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Safety in the High-Arctic

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Longyearbyen, the northernmost city in the world located in Svalbard, experiences the highest global impact of climate change. The city's population is diverse, comprising approximately 40% non-Norwegian and 60% Norwegian inhabitants. Despite extreme weather conditions and significant seasonal variations, residents maintain their daily lives in this remote area. This study explored the sense of safety among Longyearbyen's population through qualitative interviews and grounded theory analysis. We identified a core category: sense of vulnerability, and two main categories: social safety and physical safety. Social safety was influenced by strong community bonds yet threatened by new regulations that create divisions between Norwegian and non-Norwegian residents, fostering an in-group and out-group dynamic. Physical safety concerned arise from increasing natural hazards and the vulnerability of the city's infrastructure. Overall, while residents generally feel safe and enjoy living in Longyearbyen, there is a growing awareness of both social and physical safety hazards.

Keywords: High-Arctic, social safety, physical safety, vulnerability, societal safety.

1. Introduction

Longyearbyen is the northernmost city in the world situated at 78 degrees north in the Svalbard archipelago. In Longyearbyen, approximately 2500 inhabitants are living and working (Statistics Norway, 2024). In this high Arctic area, the conditions are at times challenging. The operational conditions on Svalbard are significantly influenced by its extreme Arctic environment. Key factors include: severe weather conditions such as low temperatures and strong winds, which impact both infrastructure and human activities; the remote location of Svalbard, which adds complexity to logistics and emergency response efforts; and the fragile Arctic ecosystem, which necessitates stringent environmental protections to preserve its unique biodiversity. These challenges require comprehensive safety measures and robust risk management strategies to ensure sustainable and safe operations in this harsh and sensitive region (Albrechtsen & Indreiten, 2021).

At the same time, Svalbard is a unique place to live with its high Arctic nature making it a great place for outdoor experiences and being close to nature. The changing environments throughout the year, with the midnight sun during summer and the polar nights during winter makes it a place

suited for people who can handle such extreme differences through the year.

In Svalbard the population is gender balanced as about 50% are male and 50% female. However, it is an international population where about 60% are Norwegians and about 40% are from other places in the world, mainly Europe, Asia and Africa (Statistics Norway, 2024). Additionally, there is a high turnover of inhabitants and the past five years more than 2400 people have moved to Svalbard, while more than 2300 people have left during the same period (Statistics Norway, 2024). Median stay time for the Norwegian population was 3,6 years in 2022 (Statistics Norway, 2022). This makes it a varied, complex, and unstable community with respect to its population.

Moreover, Svalbard is the region on Earth experiencing the most rapid and pronounced climate changes. For instance, the scale of glaciers retreats are enormous due to a region experiencing a warming up to seven times faster than the global average (Tian et al., 2025). This rapid transformation has recently rendered Svalbard an intriguing case study for examining how societies adapt to environmental changes. (e.g. Meyer, 2022; Winter & Gudmestad, 2023)

From the above description, one can see a potential for people in Svalbard to feel unsafe. To what degree this is the case is what we investigate with this study. Based on this, the research question is: How is the sense of safety in the population of the high Arctic city of Longyearbyen?

2. Theoretical framework

2.1. Safety

To address how the inhabitants view safety, understanding the diversity of the term safety seems necessary and appropriate. As a field of scientific study, safety lacks established normative criteria. Safety is often defined within the contexts of other disciplines such as psychology, management, and engineering (Le Coze, Pettersen, & Reiman, 2014). The diverse perspectives within safety science makes it challenging to clearly define what safety science entails, leading to multiple definitions of safety. For instance, Civil Aviation defines safety as "the state in which harm to persons or property damage is reduced to and maintained at or below an acceptable level through a continuing process of hazard identification." (Hollnagel, 2014, p. 22). This definition highlights that safety is focused on preventing things from going wrong. Another definition of safety is based on the absence of negative events. For example, "safety is marked by the absence of accidents and incidents" (Hollnagel, 2014, p. 22). This perspective views safety as an epiphenomenon—something that has no effects of its own but is defined by the absence of accidents and incidents. This understanding often links safety to risk, specifically low risk (Aven, 2014). Definitions such as "safety as the absence of accidents, where an accident is defined as an event involving an unplanned and unacceptable risk" (Leveson, 1995), and "a condition such that risk is acceptable" (Sheridan, 2008) further illustrate this view. Thus, the term safety is context dependent—yet still it remains a construct comprising an objective factor and a subjective factor, as it is a physical aspect of what can do harm to people as well as an individual or collective perception of being safe.

Based on theories related to establishing safety culture, such as the high reliability organisation (HRO) theory, mindfulness of the people involved and good communication among them are key concepts. Especially the first three cognitive techniques of mindfulness in the context of HRO theory are relevant for preparedness before an unwanted incident occurs. These are 1) *Preoccupation with failure*, which relates to anticipating potential failures and actively seeking to identify and address small errors before they escalate. 2) *Reluctance to simplify*, which means to avoid oversimplifying complex situations, and recognizing that nuanced understanding is crucial for effective problem-solving. 3) *Sensitivity to operations*, which relates to maintaining a keen awareness of the operations and the real-time conditions affecting them, ensuring that they can respond swiftly to any issue (Weick & Sutcliffe, 2015).

2.2. Societal safety

The Norwegian concept of samfunnssikkerhet is closely linked to societal safety, but has a broader scope. According to Høyland (2018) the term *samfunnssikkerhet* was first introduced in the late 1990's at the University of Stavanger and was first used in governmental documents in relation to the Government

Commission on the Vulnerable Society[a] in 1999. The concept included natural disasters, serious accidents in the transportation sector, and concerns related to vulnerability of complex, dependent, and rapidly changing systems and functions in society (NOU, 2000). The definition of the concept was finally given by the Norwegian Parliament White Paper No 17 (JD2, 2002): "*Samfunnssikkerhet* is used in this white paper to describe the society's ability to maintain critical societal functions, to protect the life and health of the citizens and to meet the citizens' basic requirements in a variety of stress situations (Norwegian Ministry of Justice and Public Security, 2002). The concept of *samfunnssikkerhet* is used in a wide sense and covers safety and security against the whole spectrum of challenges, from limited, naturally occurring events, via major crisis situations that represent a comprehensive threat to life, health, environment and material values, to security challenges that threaten the nation's independence or existence" (Norwegian Ministry of Justice and Public Security, 2002, p. 4). Thus, the concept includes both social and physical safety aspects.

Meld. St. 26 (2023–2024) also called Svalbardmeldingen published May 31st 2024, addresses societal safety on Svalbard. It emphasizes the importance of maintaining stability and predictability in the region, given the unique challenges posed by climate change, increased tourism, and evolving security dynamics (Norwegian Ministry of Justice and Public Security, 2023).

2.3. Social safety

Social factors are found to have impact on human health (e.g. O'Connor et al, 2021). The social safety theory explores how and why specific types of positive and negative social experiences are strongly related to human health and behaviour (Slavich, 2020; Slavich et al., 2023). The importance of a sense of belonging has long been recognised within social psychology. According to the social identity theory (Tajfel & Turner, 1979) individuals derive a portion of their self-concept from their membership in social groups. This theory explains how people categorize themselves and others into various social groups, adopt the identity of these groups, and compare their groups with others. This sense of belonging to a group can provide individuals with pride, self-esteem, and a sense of purpose.

3. Methods

This study employed a qualitative research design, with grounded theory (Strauss & Corbin, 1990) serving as the methodological framework for data collection and analysis.

3.1. *Informants and data collection*

Participants were recruited through purposive sampling, a non-probability sampling technique commonly used in qualitative research to ensure that participants have relevant experiences or knowledge of the topic under investigation (Patton, 2015). The inclusion criteria for this study focused on ensuring a diverse range of experiences, including length of residence in Longyearbyen (ranging from new residents to long-term inhabitants), professional occupation (e.g., tourism, research, government, retired coal miners), and level of engagement with local environmental and safety issues. This approach was designed to capture multiple perspectives on both social and physical safety in Longyearbyen, recognizing that these experiences may vary significantly between different demographic and professional groups.

Five participants were selected based on these criteria, representing a broad spectrum of residents. The sample size was sufficient to capture the key themes relevant to the research questions, while allowing for an in-depth exploration of each participant's experiences. Thus, this number aligns with grounded theory's principle of theoretical saturation, where data collection continues until no new themes or concepts emerge from the data (Strauss & Corbin, 1990). Ethical approval was obtained from the Norwegian Centre for Research Data (Sikt), and all participants provided informed consent prior to their involvement in the study.

Data were collected through semi-structured interviews, a qualitative data collection method that allows for in-depth exploration of participants' experiences while providing the

[a] Norwegian: *Sårbarhetsutvalget*, also known as the Willoch Commission / *Willoch-utvalget*

flexibility to pursue emergent themes. Semi-structured interviews are particularly well-suited to grounded theory research because they allow the researcher to adapt the interview guide in response to the participants' responses, ensuring that emerging themes can be explored in greater depth (Brinkmann & Kvale, 2014).

Each interview lasted about 60 minutes and was conducted in-person The interviews were audio-recorded with the participants' consent and transcribed verbatim to ensure an accurate representation of their experiences. The interview guide was designed to cover key topics related to the participants' perceptions of climate change, social safety, physical risks, and community cohesion. Open-ended questions were used to encourage participants to share their personal narratives, allowing for the emergence of rich, detailed accounts that would form the basis of the grounded theory analysis (Brinkman & Kvale, 2014).

This project is an ongoing project and the preliminary results are based on five interviews and more interviews are planned to gain deeper saturation of the analysis.

3.2. *Data analysis*

The analysis followed the procedures outlined in grounded theory methodology, with a focus on the constant comparative method, where each piece of data is compared to others to identify emerging patterns and relationships. The analysis began with open coding, where each interview transcript was reviewed line by line, and initial codes were assigned to describe key concepts. This process was conducted inductively, meaning that the codes were generated directly from the data rather than being predetermined by existing theories or categories (Strauss & Corbin, 1990).

Following the open coding phase, the analysis moved into axial coding, where related codes were grouped into broader categories. For example, the codes related to "loss of community cohesion" and "social fragmentation" were combined under the broader category of social safety, while codes related to "natural hazards," and "infrastructure instability", were grouped into the category of physical safety. The relationships between these categories were then explored to understand how perceptions of social and physical safety were interconnected and how they were influenced by external factors such as climate change and the influx of short-term residents (Strauss & Corbin, 1990).

The final stage of the analysis involved selective coding, where a core category "Sense of vulnerability" was identified. The constant comparative method was employed throughout the analysis to ensure that the emerging theory was grounded in the participants' experiences and that new data were continually compared to existing data to refine the categories and themes.

3.3. *Validity*

There are several approaches to quality in qualitative research. We followed Yardley's (2000) characteristics of validity: (1) sensitivity to context, (2) commitment and rigour, (3) transparency and coherence, and (4) impact and importance.

4. Results

The grounded theory analysis of the five interviews conducted with residents of Longyearbyen revealed one core category: "sense of vulnerability", and two main categories: "social safety" and "physical safety" (see Table 1). These categories encapsulate the complex ways in which climate change and socio-economic transitions have altered residents' perceptions of safety, both in terms of their immediate physical environment and the broader social fabric of the community.

Table 1. The core and main categories and of sense of safety in Longyearbyen.

Core category	Main categories	Subcategories
Sense of vulnerability	Social safety	(1) Loss of community cohesion (2) Regulatory control and local disempowerment
	Physical safety	(1) Increased awareness of natural hazards (2) Infrastructure instability

4.1. *Sense of vulnerability*

The core category was the residents' "Sense of vulnerability", which was shaped by social

changes and environmental uncertainties. This sense of vulnerability arose from several factors, including changes in social structure, and increasingly unpredictable physical conditions. These elements created an uncertainty that affected the residents' daily lives and their sense of safety and stability.

4.1.1. *Social safety*

Social safety in Longyearbyen has been significantly affected by the influx of tourists, researchers, and short-term workers, leading to a sense of social fragmentation among long-term residents. Participants expressed concerns that the close-knit community that once characterized the town is slowly dissolving, replaced by a more transient population with little commitment to the long-term welfare of the community.

Loss of community cohesion: One of the most frequently discussed issues was the loss of community cohesion. Long-term residents, particularly those who had been in the town for more than a decade, lamented the erosion of social ties and mutual support systems that had historically made Longyearbyen feel like a safe, close-knit community. One participant, who had lived in the town for over 20 years, explained:

> *We knew absolutely everyone in the town. If you needed help, there was always someone nearby who you could rely on. Now, I can sit on the plane or walk down the street and not recognize anyone. (Participant 3)*

The rapid influx of tourists and short-term residents, driven by the growth of the tourism and research industries, has weakened the informal social networks that once defined the community. Many long-term residents reported feeling a sense of alienation from the newer residents, who are often only in the town for a few months or years and therefore do not invest in building strong social ties. As one participant put it:

> *Tourists come and go, and now it feels like some of them are moving here, not to live, but to take what they can get and leave. It doesn't feel like we're building something together anymore. (Participant 5)*

This shift in the town's social composition has also led to a sense of loss of identity for many long-term residents, who feel that the town's historical connection to coal mining and its "pioneer spirit" is being replaced by a more consumer-driven economy focused on tourism. The cultural dislocation that accompanies this change has further deepened the divide between long-term residents and newcomers, creating tensions around issues of community involvement, environmental responsibility, and local governance.

Regulatory control and local disempowerment: Participants also expressed concerns about increased governmental control and the resulting sense of local disempowerment. Longyearbyen's unique status as a Norwegian territory with limited local governance means that many key decisions concerning the town's future—particularly those related to climate change and economic development—are made by national and international entities. Several participants felt that their voices were not being heard in important decisions about the town's development, particularly related to foreigners in Longyearbyen but also in the context of tourism and environmental protection:

> *There are so many rules coming from the government that don't make sense for us here. It feels like they are treating Longyearbyen like it's just another town in Norway, but it's not. The situation here is so different, but we don't have much say in the decisions that affect our lives. (Participant 1)*

This sentiment was particularly strong among long-term residents who had lived in the town during its coal-mining heyday and felt that the transition to a tourism economy was being driven by external forces without adequate consideration of the town's historical identity and the needs of its permanent residents. The feeling of local disempowerment has contributed to a growing sense of social insecurity, as residents feel increasingly disconnected from the decision-making processes that affect their everyday lives.

4.1.2. *Physical safety*

This category relates to the increasing risks posed by natural hazards, particularly those associated

with climate change. The unpredictability of the environment, driven by rapid warming and thawing permafrost, was found to heightened concerns about avalanches, landslides, and infrastructure stability.

Increased awareness of natural hazards: Participants consistently reported that their awareness of natural hazards had increased in recent years, particularly following the 2015 avalanche, which killed two people and destroyed several homes in Longyearbyen. Many participants described how the event had fundamentally changed their relationship with the landscape, making them more cautious and vigilant in their daily lives:

> *Avalanche danger is something we're much more aware of now. We check the forecasts all the time, and you learn to avoid certain areas during the winter months. (Participant 2)*

The unpredictability of these hazards has made it difficult for residents to feel safe in their environment, particularly as the climate continues to change. Several participants described feeling a sense of vulnerability to the elements, as even the most up-to-date technologies for predicting avalanches and landslides could not entirely mitigate the risks:

> *We have apps and alerts, but you never really know when something might happen. The weather here can change so quickly, and sometimes the technology isn't enough to give us a real sense of security. (Participant 5)*

Infrastructure instability: The thawing of permafrost was another frequently discussed issue, with several participants noting that the stability of buildings and infrastructure in Longyearbyen had been affected by climate change. As the permafrost thaws, the ground beneath buildings and roads becomes unstable, leading to cracks in foundations and other structural damage. One participant, who worked in construction, described the challenges of maintaining infrastructure in such unpredictable conditions:

> *We're constantly having to repair things that were built on permafrost. The ground shifts, and suddenly you have cracks in buildings, pipes bursting. It's a never-ending battle to keep things stable. (Participant 4)*

This instability has increased the sense of physical insecurity for many residents, who worry about the long-term sustainability of the town's infrastructure as climate change accelerates. The costs of maintaining and adapting infrastructure to the changing environment are also a growing concern, particularly as the tourism economy does not provide the same level of stable funding that coal mining once did.

5. Discussion and conclusion

The high Arctic is a remote place with extreme weather, hazardous environment, and the highest level of temperature rise and climate changes in the world. Thus, looking at the northernmost society in the world, our research question was: How is the sense of safety in the population of the high-Arctic city of Longyearbyen?

The findings suggested that the inhabitants of Longyearbyen separate the social and the physical safety. Regarding the social safety, changes in rules and regulations has provided a more unstable social connection between inhabitants that are Norwegian and inhabitants that are non-Norwegians.

In 2022, it was decided that the foreign population would no longer have the right to vote in elections for the local government of Svalbard, as they had since 2002, unless they had lived for three years in mainland Norway (Royal Resolution, 2022). This created an in-group and out-group, and an exclusion of foreign citizens who have lived in Longyearbyen for several years and are part of the local community. From a safety perspective, it is important to include as many viewpoints as possible when making decisions This is related to the cognitive technique of reluctance to simplify. This principle emphasizes the importance of a large variety of of perspectives in order to avoid over-simplification (Weick & Sutcliffe, 2015). Additionally, in such a remote and vulnerable community as Longyearbyen, there is a strength in the competence that the foreign population brings to the town. Everyone is needed on an Arctic island far away from everything when a crisis arises. Thus, everyone is also needed when planning and

making decisions for preparedness. A sense of not belonging in a group or being held from basic rights such as the right to vote, could result in negative feelings (Slavich, 2020; Slavich et al., 2023) From a safety perspective worst case scenario, hazardous actions could emerge from a feeling of not being accepted.

Another important part of this is the social safety where people know each other well and are part of a common community. In a remote place like Longyearbyen, or Svalbard in general, this is especially important. Excluding about 40% of the population from political decisions therefore also affects the social safety in the community by creating an in-group and out-group at the system level (Tajfel & Turner, 1979).

The short collective memory of Longyearbyen was also raised as a concern. When changes occurs quickly but history and local knowledge dissipates due to change of inhabitants and the transition from coal to tourism and research (cf. regulatory control and disempowerment), this could be considered a safety hazard, as knowledge valuable to the management of hazard may be lost. Furthermore, it is not in accordance to the HRO theory of how to build a safety culture, as the municipality will not get input from all the "front line workers" who can be said to be the inhabitants of Longyearbyen (Weick & Sutcliffe, 2015).

The physical environment has changed in Longyearbyen over the past decades, and the natural hazards have increased due to the melting of glacierd, reduction in sea ice, thawing of permafrost and decreasing snow cover, or cryospheric changes as they are called. These hazards have made the locals change. However, as our findings suggests, the climate changes have also created tension as the environmental responsibility sometimes makes life harder with less freedom and more regulations for the locals, as in other settlements of the Arctic (Hovelsrud et al., 2012).

All in all, the residents in Longyearbyen seems to enjoy their time there and enjoy the great possibilities of rich wildlife and outdoor activities. However, there is a growing awareness of safety in the society, regarding both the social and the physical aspects, as the world is changing both politically and environmentally due to climate change.

Author contribution

GBS had the overall responsibility and coordinating role of the process. GBS and JB conducted and coordinated the data collection, GBS and ILK conducted the analysis, and GBS, ILK, JRV and MSL contributed to the conceptualisation and writing process.

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