of August, 2021) supports this notion by stating that the authorities might listen to the opinions of the residents but they do not seem to affect the outcomes. To me, it seems like the potential in the inputs of the locals is to some

extent disregarded. I see that the problem could be that integrating participation in planning strategies is regulated in the Environmental Law since mandatory public engagement might also take space from spontaneous and non-regulated activities. On the other hand, I have observed that the reason for having friction between the planning sector and local participants is that might be difficult to perceive the situation from the other participants' viewpoint, and also the residents have their idea of how climate adaptation should look like. Person 1 (Interview, 14th of July, 2021) points out that it is quite different to look at the local planning and decision-making from the inside compared to outside observations. I recognize that sometimes a gap occurs between the expert knowledge and the situated knowledge of the locals. From my viewpoint, it might be difficult for the locals to understand why certain plans end up with a different result than what was initially expected when the locals have no chance to follow through the whole process. Simultaneously, I argue that the experts have difficulties in perceiving the processes from outside, through the eyes of the non-organized community members.

In some situations, the community might even be too eager to participate, which makes the management of the incoming suggestions more difficult for the planning authorities. However, I argue that despite a lot of suggestions flowing in, the suggestions should at least be acknowledged and taken seriously. Person 1 notes, that oftentimes people's suggestions are focused on the action phase, so the information might be less useful in the planning phase of the process. I speculate that it might cause confusion and even conflicts when the non-organized members do not see that their suggestions have an impact, as noted by Person 2 previously. In general, participatory processes have become a more common approach especially when the planning sector wants to promote justice and equality, and the current problem is more on the hierarchical side of traditional planning practices. Since top-down processes generally focus on specified legalism (van Buuren et al., 2013) adaptive planning promotes informal policy-making strategies and open dialogue between stakeholders. I argue that the role of an individual in a planning process should not either be underestimated, since an active individual can encourage others to participate and find alternative approaches to common obstacles (see chapter 2.2.).

Parallel with the resident's suggestions to Lokalstyre is the guidelines from authorities and politicians, which are based on the UN's Sustainability Goals. According to Person 1 (Interview, 14th of July, 2021), if a conflict should arise between the suggestion of the locals and the sustainability goals, the latter would be the overriding option. Hence, the evidence from the interview shows to me that the administrative side might insist on local adherence to the Sustainability Goals, but the local voices at times advocate for solutions that are not in alignment with these global objectives. It seems to me that the Sustainability Goals work as a baseline for the community plan, but it can be challenging to apply them to real-life scenarios. To me, sustainability contains more than just scientific facts, since it is linked to people's evaluations and interpretations, which is why navigating between the theoretical objectives and the subjective perception of the locals seems to be the core challenge in this case. Another obstacle in building up social resilience is the turnover rate of the population. Even though the people who move away can spread the knowledge forward, the community has to continuously make an effort to educate the new residents moving to town. Person 3 (Interview, 30th of August, 2021) explains that collective memory is fairly short-term, especially with the high turnover in Longyearbyen. I agree that while the turnover of the population complicates the establishment of common knowledge in workplaces, it also creates difficulties when the locals are searching for long-lasting relationships and continuity.

Overall, I can identify space for participation in the planning processes in Longyearbyen. The town has some unique challenges like the turnover of population, the cradle-to-grave cycle is not possible to maintain and the structural change from a mining town to a modern research center shapes the qualities of the community. Despite the obstacles, the community seems to have engaged members who are contributing to building social resilience.

5 FINDINGS & DISCUSSION

In this chapter, I point out the central findings from my data, and discuss the role of resilience policies and planning, while covering central issues in developing climate adaption strategies in Longyearbyen. The chapter clarifies key discoveries of the study which are backed up by the information gathered from the interviews, scientific reports, and research articles.

From my viewpoint, climate resilience is a multidimensional concept that can be perceived from several viewpoints. Ultimately, the key policies and plans for climate resilience are

found in the exact definition of the word *resilience*, how can Longyearbyen prepare for, endure and recover from the impact of climate change through planning and policy-making? My comprehension is that climate resilience planning covers the timeline from preparation to recovery differently, depending on which sector is observed. For instance, recovering from the impacts of climate change can look very different in the social, economical, and environmental sectors and some sectors might take a longer time to bounce back than others. While the community might need a lot of resources to renovate infrastructure and to cope with mental trauma, nature needs time to heal but has the capability to recover on its own. Developing a climate-resilient community requires attention to the big picture, where guidelines and policies are considered, and alternative flexible options remain as a part of the toolkit. Simultaneously, I find that the details should also be a part of the resilience strategy, but it requires a wide range of stakeholders in order to ensure that crucial information does not go missing. On a more detailed level, it might be easy to focus on improving one thing, but then harm another without realizing the damage at first, which can be observed for example in the development conflict. On top of the development conflict, there are oftentimes other wider interest conflicts, such as the resource conflict and the property conflict, as explained in chapters 2.3 and 4. While there are seldom simple solutions to these conflicts, they might also contain the potential for finding common interests. I see that the sectors can cooperate, and with new innovations, all the three sectors can find ways to operate without damaging the other sectors. For example, by focusing on local production, the locals are able to participate in hunting and fishing traditions, while greenhouse gases and pollution is decreased which benefits the environment, and revenue is created from trading the products in favor of the economical sector. Also focusing on renewable energy sources can create more jobs, decrease the pressure on the environment and bring profit. Yet the remote location in the high North and the scarcity of resources challenge all the three sectors, but since a vibrant community and abundant wildlife already exist in Svalbard, I think it is reasonable to search for solutions that improve the quality of life of the local people and the wildlife.

In the search for ways to increase climate resilience, I have discovered that some central issues can not be erased: even with a higher level of certainty and more accurate knowledge, conflicts based on different values and dissimilar interpretations would remain. Hence, I see that navigating between the reality and the subjective experience of the stakeholders is a

central part of finding common ground in decision-making and resilience planning. Since Svalbard itself does not hold the top position in the hierarchal decision-making ladder and is more at the receiving end of the scale, the archipelago must adapt to orders and policies developed outside Svalbard. From my viewpoint, this might cause additional conflicts since stakeholders positioned far away from Svalbard can lack contextual understanding and adequate knowledge about the place, which creates a risk that the decisions are not made in the best interest of the archipelago. However, the governor of Svalbard and Lokalstyre are still in dialogue with politicians and external authorities, and Norway has clear intentions to support Svalbard and thus maintain a solid Norwegian community in the archipelago. On the other hand, while the government wishes to make Longyearbyen attractive to Norwegian families, the current housing trend does not fully follow up these aspirations; the housing structure favors small apartments, a significant amount of houses have structural inadequacies and they are located in the avalanche danger zones.

On top of maintaining Norwegian presence in the archipelago, other central objectives of the Svalbard policy are the proper observance of the Svalbard Treaty and preservation of the area's distinctive natural wilderness. As discussed in chapter 4.2.1, Norway's sovereignty has been put under the spotlight, which raises the question of whether some large-scale conflicts are coming when the competition for resources gets tighter and the global interest towards the Arctic is growing. My observation is that the race for the resources in connection to preserving the natural wilderness of the area puts Svalbard in a tricky position since external pressure and orders from outside the archipelago ultimately determine the direction for future development. However, I see that the environment should remain a top priority since the recovery rate of nature is extremely slow in the high North and the wildlife is already pressured by human activities and the harsh climate conditions.

To endure the challenging climate conditions, the long polar night, and restricted access to services, I find it important that the locals have common factors which bring the community together and create a sense of belonging, such as an appreciation for the surrounding nature. In my opinion, a challenge for social resilience is the turnover rate of the population, which makes the members of the community lose valuable information and social assets both collectively and as individuals. However, the upside is that new residents bring fresh

knowledge and new insights, and also more people are aware of the situation of Svalbard and can spread the message forward.

Despite the upcoming changes and challenges some of which have to be addressed already now, such as longer ice-free periods, increased precipitation, and erosion, Svalbard has unique potential and a special global position. I think Longyearbyen has the opportunity to demonstrate how a small, remote town can cope with the changing climate and the locals can live in abundance when the problems are addressed from early on. However, according to my observations, a lot of the plans remain on the more overall and abstract level, so it is challenging to grasp the actual impact of the planned measures. From my viewpoint, the current resilience planning is either concerned about smaller-scale implementations, such as building avalanche fences and iron nets for mudslides, or there are grand visions to transform major parts of the town to better functioning, active arenas. I think it can also be questioned whether the current development measures are merely to create a sense of security in the community since it is highly difficult to predict the actual infrastructural needs and the magnitude of the impact of climate change.

Looking at the situation from a more practical perspective, I see that a concrete suggestion to prepare for coming changes would be an extensive toolkit for resilience, which is based on both the theoretical and empirical notions from Longyearbyen. The toolkit could include physical prevention measures from avalanches and mudslides, guidelines for increasing emergency preparedness, well-coordinated evaluation situations, training locals and visitors to act responsibly in the archipelago, developing climate-smart infrastructure and building materials, and making comprehensive plans about development areas and danger zones. I argue that having enough room to react spontaneously to unexpected events while also possessing tools to choose from, helps to manage the crisis and find a starting point for the recovery process. When plans are based on guidelines and have a rough framework without being too static or ready-made, there is more space for adjusting the plans according to the situation and allowing a learning process to continuously flow between trial and error. Also, I argue that feedback based on previous mistakes alongside continuous re-evaluation should be core values for adaptive planning practices.

Overall, I see that climate change can bring both opportunities and threats, and in the end, it is a matter of how the community will react to the changes. New opportunities are presented in the form of longer ice-free periods prolonging the boating season, warmer climate conditions introducing new species to the area, and thawing permafrost allowing more plants to grow on top of the active layer. On the other hand, the current system and way of life are at risk to become damaged or even vanish, the existing wildlife suffers, and the place attachment of the locals can be affected negatively through changing climate conditions.

Going back to the research questions, I find that the central policies and plans contributing to climate resilience appear different in each sector. From an environmental viewpoint, the optimal would be to scale down the most harmful actions to the minimum, such as coal mining. The most significant environmental act would be to achieve the global objective to stop or even slow down the rate of climate change for instance through renewable energy production and transforming other industries to environmentally friendly alternatives. On a local level, I find that cutting down on the major carbon footprint of the residents of Longyearbyen is an achievable goal, but as discussed in chapter 4.1.1., the best solution for environmentally friendly energy production is yet to be found. Also, the existing policies and planned restrictions for motorized vehicles, improving waste management, and decreasing the transportation of non-recyclable items benefit the flora and fauna of the area. From an economical viewpoint, the resilience of Longyearbyen is highly dependent on external factors, hence it is more vulnerable. Stable, local sources of income help the community to function even in uncertain times, but there is only a handful of initiatives that can operate independently. The research and education sector receives funding, the tourism sector needs visitors, and local services, such as shops, are dependent on the transported items from the mainland. I see that the fundamentals of planning for economic resilience in the case of Longyearbyen are constructed through good relationships with external actors responsible for funding, promoting locally produced items, and making sure that Svalbard is an attractive destination in the eyes of the rest of the world. Also, the government states in the Svalbard Policy that they aspire to maintain Norwegian presence and observe that the Svalbard Treaty is followed, hence Svalbard can expect to receive a designated part of the national budget also in the future. Social resilience then, stands on maintaining peace and stability in the archipelago, according to Svalbard Policy. I think that these qualities are achieved through

clear communication and allowing residents to take part in the discussions. Lokalstyre strives for including local voices in their planning processes, which I think adds to the residents' sense of belonging and contributed to building a good atmosphere in the community. Also investing in public spaces and facilitating arenas for meetings strengthen the relationships between the locals. Ensuring public safety through an adequate level of preparedness is also an important factor in giving a sense of security to the residents.

I have observed from the data that the level of participation from the side of the residents could be better if the residents were able to give more accurate inputs in the planning phase (see chapter 5.3.2), but this might require educating the locals more on how the planning processes work. Also, it seems to me that there are locals who would like to participate more, and some have valuable information which never reaches the decision-makers, hence more physical meeting arenas and workshops could increase the flow of information between the organized and non-organized community members.

Finally, the adequacy of the planned measures depends on what *adequate* is in this case. I understand adequacy in the context of climate resilience plans in Longyearbyen as reaching a level of planning where enough effort has been made to ensure continuity of the community in the future, despite the change circumstances. It seems to me that climate adaptation is taken as high-priority in Longyearbyen. I can identify both short-term and rapid responses to sudden events, such as landslides and avalanches, as well as long-term coping strategies, such as how thawing permafrost and rising sea levels should be reacted upon in the planning sector. From the discussion with locals and reports from experts and authorities, I can identify an overall satisfaction with the current measures, but events like the 2015 avalanche (see 5.1.2.) have made some of the residents doubtful of the level of preparedness, and some are still questioning if building up fences is enough to give the community members a subjective feeling of safety. Also, some experts are worried about how the politicians are responding to the scientific reports showing the rate of global warming, and if the alarming results are properly reflected upon in environmental policies. Overall, I acknowledge that the relatively small area for operations and support from the government help in finding solutions to become a more resilient community, and if a working model was to be found, Longyearbyen

could set an example of how a town and its surroundings can flourish regardless of the changing environment.

6 CONCLUSION

This chapter presents final conclusions and summarizes the main points of the research.

In this case study of Longyearbyen, I asked which key policies and plans are currently addressing resilience in Longyearbyen and if locals have been able to participate in the decision-making. I was also investigating how sufficient the resilience policies and plans are from the viewpoint of experts and locals. The main policies and plans contributing to resilience in Longyearbyen consist of strict environmental policies to protect the wildlife, plans to ensure safe living conditions through prevention measures, and building a vibrant community where the citizens are considered as an important link in the planning chain. Also, as the town is planning for transformation from a mining settlement towards a sustainable future, Longyearbyen can achieve further economic and environmental resilience. From a more general viewpoint, maintaining a good amount of flexibility in planning seems to be one of the key concepts in creating resilience. Also, rapid actions and a sufficient amount of tools to work with are necessary when encountering unexpected events. Through my data sources, I have discovered that the locals are willing to take part in planning discussions, but since they may lack contextual knowledge of how planning processes are functioning, some of the potential in including local voices might be lost. Also, if there are not enough arenas for facilitating public discussion, some of the valuable situated knowledge the locals possess might go unnoticed. I have identified that both the residents and experts seem to have concerns about how Longyearbyen is equipped to deal with climate change in the future, but I can conclude that the government and the local stakeholders are making an effort to ensure good living conditions for both the locals and the wildlife. I can constitute that the future of the Arctic is mainly in the hands of global forces and international policies addressing the impacts of climate change. But on a local scale, the stakeholders in Longyearbyen can influence the planning and thus determine how adaptation to climate change is emphasised in future policy-making and planning.

7 BIBLIOGRAPHY

Adams, W. C. 2015 *Conducting semi-structured interviews*. In: Handbook of Practical Program Evaluation (Newcomer, K. E., Hatry, H. P. & Wholey, J. S., eds.). John Wiley & Sons, Inc. Hoboken. USA. pp. 492–505. Retrieved from <https://doi.org/10.1002/9781119171386.ch19> Accessed in August 2021.

Arctic Centre (n.d.) *Basic Information About the Arctic*. [web source] Retrieved from <https://www.arcticcentre.org/EN/arcticregion> Accessed in September 2021.

Baskarada, S. (2014) *Qualitative case study guidelines*. The Qualitative report. pp. 1-18.

Baxter, P., Jack, S. (2008). *Qualitative case study methodology: Study design and implementation for novice researchers*. The Qualitative Report.

Canosa, I.V., Ford, J.D., McDowell G., Jones, J., Pearce, T. (2020). *Progress in climate change adaptation in the Arctic*. Environmental Research Letters. [web source]. Retrieved from <https://iopscience.iop.org/article/10.1088/1748-9326/ab9be1/pdf> Accessed in September 2021.

Campbell, S. (1996). *Green Cities, Growing Cities, Just Cities? Urban Planning and the Contradictions of Sustainable Development*. Journal of the American Planning Association.

Commission of the European Communities. (2000). *Communication from the Commission: on the precautionary principle*. Article 3. [web source] Retrieved from <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2000:0001:FIN:EN:PDF> Accessed in September 2021.

Creswell, John W. (2009). *Research Design. Qualitative, Quantitative and Mixed Methods Approaches*. Sage Publications. University of Nebraska-Lincoln

Davoudi, S. (2012). *Resilience: A Bridging Concept or a Dead End?* “Reframing” Resilience: Challenges for Planning Theory and Practice. [web source] Retrieved from <https://www.tandfonline.com/doi/full/10.1080/14649357.2012.677124>. Accessed in September 2021.

Duit, A., Galaza, V., Eckerberga, K. and Ebbessona, J. (2010). *Governance, complexity, and resilience. Global Environmental Change*, pp.363–368.

Environmental Management of Svalbard and Jan Mayen. (n.d.). *Pollution*. [web source]. Retrieved from <https://www.mosj.no/en/influence/pollution/> Accessed in September 2021.

European Parliament. (2019). Parliamentary questions. Subject: *Equal access by states signatories to the Spitsbergen Treaty to resources in the area of the fisheries conservation zone around the Svalbard archipelago*. [web source] Retrieved from https://www.europarl.europa.eu/doceo/document/E-9-2019-002536_EN.html Accessed in September 2021.

Folke, C (2006). "Resilience: The emergence of a perspective for social-ecological systems analyses". *Global Environmental Change*. pp.253–267

Folke, C., Hahn, T., Olsson, P., and Norberg, J. (2005). *Adaptive governance of social-ecological knowledge*. Annual Review of Environment and Resources. pp.441-473.

Folke, C., Hahn, T., Olsson, P. (2002). *Adaptive Governance of Social-Ecological systems*. Annual Review of Environment and Resources. pp. 442-462.

Ford, J.D., McDowell, G., Jones, J. (2014). *The State of climate change adaptation in the Arctic*. Environmental Research Letters. IOP Publishing.

Fritz, A., Ramirez, R. (2021) *Earth is warming faster than previously thought, scientists say, and the window is closing to avoid catastrophic outcomes*. [web source]. Retrieved from

<https://edition.cnn.com/2021/08/09/world/global-climate-change-report-un-ipcc/index.html>

Accessed in September 2021.

Giddens, A. (2009). *The politics of climate change*. Polity Press: Cambridge

Grant, M. (2020). *Sustainability*. [web source] Retrieved from <https://www.investopedia.com/terms/s/sustainability.asp> Accessed in September 2021.

Grydehøj, A., Grydehøj, A.. (2012). *The globalization of the arctic: Negotiating sovereignty and building communities in Svalbard, Norway*. Island Studies Journal.

Heininen, L. (2011). *Impacts of Globalization, and the Circumpolar North in World Politics*. University of Lapland.

Hovelsrud, G., Kaltenborn, B. & Olsen, J. (2020) *Svalbard in transition: adaptation to cross-scale changes in Longyearbyen*. The Polar Journal, pp. 420-442.

Holling, C.(1996). *Engineering resilience. In Engineering within Ecological Constraints*; Schulze, P., Ed.; National Academy Press: Washington, DC, USA.

IPCC. (2019). *Summary for policymakers IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*. Chapter 3. [web source]. Retrieved from <https://www.ipcc.ch/srocc/chapter/chapter-3-2/> Accessed in September 2021.

Kaltenborn, B., Østreng, W. & Hovelsrud, G. (2020) *Change will be the constant – future environmental policy and governance challenges in Svalbard*, Polar Geography. pp. 25-45, DOI: 10.1080/1088937X.2019.1679269

Kingdon J. W. (1995). *Agendas, alternatives, and public policies*. Longman. New York.

Kenny, M. (2017). *Urban Planning in the Arctic: Historic Uses & the Potential for a resilient Urban Future*. [web source]. Retrieved from <https://www.researchgate.net/publication/>

323240318_Urban_Planning_in_the_Arctic_Historic_Uses_the_Potential_for_a_Resilient_Urban_Future University of Warwick, UK. Accessed in September 2021.

Keskitalo E. (2008) *Climate Change and Globalization in the Arctic: an integrated approach to vulnerability assessment*. Abingdon. Routledge.

Krippendorff, K. (1980). *Content Analysis: An Introduction to its Methodology*. Beverly Hills. Sage Publications.

Larsen, J., Fondahl, G (Eds.). (2015). *Arctic Human Development Report: Regional Processes and Global Linkages*. Nordic Council of Ministers.

[web source] Retrieved from <https://doi.org/10.6027/TN2014-567> Accessed in September 2021.

Longyearbyen Lokalstyre (2017a). *Areal Plan for Longyearbyen planområde 2016-2026*. Retrieved from <https://www.lybkulturhus.no/getfile.php/3760924.2046.trfeqtusuq/Utfyllende+bestemmelser,+datert+20.01.17+rev.20.02.17.pdf?&force=1> Accessed in August 2021.

Longyearbyen Lokalstyre (2017b). *ROS-analyse*. [web source]. Retrieved from [https://www.lokalstyre.no/getfile.php/3861266.2046.pkkakkqzzilnus/Helhetlig+risiko+og+s%C3%A5rbarhetsanalyse+\(ROS\)+for+Longyearbyen+lokalstyre+og+Longyearbyen+2017.PDF?&force=1](https://www.lokalstyre.no/getfile.php/3861266.2046.pkkakkqzzilnus/Helhetlig+risiko+og+s%C3%A5rbarhetsanalyse+(ROS)+for+Longyearbyen+lokalstyre+og+Longyearbyen+2017.PDF?&force=1). Accessed in August 2021.

Longyearbyen Lokalstyre (2020). *Overordna plan for skredsikring i Longyearbyen 2020-2024*. [web source]. Retrieved from <https://lokalstyre.custompublish.com/getfile.php/3919287.2046.nnqb7qnkiiizqn/Overordna+plan+for+skredsikring+av+Longyearbyen+2018+-+2020.pdf?&force=1>. Accessed in July 2021.

Lück, M., Maher, P. T., & Stewart, E. J. (2010). *Cruise tourism in polar regions: Promoting environmental and social sustainability?*. New York: Routledge.

Lord, A., Tewdwr-Jones, M. (2018). *Getting the Planners Off Our Backs: Questioning the Post-Political Nature of English Planning Policy*. Planning Practice and Research. Routledge.

Macnamara, J. (2018). *Content Analysis*. University of Technology Sydney. [Web source]. Retrieved from https://www.researchgate.net/publication/327910121_Content_Analysis Accessed in September 2021.

Moe, A. 2021. *Går det mot lovløse tilstander på Svalbard?* [web source] Retrieved from <https://www.aftenposten.no/meninger/kronikk/i/dnJwWw/gaar-det-mot-lovloese-tilstander-paa-svalbard> Accessed in August 2021.

Nikel, D. (2019). *16 Fascinating Facts about Svalbard*. [web source] Retrieved from <https://www.lifeinnorway.net/svalbard-facts/> Accessed in September 2021.

Nordregio. 2019. *Settlements by size in the Arctic*. [web source]. Retrieved from <https://nordregio.org/maps/settlements-by-size-in-the-arctic/> Accessed in September 2021.

Norwegian Environmental Agency. (2019). *Climate in Svalbard 2100: a knowledge base for climate adaptation*. NCCS report. [web source] Retrieved from <https://www.regjeringen.no/en/dokumenter/meld.-st.-32-20152016/id2499962/> Accessed in July 2021.

Norwegian Ministry of Justice and Public Security.(2016). *Svalbard*. Meld. St. 32 (2015–2016) Report to the Storting (white paper). [web source] Retrieved from https://www.regjeringen.no/contentassets/e70b04df32ad45f483f2619939c5636d/en-gb/pdfs/stm200820090022000en_pdfs.pdf Accessed in August 2021.

Norwegian Ministry of Justice and the Police. (2009). *Svalbard*. Report No. 22 (2008–2009) to the Storting. [web source] Retrieved from <https://www.regjeringen.no/contentassets/>

[e70b04df32ad45f483f2619939c5636d/en-gb/pdfs/stm200820090022000en_pdfs.pdf](https://www.researchgate.net/publication/324111111/e70b04df32ad45f483f2619939c5636d/en-gb/pdfs/stm200820090022000en_pdfs.pdf)

Accessed in August 2021.

O'Hare P., White I. (2013) *Deconstructing Resilience: Lessons form Planning Practice*. Planning Practice and Research. Issue 3. Routledge.

Olsson, P., L. H. Gunderson, S. R. Carpenter, P. Ryan, L. Lebel, C. Folke, and C. S. Holling. (2006). *Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems*. *Ecology and Society*. [web source] Retrieved from: <http://www.ecologyandsociety.org/vol11/iss1/art18/> Accessed in July 2021.

Pedersen, T. (2017). *The Politics of Presence: The Longyearbyen Dilemma*. Arctic Review on Law and Politics, Vol. 8, 2017, pp. 95–108. [web source] Retrieved from <http://dx.doi.org/10.23865/arctic.v8.682> Accessed in September 2021.

Pedersen, T. (2008). *The constrained politics of the Svalbard offshore area*. Marine Policy. [web source]. Retrieved from <https://www.sciencedirect.com/science/article/abs/pii/S0308597X08000171> Accessed in September 2021.

Pollock, T. (n.d.) *Difference between Structured, Unstructured & Semi-Structured Interviews*. [web source] Retrieved from <https://www.oliverparks.com/blog-news/the-difference-between-structured-unstructured-amp-semi-structured-interviews> Accessed in September 2021.

Ramboll. (2017) *Sustainable Society Development in Arctic Cities*. [web source]. Rertieved from https://ramboll.com/-/media/images/rgr/lets-talk-megatrends/arctic/report_sustainable-society-development-in-arctic-cities.pdf. Accessed in September 2021.

Rashid, Y., Rashid A., Warraich, M. A., Sabir, S. S., Waseem, A. (2019). *Case Study Method: A Step-by-step Guide for Business Researchers*. International journal of Qualitative Methods. University of Alberta.

Rega, C., Bonifazi A. (2020). *The rise of Resilience in Spatial Planning: A journey through Disciplinary Boundaries and Contested Practices*. Department of Civil Engineering Sciences and Architecture, Polytechnic University of Bari, Italy.

Sadeleer, N. (2007). *Implementing the precautionary principle*. Routledge.

Scheffer, M. (2009). *Critical Transitions in Nature and Society*, Princeton NJ: Princeton University Press.

Spitsbergen-Svalbard.com (2020). *History of Svalbard: The Svalbard Treaty*. [web source] Retrieved from <https://www.spitsbergen-svalbard.com/spitsbergen-information/history/the-spitsbergentreaty.html> Website accessed in July 2021.

Statkraft (2018). *Fornybar energiforsyning til Svalbard – Longyearbyen*. [web source]. Retrieved from https://www.statkraft.com/globalassets/explained/svalbard_rapport_0911_final.pdf Accessed in July 2021.

Statistics Norway. (2021). *Population of Svalbard*. [web source] Retrieved from <https://www.ssb.no/en/befolkning/folketall/statistikk/befolkningen-pa-svalbard> Accessed in September 2021.

Stephen, K. (2018) *Societal Impacts of a Rapidly Changing Arctic*. Current Climate Change Reports. pp.223–237. [web source] Retrieved from <https://doi.org/10.1007/s40641-018-0106-1> Accessed in September 2021.

Svalbard Global Seed Vault. (n.d.) *Our Purpose*. Retrieved from <https://www.seedvault.no/our-contribution/our-purpose/> Accessed in September 2021.

Sysseimesteren. (n.d.) [web source]. Retrieved from [sysseimesteren.no](https://www.sysseimesteren.no). Accessed in September 2021.

The Svalbard Treaty (1920). [web source] Retrieved from lovdata.no/lov/1920-02-09
Accessed in September 2021.

Ulfstein, G. (1995). *The Svalbard treaty: From terra nullius to Norwegian sovereignty*. Oslo. Scandinavian University Press.

UNIS. (n.d.) *Arctic Safety Centre*. [web source] Retrieved from <https://www.unis.no/arctic-safety-centre/> Accessed in July 2021.

van Buuren, A., Driessen, P. P. J., van Rijswijk, M., Rietveld, P., Salet, W., Spit, T., & Teisman, G. (2013). *Towards adaptive spatial planning for climate change: Balancing between robustness and flexibility*. Journal for European Environmental & Planning Law. [web source] Retrieved from <https://doi.org/10.1163/18760104-01001003> Accessed in July 2021.

Visit Svalbard. n.d. *The Master Plan: Destination Svalbard Towards 2025*. [web source] Retrieved from <https://en.visitsvalbard.com/dbimngs/Fact%20sheet%20Masterplan%20.pdf> Accessed in August 2021.

Willows, R.I., Connell, R.K. (2003). *Climate adaptation: Risk, uncertainty and decision-making*. UKCIP, Oxford.

Wright, O. (2021). *World is warming up faster than we feared, warns UN*. [web source]. Retrieved from <https://www.thetimes.co.uk/article/world-is-warming-faster-than-we-feared-warns-un-kd6f5zp3s> Accessed in September 2021.

Yin, Robert K. (2015). *Case study research: Design and Methods*. Sage Publications. London.

Ylvisåker, L. (2020). *Verda Mi Smeltar*. Samlaget.

Åtland K., Pedersen, T. (2009). *The Svalbard Archipelago in Russian Security Policy: Overcoming the Legacy of Fear – or Reproducing It?* [web source] Retrieved from <https://www.tandfonline.com/doi/10.1080/09662830802642470> Accessed in September 2021.

Østreng, W., Eger, K. M., Fløistad, B., Jørgensen-Dahl, A., Lothe, L., Mejlænder-Larsen, M., & Wergeland, T. (2013). *Shipping in Arctic waters: A comparison of the northeast, northwest and trans polar passages*. Berlin. Springer.

7.1 FIGURES

Cover picture. Haugen, Longyearbyen. Photograph by Laura Nurmi

Figure 1. Map of Longyearbyen. Safety zone marked in pink. Retrieved from Visit Svalbard.

Figure 2. The elusive border between the urban and the wilderness. Photograph by Laura Nurmi

Figure 3. A diagram of my study process. Own illustration.

Figure 4. The planner's triangle. Own illustration, based on Scott Campbell's (1996) vision.

Figure 5. A diagram of stakeholders in Svalbard. Own illustration.

Figure 6. Longyearbyen seen from Platåfjellet. Photograph by Laura Nurmi

Figure 7. Map of Management Area 10 by Norwegian Polar Institute

Backcover picture. Sukkertoppen and avalanche protection fences. Photograph by Laura Nurmi

