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Exploring the gap between top-down sustainability objectives and perceived local sustainability challenges – the case of Senja Municipality

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Preface

This master's thesis marks the end of my master's degree in Fisheries and Aquaculture science at the Norwegian College of Fishery Science. These years have brought forth educational and exciting experiences, yet also challenging ones.

I wish to thank my main supervisor, Signe A. Sønvisen, and co-supervisor, Jahn Petter Johnsen, for their invaluable feedback, advise, patience, and inspiration throughout this journey. The time and efforts you devoted to guiding me are truly appreciated.

I would like to express my gratitude to all the stakeholders who participated in the workshops. Without your contributions, this thesis would not have been possible.

I also wish to express a special thanks to SINTEF Ocean for allowing me in on the Coastal Squared project, and to the SINTEF Nord office, where I have engaged in insightful and motivating discussions.

Last, but not least, I wish to send kind regards to my closest friends and family for their endless support and motivation.

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Ina Helene Ahlquist

Abstract

Achieving social, environmental, and economic sustainability has become the aim of nations and organizations across the globe. One of the attempts to operationalize sustainability is through the integration of the sustainable development goals in coastal governance. However, the perceived characteristics of challenges for sustainability, and thus also solutions to them, may differ depending on the point of view, and there may be a gap between perceptions of sustainability at different levels. Since perceptions of sustainability are shaped by how people interact with and understand the system they are part of, local key stakeholders were engaged at a specific local level, Senja Municipality, to explore local perceptions of sustainability. The stakeholders provided information about the context, including what they regarded as the conditions and limitations under which local sustainable development takes place.

Working towards sustainability is challenging in cases where governance efforts are not perceived as contributing to sustainability at the local level. In the case of Senja, local stakeholders arguably perceived their system as an SES where a more sustainable development could be found as compromises within environmental, social, and economic aspects, depending on the context. It concerned trade-offs where steps must be taken to reduce or hinder irreversible measures that later will be regretted. This has implications for local governance through how identifying sustainable compromises, therefore, becomes a governance challenge and a question about which processes and governance mechanisms are needed to do so. A result of shortcomings in managing the gap between top-down sustainability objectives and perceived local challenges for sustainability is that overall sustainability may be limited.

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1 Introduction

> For the world to reach sustainable development goals within 2030, all parts of society must contribute. In practice, this means that as a citizen, politician, business manager, or decision-maker one must constantly question whether activities, decisions, projects, and productions one wishes to undertake contributes to social, environmental, and economic sustainability. All three dimensions are equally important. (Meld. St. 40 (2020-2021), p. 8)

Achieving social, environmental, and economic sustainability has become the aim of nations and organizations across the globe. One of the attempts to operationalize sustainability is through the integration of the sustainable development goals (henceforth SDGs) in coastal governance (Meld. St. 40 (2020-2021)). However, challenges may arise when different perceptions of *sustainable* governance exist. That is, all parts of society do not share the same perception of what sustainability entails, yet all parts of society are entailed to evaluate the sustainability or success of governance outcomes. This means that although coastal governance aim to achieve sustainable governance (Meld. St. 40 (2020-2021)), there exists no one agreed-upon way to solve sustainability problems, and no one-size-fits-all when it comes to pathways to sustainability (Jentoft & Chuenpagdee, 2009).

Coastal governance has been defined as a wicked problem (Jentoft & Chuenpagdee, 2009). That is, coastal governance problems are difficult to define, tend to reappear, cannot be solved permanently, and are not easily delineated from other problems. They can be connected to other and larger challenges within or across the environment, economy, and society. They appear in what we call social-ecological systems (henceforth SESs), where nature and society are understood as coupled systems. Regardless of the scale, challenges within SESs are contextual and unique since their causes and effects are shaped by context. Therefore, their solution cannot be found by applying any ultimate test proving true or false,

good or bad, or even whether an issue is solved. This is a result of the presence of too many and often opposing interests and opinions (Rittel & Webber, 1973).

In Norwegian coastal governance, the wickedness is attempted to be solved by handling complexity through a process of creating specific governance objects. These objects include, for example, coastal space, fish stocks, or vulnerable areas. By defining specific properties (e.g., number of fish) of these objects, they can be used to define measures to guide or direct human behavior. Such measures can be, for example, procedures to allocate locations for aquaculture production or fish quotas (Johnsen, 2017; Solås, 2014, pp. 2-8, 25-27). However, when new elements with wicked characteristics, for example the inclusion of more abstract SDGs, are added to what coastal governance must include, the existing coastal governance procedures become insufficient.

As the quote at the beginning alleges, all levels of society must contribute to work towards sustainability goals. However, and just as with the perception of sustainable governance, the perceived characteristics of these problems, and thus also solutions to them, may differ depending on the point of view, and there may be a gap between perception and understanding at different scales (Jentoft & Chuenpagdee, 2009). Therefore, proper understanding of what is regarded as challenges is essential to address them at the appropriate level. For example, some challenges need to be managed at a local scale while others hinge on higher levels of government. In Norway, the management of resources have a history of being solved politically and through participation and negotiations (Buanes et al., 2004), resulting in the specific instrumental procedures I mentioned above. However, these negotiations and the instrumental outcome from them rely on understanding the challenges in question, and must take place at the correct level. In the case of sustainability, this includes understanding the characteristics of the sustainability challenges at hand, and how these characteristics are perceived at different levels of society and by different stakeholders. If local sustainability challenges and their characteristics are not well understood, this may limit sustainable development.

In this thesis, I will explore how sustainability issues are perceived and understood at a specific local level, Senja Municipality, through engagement of local key stakeholders. The stakeholders may provide information about the context, including what they regard as the

conditions and limitations under which local sustainable development takes place. Furthermore, I will discuss how the perceived challenges impact the local governance system and how and where they may be handled. Therefore, the two overarching research questions of this thesis are:

What are perceived as the main challenges for sustainable development by local stakeholders in Senja?

How do these challenges affect the local governance system?

The overarching questions are answered through three sub-questions:

i) How do local stakeholders in Senja perceive sustainability?
ii) What do these stakeholders consider as the main challenges for sustainable development in Senja?
iii) How can these challenges be addressed in accordance with local perceptions of the challenges?

The investigated system is "infinitely" connected to other and larger systems, but this study will mainly focus on the social-ecological settings within the governance area of Senja Municipality, i.e., areas on land including watercourses and in the sea out to one nautical mile outside of the baseline (Plan- og bygningsloven, 2008, § 1-2). This way, it becomes possible to uncover topics that require attention to facilitate a more targeted and evidence-based approach to policy-making, thereby promoting long-term sustainability. The applied methodology and results will contribute with local stakeholders' knowledge of the main challenges for sustainable economic development in Senja.

This thesis is structured as follows. In chapter 2 Theory relevant theories and terms will be presented, elaborating on systems thinking, SESs, interactive governance theory, and sustainability. In chapter 3 Methods, the chosen approach to investigate local perceptions of sustainability challenges will be presented, i.e., through thematic content analysis and application of interactive governance theory. In chapter 4 Description of context and case, the relevant information about the governing systems and system-to-be-governed will be presented. In chapter 5 Results, the findings from the thematic content analysis of workshop discussions are presented and structured inspired by interactive governance theory. In chapter 6 Discussion, the results will be discussed in light of existing theories and relevant literature,

aiming to address the research questions, while also summarizing the findings. Last, in chapter 7 Conclusion, concluding remarks are made.

2 Theory

This chapter will present the theoretical framework and the central concepts that are used in the thesis. To identify what needs to be prioritized to improve sustainability in a governance system, an assessment of what sustainability entails and what limits the achievable sustainability will be presented. In this thesis, I approach Senja as part of an SES.

2.1 Systems thinking and social-ecological systems

A system is defined as something consisting of parts or items regularly interacting as a unified whole (Ford, 2019; Merriam-Webster, n.d.). However, a system is more than its parts as a result of being interconnected. Applying systems thinking therefore entails using methods and approaches that recognize a system's behavior, patterns, or structure by investigating its dynamic relationships and feedback loops (Ford, 2019). This includes recognizing the connections within and between systems at different scales. The system that is approached in this thesis is a human-nature coupled system (i.e., an SES) made up of social-ecological components. Human-environment or social-ecological components include, among other elements, plants, animals, currents, temperature, institutions, culture, and stakeholders, and how they are connected. Within the global SES, there are myriads of subsystems at different levels (e.g., national, regional, and local SESs) that affect each other (Jentoft & Chuenpagdee, 2009).

Furthermore, an SES can consist of many ecological systems and many social systems concurrently. These subsystems can be difficult to separate from each other as they connect directly or indirectly within an SES (Colding & Barthel, 2019). However, a rough categorization for analysis purposes can, for example, divide natural components (e.g., plants, currents, fish) into ecological subsystems and social components (e.g., citizens, businesses, and institutions) into social subsystems. Yet, applying a SESs perspective entails considering people and nature together as linked subsystems that develop together and affect each other. Due to the systems' connectivity across scales and levels, it can be useful to approach them as complex and adaptive SESs. Therefore, for example, successfully addressing governance issues hinges on acknowledging attributes that are not observed in simple systems (e.g., how and why connectivity across scales can make it challenging to establish boundaries for regulatory purposes) (Berkes, 2017). Moreover, SESs are governed from within social subsystems (e.g., by a municipal administration or national government). Efforts to govern an

SES, in turn, must be targeted at the human or social part of the system, while still recognizing the interplay between social, ecological, and economic factors.

In this thesis, I investigate an SES connected to the coastal parts of Senja. This includes looking into social-ecological components that can be found within the geographical area of Senja, yet that may extend beyond the area in Senja. For instance, this includes migratory fish stocks that seasonally can be located in Senja. Approaching Senja as an SES makes it possible to study linkages between ecological and social systems. Identifying development challenges and governance solutions through an SES lens thus entails looking for solutions that combine ecological and social elements and recognize how they connect within and outside of Senja. This may arguably facilitate more ecosystem-based management and promote long-term sustainability (Colding & Barthel, 2019). Furthermore, by analyzing and discussing the main challenges for sustainability in a local SES through the lens of interactive governance theory, it may be possible to capture the uniqueness of challenges and facilitate socially just, tailor-made, and effective solutions (Jentoft & Chuenpagdee, 2009).

2.2 Interactive governance

Governance is a continuous process. It includes governments and what they do, but also efforts made by stakeholders (e.g., private businesses, organizations, universities, local citizens, researchers, media, etc.) individually or collectively with the government to solve societal problems, generate synergies, or co-create norms applicable to the social-ecological settings in question. It concerns the implementation and revision of stated goals, but also a reflection of goals and their background (e.g., values, norms, and principles shaping these goals). Governance changes over time and occurs internationally, nationally, regionally, and locally. It can be conflictive, but most often interactive and cooperative. For example, stakeholders may try to find solutions that are beneficial for more than just themselves based on consultations between them, or they may establish strategic networks (Jentoft & Chuenpagdee, 2009).

Interactive governance theory (henceforth IGT), as presented by Jentoft and Chuenpagdee (2009) based on Kooiman (2003), has SESs as a point of departure. Although the governance system can be perceived as an SES, IGT sees the governance system as made up of three subsystems. These are the governing system (henceforth GS), the system-to-be-governed (henceforth SG), and the governing interactions (henceforth GI) between the two first. The

GS includes policy-making, decision-making, and administration, and is what governs the system-to-be-governed. The SG is the system that is subject to being governed and includes, for example, local stakeholders and nature. The GI includes top-down and bottom-up governance, but also more specific interactions such as regulations or the sharing of knowledge (Jentoft & Chuenpagdee, 2009; Johnsen, 2013).

Furthermore, IGT suggests that the three subsystems have four inherent characteristics: diversity, complexity, dynamics, and scale (Figure 1). Diversity relates to the components that make up the SES in question and can be different within the subsystems (GS, SG, and GI). The components are the physical elements in the system, and the diversity is decided by how many there are and their characteristics (e.g., function, capabilities, rarity, similarity). Following definitions of SESs and IGT, in a coastal system, components can be both social and ecological. They are, for example, specific habitats or stakeholder groups (Jentoft & Chuenpagdee, 2009).

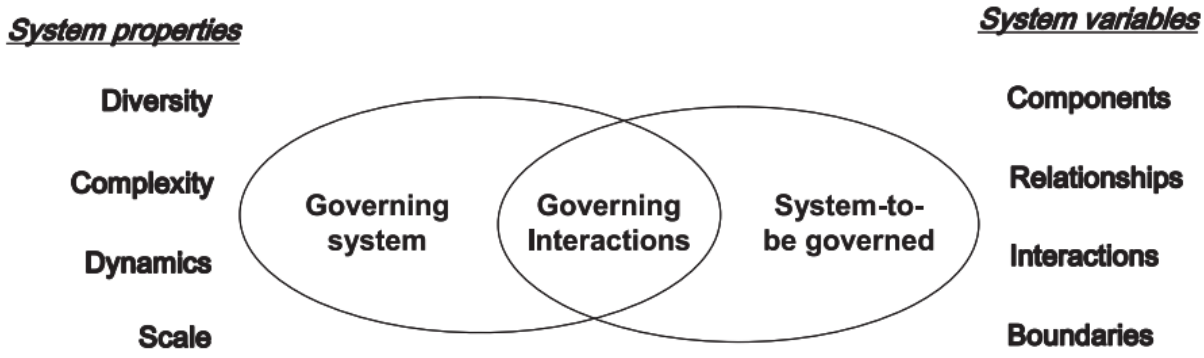

Figure 1 - Governability assessment framework as graphically presented by Jentoft and Chuenpagdee (2009).

Complexity arises from the relationships between components in the system and how these relationships shape the system. For example, individuals may relate to each other by collectively wanting to manage resources and thus create a community or an institution. Relationships can also be seen, for example, between stakeholder groups such as fisheries and aquaculture, where they can be conflictive or cooperative (Jentoft & Chuenpagdee, 2009). Dynamics depend on how components within the system influence each other, parts of the system, or the system as a whole through interactions. Interactions are, for example, how stakeholders and government communicate, such as participation in governance, or by which

means a GS contributes to increase overall knowledge in a community (Jentoft & Chuenpagdee, 2009). Scale relates to boundaries, which in this sense are spatial. They can identify groups or subsystems. For example, the scale of a small fishing community or a large-scale fishery may be determined based on how far the fishing vessels can go and how far the consequences from the fisheries extend (Jentoft & Chuenpagdee, 2009).

According to IGT, governance may experience that the diversity of a system makes it so that there is no one-size-fits-all solutions. When this happens, conventional top-down governance approaches may not suffice. Consequently, IGT identifies it necessary with evidence-based decision-making that is built on local knowledge to foster contextually appropriate decisions. Furthermore, as complexity within a system increases, governance must learn about how relationships within the system can facilitate or hinder achieving the desired system state. Additionally, to be able to govern a system it is necessary to understand the system's dynamics, more specifically within the SG and GS, that is, how interactions within and between the systems "affect the ability to govern and the overall quality of governance". Interactions mostly happens at the border or in overlapping areas in terms of spatial and temporal distribution of system components. To successfully govern a system, these boundaries need to be defined (Chuenpagdee & Jentoft, 2013, p. 38). However, issues may arise, for example, when more than one governing body is responsible for the same system or when a mismatch in objectives exists between the GSs and the SG (Jentoft & Chuenpagdee, 2009).

In SESs and governance systems, ecological, economic, and social goals can be contradictory, limiting the achievement of each other. Coastal governance is therefore faced with the challenging task of trying to find solutions to issues that do not have any one obvious solution (Chuenpagdee & Jentoft, 2013, pp. 34-35; Jentoft & Chuenpagdee, 2009). Since the wicked problems that coastal governance aims to solve are context-specific, the governing solutions also need to be unique to properly address them (Jentoft & Chuenpagdee, 2009). This knowledge is held by scientists, governors, locals, and so on, *together*, and not separately. In other words, there are no specialists or experts in the system, as the knowledge necessary to tackle problems is distributed among people interacting with and being part of the system (Rittel, 1972). Also, gathering knowledge about challenges and solutions from "those who know" may facilitate increased participation and ownership in decision-making

while improving efficiency and legitimacy in decision-making processes (Edelenbos & van Meerkerk, 2016, pp. 4-6).

Additionally, sharing this knowledge, e.g., the knowledge held by people living and working in the area, also known as local knowledge, can be of high value for governors as well as scientists and local stakeholders themselves. For example, by bridging local and expert knowledge and making it available for policy-makers, it is possible to have more evidence-based decision-making (Fraser et al., 2006). Furthermore, even though stakeholders may not agree with management decisions, they may be more inclined to comply with or embrace governance outcomes if they actively participated in the decision-making, as the active involvement can generate ownership to the decisions (Jentoft & Chuenpagdee, 2009).

2.3 Sustainability

Sustainability is a general and abstract concept. The Brundtland Commission's definition of development being sustainable is when it "meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987, p. 16). However, such an overarching and holistic formulation can fall short of suggesting what sustainability entails or which efforts that are necessary to achieve sustainability. Another frequently applied description is the *triple bottom line* that gradually emerged from social, economic, and environmental perspectives. Consensus is that sustainability applies to the state of the environment, society, and economy, and is found somewhere within these three dimensions or "pillars". On the other hand, it is not explicit what each of these pillars entails or which trade-offs should be made between them for something to become the most sustainable (Purvis et al., 2018).

The term sustainability is not fixed as it changes depending on perception and context. Factors such as values, time frame, knowledge, options (e.g., available technological solutions), scale, and objectives affect the view of what sustainability means. In one situation, sustainability may be when barriers to economic growth are removed, whilst, in another, sustainability may not include economic growth at all (Purvis et al., 2018). It is defined and receives its content from an understanding of progress and processes linked to specific challenges and goals (Kemp & Martens, 2007). For example, something *may* be perceived as sustainable when in line with the United Nations (UN) SDGs, but not necessarily. Perceived key challenges for sustainability globally, nationally, and locally may vary greatly, and the

steps required to work towards sustainability at different scales will therefore not be consistent (Jentoft & Chuenpagdee, 2009).

In this thesis, sustainability is approached as a term defined within a local case based on local knowledge. This is since the abstract perceptions of sustainability in terms of global objectives and goals (e.g., the SDGs) can be made specific with a local case. Because of its characteristics, sustainability cannot be achieved as a "perfect state" but rather measured in terms of continuous progress when solving various sustainability challenges and reaching sustainability goals. In this sense, sustainability becomes a normative concept (Berkes, 2017).

Furthermore, knowledge about sustainability challenges and solutions may be found by engaging those regularly interacting with the system in question. Local knowledge can be deeply rooted into a community's history, culture, and practices. As a result of continuous interaction with the system and having an understanding of progress and processes therein, local stakeholders may provide insights about the environment, resources, and social dynamics that influence sustainability at the local level and facilitate or limit development (MARE, 2005, p. 339). Provided that:

a) local stakeholders hold valuable insights into the interconnections among environmental, social, and economic aspects of development, and
b) the operationalization of sustainability includes removing barriers for locally desirable development,

in a specific case, working towards sustainability could entail addressing locally perceived challenges that limit development.

3 Methods

Five workshops with key stakeholders in the coastal SES in the municipality of Senja (henceforth Senja) were carried out from which the content was analyzed to identify perceived challenges for local sustainable development in a coastal community (Figure 2). First, background research, including a literature review, was conducted. This was followed by stakeholder mapping to identify key stakeholders representing the sectors agriculture, aquaculture, management, marine fisheries, recreational river fisheries, and tourism. Stakeholders from these groups were invited to participate in workshops. A qualitative inductive approach with conceptual mapping was applied in the workshops. The workshops were voice recorded and later transcribed. Thematic content analysis was then applied to the transcriptions to identify key topics related to sustainability challenges. Afterwards, a validation workshop was arranged to validate the findings. Last, to investigate the perceived challenges and potential operationalization of sustainability, the results were analyzed through the lens of IGT.

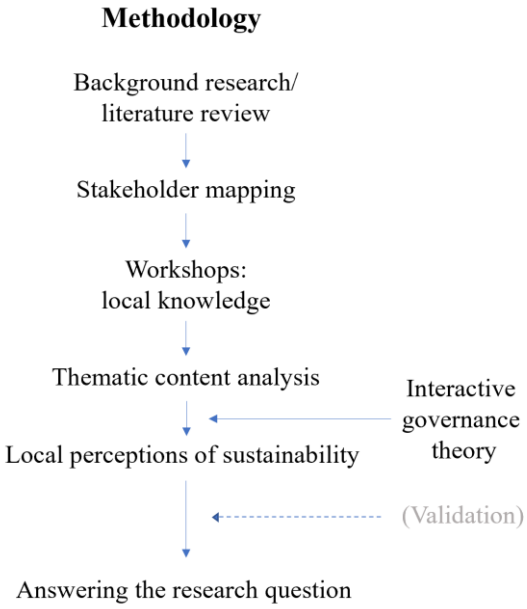

Figure 2 - Model over applied methodology.

3.1 Choice of case study

The purpose of this study was to identify local perceptions of sustainability and challenges by gathering relevant knowledge, analyzing findings, and applying relevant theories. Since the research question related to a local scale, and the challenges in SESs are context-specific, a case area (Senja) was chosen and stakeholders were asked about their perspectives on local sustainability challenges. Engaging with local stakeholders and discussing sustainability challenges provided essential insight on how to work towards improved sustainability based on stakeholders' first-hand experiences with the investigated system. Although being a time-consuming and labor-intensive approach, a qualitative inductive (case study) approach was desirable since the case required an in-depth inquiry (Burnard et al., 2008; Yin, 2012).

Furthermore, areas in the high north are expected to experience significant consequences from climate change and other global drivers (Previdi et al., 2021). This forces industries, governments, and citizens to become more flexible and adaptable to find the best path forward in a dynamic reality, especially in the coastal zone where myriads of ecological and human interactions occur (Buanes et al., 2004). Hence, in the context of sustainability, a specific focus on a coastal area within the Arctic held significant relevance. Furthermore, considering that Norway was among both the lowest and highest-ranking countries in terms of sustainability (Clark et al., 2020; Sachs, 2023, pp. 25, 381), using a case area in Norway may have provided examples of how to further progress in sustainability. However, effectively handling local challenges necessitates a solid understanding of the local level. Senja Municipality, the case, is a coastal municipality in northern Norway and provides a coastal case area in Norway with a local government trying to balance international and national goals with local and regional needs (Senja kommune, 2020), and was highly relevant to the study of local perceptions of sustainability.

3.2 Background research and literature review

The coastal zone has extensive activities and stakeholders in it and is subject to multilevel governance (Buanes et al., 2004; Jentoft et al., 2009). Therefore, background research was carried out to gain an overview of the case of Senja (e.g., characteristics and attributes of Senja such as important industries, priorities in the local government, and main activities). Literature about the case of Senja was gathered by using Google as a search monitor and applying various terms in Norwegian. The searches were multi- and cross-disciplinary,

exploring diverse theories, methodologies, existing research, relevant regulations, sustainability frameworks, governmental reports, industry perspectives (e.g., aquaculture, agriculture, marine fisheries, tourism), UN sources, and social media content shared by the Municipal administration and stakeholders. To further get direction for relevant searches, the head of the seafood industry cluster in the Senja region (Sjømatklynga Senja) was asked about plans and challenges in Senja.

As part of the background research on Senja, the Municipality's official documents were read through. Relevant documents for this study included plans, part of plans, and strategies that had been adopted and were still valid (after 2022). These documents contained the Municipality's intent moving forward. However, proposals under development were excluded, as they had not yet received approval and thus remained susceptible to major changes. Though, one exception was made: Senja was in the process of developing a municipality part-plan for biodiversity which was included as relevant literature due to its relevance to sustainability. The documents that were recognized as most relevant for this thesis were overarching and thus relevant for the whole Municipality. This meant that, for example, detail changes, dispensations, and information about objections and complaints were excluded as they may have only applied to parts of Senja (Senja Kommune, 2023b).

3.3 Stakeholder mapping

To identify relevant stakeholder groups and individuals to provide representative descriptions of the main sustainability challenges, stakeholder mapping was carried out and a power-interest matrix was made to categorize stakeholders (Appendix 1). "Key stakeholders" in an SES change depending on the social, economic, and ecological situation. For example, the components and capabilities of an area, such as its utilizable natural resources, available workforce, or infrastructure, vary as a result of changes in temperature, usage, and funding, to mention some. Thus, economic growth and key players will not be equally distributed across time, areas, industries, or businesses (Buanes et al., 2004). Furthermore, the applied scale is decisive for identifying key stakeholders. On a local scale, a group of fishermen can be a major contributor to local socio-economic activity, and can therefore be identified as key stakeholders. On a national scale, the key stakeholders depend on such as the nation's main economic activities and may be more scattered across sectors and larger geographical areas. However, since the research question in this thesis concerned local challenges perceived by

present stakeholders, those who were identified as key stakeholders were currently part of the local SES and participating in main activities as identified from the background research (i.e., agriculture, aquaculture, management, marine fisheries, recreational river fisheries, and tourism).

In the coastal zone plan for Midt-Troms, which among others includes Senja Municipality, it is stated that:

> The plan covers the marine areas in the participating municipalities, but use and conservation along the coast shall be seen in relation to both sides of the shoreline. (Senja Kommune, 2021)

Activities at sea and on land interact in the coastal zone, and groups and people from both environments can have relevant input in cases concerning this area. Thus, stakeholders both at sea and on land were included as relevant stakeholders for this case study. The identified relevant stakeholders in the case of Senja represented aquaculture, agriculture, marine fisheries (henceforth fisheries), recreational river fisheries, tourism, the Municipal administration and council, and the County administration and council (Table 1). They were identified based on Senja's investment areas (Senja kommune, 2019), previously identified central stakeholders in the existing coastal zone plan for the region (Sørdahl et al., 2017), groups identified in scientific publications using relevant methodologies or analysis (e.g., Buanes et al. (2004), Tiller et al. (2021)), and from various statistics (e.g., employment, value creation).

The study was limited to activities taking place within the Municipality's jurisdiction area. Therefore, only stakeholders with activities within this area were accounted for as *key* stakeholders. Although, activities carried out outside of the area may contribute significantly to, for example, employment or impact on marine life in Senja. However, an exception was made to include members of the County council as they were recognized as relevant due to the County's jurisdiction within Senja, making them a part of the local governing system.

Table 1 - Identified sectors with key stakeholder groups affecting sustainable development in Senja.

Key stakeholders
Agriculture
Aquaculture
Management
Marine fisheries
Recreational river fisheries
Tourism

Specific individuals relevant for workshop participation from each of the identified key stakeholder groups were found through Google searches, governmental documents, the Municipality's webpage, Barentswatch, and the Snowball method (Biernacki & Waldorf, 1981). Search terms, in Norwegian, included, for example, "group representative", "contact person", or "new investment" accompanied by terms for the various sectors and "Senja". Next, the individuals were mapped in a power-interest matrix. A power-interest matrix was used to categorize stakeholders based on their interests and influence toward the research question, which in this study concerned groups or people with interest and/or influence affecting sustainable development in Senja. Mainly stakeholders with high power and high interest were chosen as candidates for workshop participation, although some had high interest and not necessarily high influence (Table 1). This was to invite people expectedly with knowledge of the challenges for sustainability in Senja as well as influence over the operationalization of sustainability in Senja. Candidates from aquaculture, agriculture, fisheries, recreational river fisheries, tourism, the County council, and the Municipal council were contacted via email, phone, or both, and invited to participate in in-person workshops to create an interactive arena facilitating knowledge sharing and learning about the SES they were part of while gathering data about sustainability challenges. Despite contacting and inviting many relevant candidates, few replied.

3.4 Workshops

Five workshops were held in-person in Finnsnes in Senja Municipality in the fall of 2021 for four days with one-two workshops carried out per day. The location was close to the

participants' place of residency as a means to improve participation. The number of participants per group remained few and ranged from one to four (Table 2). Although additional participants could have contributed to broader input on the discussed topics, a small sample is arguably sufficient when applying in-depth analysis to content provided by knowledgeable respondents. The workshops were held in Norwegian.

Table 2 - Number of workshop participants per stakeholder group.

Stakeholder group	Number of participants
Agriculture	4
Aquaculture	1
Management	3
Marine fisheries	1
Recreational river fisheries	3

To capture the range of perspectives from diverse stakeholder groups, the workshops were structured into sectoral divisions, each comprising stakeholders from the specific sectors agriculture, aquaculture, fisheries, management, and recreational river fisheries respectively. Tourism stakeholders were invited to workshops but replied that they either did not have time or desire to participate. Nevertheless, the sectoral division was chosen to facilitate openness and a safe environment to share opinions on main challenges, regardless of who the responsible party contributing to a challenge may have been perceived as (e.g., one of the other sectors). Additionally, challenges of high importance or extent had the opportunity to be brought forth by multiple groups, contributing to painting a fuller picture of the context, which in turn may strengthen the validity of the study (Yin, 2012). On the other hand, the sectoral division may have reduced the number or length of important discussions on topics where groups disagreed as well as limiting knowledge sharing.

The workshops were recorded after participants consented to this in writing. I facilitated the workshops, accompanied by a colleague, which followed the structure of six conversation

starters (Appendix 2, Figure 4). The choice of conversation starters was based on research applying similar approaches (see for example Tiller et al. (2021)). By using conversation starters relevant to the land-sea interface in their investigated case areas, Tiller et al. (2021) managed to capture the impacts of decision-making and various feedbacks, and therefore identify challenges for sustainable development based on interpretation of the collected data from workshops. One of the identified conversation starters relevant for the land-sea interface in Senja was infrastructure as it had been prioritized by the Municipal administration in Senja to facilitate development (Senja kommune, 2019). The conversation starter was used by asking relevant, open ended questions linked to it, for example, "Are there any challenges relating to infrastructure in Senja? If yes, what are they?". This approach may capture the unique perceptions of sustainability in Senja which is being investigated in this thesis.

The conversation starters' purpose was, more specifically, to facilitate continuous conversation by initiating potentially relevant discussions or redirecting the discussions in cases where necessary. For example, if participants felt they had sufficiently elaborated on a topic and there were no other courses in the dialogue leading to a next topic of discussion, a conversation starter would be applied. To reduce unintendedly steering the conversation, the drivers were intentionally made vague and could relate to several concepts (Appendix 2).

To further reduce the impact that my background research could have had on the final dataset, it was made clear that the discussions did not need to revolve around the conversation starters, but that they were suggestions to ignite the conversation. For example, I asked the agriculture stakeholders whether they experienced challenges from climate change, to which they replied that they had no notably worthy experiences that they would define as a consequence of climate change. Therefore, in the data set representing key challenges from the agriculture stakeholders' perspective, "climate change" was not included.

During the workshops, conceptual maps were made to serve as part of the data collection (e.g., Figure 4). A conceptual map resembles a mind map but contains the main elements in a system or subsystem and how these elements connect, related to a discussed topic. In the case of Senja, the six predetermined conversation starters served as the foundation of the map, from which arrows were drawn to stakeholder-identified challenges or topics that were discussed. The arrows between the variables indicated their relationship. For example, when

discussing a topic (e.g., “pollution”), elements within this topic and how they challenge development would be simplified into connected concepts (e.g., “salmon lice” and “traffic light system”) (see Figure 3).

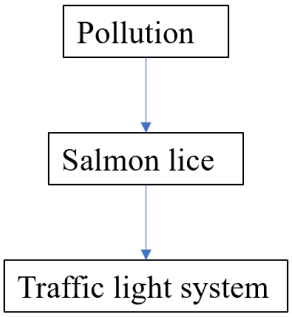

Figure 3 - Example of part of a conceptual map in progress .

Conceptual mapping was chosen as a method to collectively with the stakeholders be able to identify, visualize, and keep track of what the stakeholders regarded as the most important topics relating to challenges for sustainable development in the case area (Figure 4). It served as a tool to visually represent the key variables and their interconnections, potentially contributing to increased learning for participants and myself by presenting the complexity and diversity of the system while having discussions.

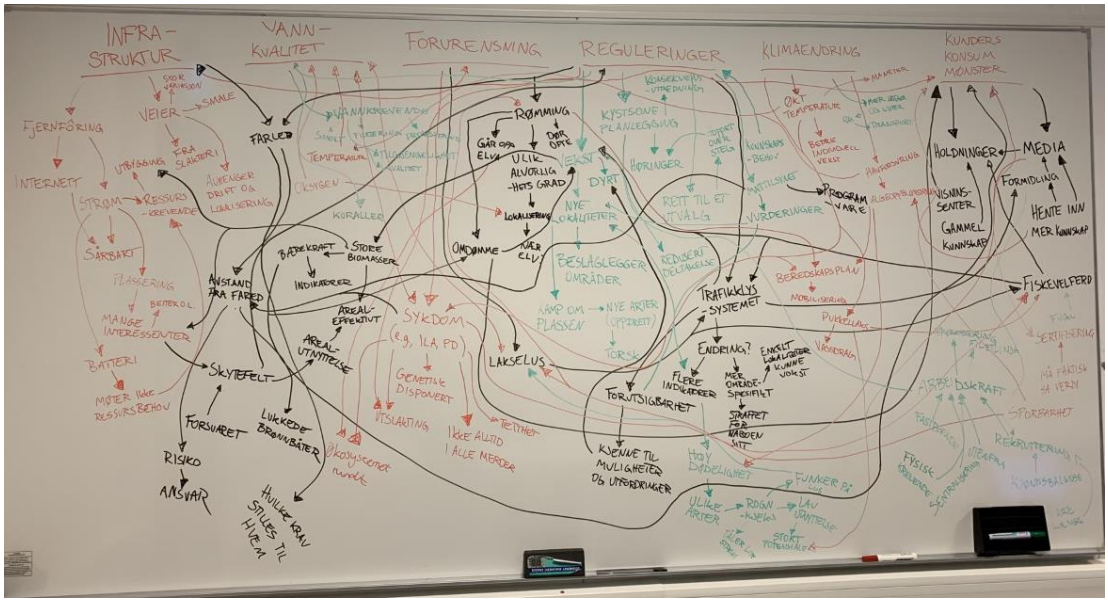

Figure 4 - First draft (in Norwegian) of a conceptual map co-produced with stakeholders during a workshop.

3.5 Thematic content analysis

To analyze the content collected during workshops, first, the voice recordings of the workshops were transcribed. This was carried out manually by writing down the dialogues while anonymizing them (i.e., coding participants as participants 1, 2, 3, etc.). The reason for this, as opposed to taking notes underway or using the maps for analysis, was to make sure that no data got lost (e.g., variables or relationships discussed but not sufficiently written on the whiteboard during discussions), to remember the definitions and descriptions of the challenges, and to reduce the possibility of misinterpretations.

Furthermore, the main variables from each workshop were found by applying thematic content analysis to the transcriptions. Thematic content analysis is an inductive approach developed from grounded theory that aims to identify main themes in data based on formulations, keywords, or short phrases in transcripts. It is therefore a way of categorizing data, often accompanied by examples to present topics, which allows for making sense of the data. The transcriptions were managed “by hand”. This meant reading through the transcripts while taking notes (e.g., highlighting words or make comments in the margins) of short phrases, keywords, and theories used by participants (also known as open coding) (Burnard et al., 2008). For example, challenges occurring as a result of a Pacific salmon invasion would be noted as within the topic “invasive species”. More specifically, the thematic content of

invasive species could be uncovered based on phrases such as one stakeholder saying "the invasion of Pacific salmon challenges the local ecosystem since it displaces Atlantic salmon in watercourses when entering the river". The categories (e.g., "invasive species") were made during analysis based on the workshop content and wording used by stakeholders. This meant that, for example, "invasive species" could have been named "nonnative species". Furthermore, findings such as the suggested phrase about Pacific salmon were used to identify variables that should be merged, removed, or added. Concepts that had the same content or that could be grouped based on their characteristics were merged. For example, the concepts "aquaculture", "fish farming" and "kelp farming" could be merged into the topic "aquaculture production".

Since there were numerous variables relating to challenges of different significance, the twelve main challenges from each stakeholder group were identified based on the transcriptions and thematic content (Appendix 3). The twelve main topics were, more specifically, identified based on recurring mentions, described extent, or described importance. For example, the topic "road quality" was discussed in all workshop sessions and as challenging for sustainable development, and was therefore to be considered as one of the main challenges for sustainable development in Senja.

3.6 Validation

A qualitative data collection approach and interpretation of data is arguably more subjective compared to quantitative approaches. In cases where social reality needs to be described (such as in this thesis), however, there is a common belief that a definite and objective view, and therefore description, does not exist (Burnard et al., 2008). Therefore, the subjectiveness of a qualitative approach as opposed to a quantitative one can be beneficial to use. However, when using qualitative approaches, especially with few data points, challenges may exist relating to such as uncertainty and credibility, precisely due to the subjective character. Therefore, to reduce uncertainties and to improve the credibility of the findings in this study, those who participated in workshops and shared local knowledge about sustainability challenges, which in turn represented local sustainability perceptions, were invited to validate the findings (i.e., the identified main sustainability challenges) in an in-person meeting in Finnsnes. During the validation meeting, discussions were to be about whether the identified key topics and challenges for sustainable development in Senja were interpreted correctly,

agreed upon as key, and if any other topics of high importance were not identified during the initial workshops. However, none showed up for the validation meeting, and the validation was therefore not carried out.

3.7 Interactive governance theory

The further analysis of the findings from the thematic content analysis was inspired by IGT and adapted to the case. According to IGT, challenges may be addressed within a GS, a SG, or GI at different levels depending on the challenges' diversity, complexity, dynamics, and scale (Jentoft et al., 2009). Therefore, inspired by IGT, I looked for where within the SG or GSs challenges for development in the SES in Senja may be addressed based on the discussions of key topics identified through thematic content analysis of the workshop-transcriptions.

Any level of GS that is subject to being governed by a higher level GS will from one perspective also be considered a SG. Concurrently, any SG that contributes to govern, including stakeholders at the local level participating in local governance, will through their actions (or GI) be part of a GS. However, for analysis purposes, the different levels that govern are referred to as the global, national, regional, and local GS, while the SG in this thesis is referring to the local scale including such as local stakeholders and local ecosystems. Yet, in some instances, that which affects a challenge may be outside any level of GSs or the SG's control. Still, measures within different subsystems can be made to affect the outcome of these challenges. In these cases, the perceived challenges were grouped and presented based on highlights from the discussions (e.g., how stakeholder proposed approaching the challenges).

Furthermore, GI may be considered as the efforts to address the wickedness in wicked problems (e.g., spatial division of areas). Although IGT sees GI as one of the three subsystems, in this thesis, I look at the GIs as interactions being developed within and between the two other systems (as illustrated in Figure 1) while choosing to focus on who is in control of initiating or steering the GIs applied to address challenges (local, regional, national, global GSs, and SG). This way, the results in this thesis is identified, categorized, and grouped based on IGT.

3.8 Ethics

This study applied the data collected in the fall of 2021 during the SINTEF Ocean project "Coastal Squared" (project number 322498), which was funded by the Research Council of Norway. The objectives of the Coastal Squared project was to identify opportunities and challenges in coastal and rural areas in northern Norway to use as input data in a decision-support tool, while also serving as the foundation for a Serious game to play with future generations (The Research Council of Norway, n.d.). However, in this study, the data used and analyzed is that focusing on local perceptions of sustainability. The data collection in the Coastal Squared project was carried out by me.

The data was initially collected for the Coastal Squared project, thus the Norwegian Centre for Research Data was contacted to gain permission for the use of the data in this thesis. When collecting data from people it is important to recognize privacy. Therefore, the Norwegian Centre for Research Data was consulted to secure that the data collection and further processing were in line with the European General Data Protection Regulation. This included that the collected data was only to be used as described to the participants, the data be processed confidentially, and that the input provided by the participants shall not be traceable back to the individuals in the mediation of results. An informational letter was created stating the study's purpose and providing contact information in case of questions or if any participants desired to be removed from the study at a later point in time. All participants approved and signed the informational letter before the data collection took place. Furthermore, the project leader for the Coastal Squared project was asked for permission, and consented, to use the data in the context of this thesis.

4 Description of context and case

Sustainable economic growth and innovation have been proposed as solutions to enable and facilitate sustainable societies (Meld. St. 40 (2020-2021)). However, to work towards sustainability, there are barriers in need of being addressed. These barriers, or sustainability challenges, may concern both GSs and SG. As previously described, different governance levels must address challenges depending on their characteristics, which in turn can affect other governance levels as a result of being connected.

4.1 Governing systems

Governing systems exist on various levels and may overlap with other GSs. At the global level, international policy-making and conventions are part of the global GS that operates across state boundaries and often create the basis for how GSs at lower levels will act. At the national level, such as in Norway, the national GS includes, for example, the Norwegian Parliament, directorates, and ministries with different areas of responsibility such as Norwegian fisheries management and environmental management. In Norway, there are three main levels of administration: the national, the regional, and the local level. Some agencies follow the structure of an operative local level, managing and coordinating regional level, and a central directorate at the national level (e.g., the police and the Norwegian Labour and Welfare Administration). However, other agencies work with only two levels of administration to achieve more holistic management and save administrative costs (e.g., the Norwegian Tax Administration) (NOU 2019: 5, pp. 85-86).

The national administration, or the government, plan and investigate, and contribute with expertise and council for the political leadership at the state level. They also handle tasks related to international cooperation (NOU 2019: 5, p. 82), and connect the national and global GSs. The national GS decides the frames for how activities can be carried out in Norway through, for example, formulation of laws and objectives and demanding results from lower levels of government. Although being subject to national politics, the regional and local GSs brings the decision-making closer to people and enables improved integration of regional and local expertise to address regional and local challenges and demands. Tasks that are too big or comprehensive for the local level yet in need of being managed close to people are handled by the regional level (NOU 2019: 5, pp. 84, 87-89). This is because the regional level has higher capacity and expertise within the organization to solve tasks compared to the

lower level, yet is not at the large scale of the national level so there is still potential for citizens to influence development within their region (Meld. St. 6 (2018-2019), p. 6).

The different GSs collectively affect management outcomes and which activities or efforts may be carried out. For example, before aquaculture stakeholders in an area (who are part of the SG) can set up a new locality for salmon production, the local GS (the municipality in question) must set aside areas for aquaculture purposes. However, also the regional GS plays a key role as it is the county that assigns licenses for production. Yet, production must be within the frames made by the national GS. In Norway, these frames are, for example, the number of aquaculture licenses allocated by the Ministry of Trade, Industry and Fisheries, limitations on maximum allowable biomass, or national sustainability objectives (Akvakulturloven, 2005, pp. § 4, 9, 15; Fiskeridirektoratet, n.d.). Therefore, despite the institutional division or labor, the different GSs need to collaborate to streamline resource management and use and agree on principles and goals to steer development in the same desired (sustainable) direction.

To address and act on existing and future environmental, social, and economic unsustainability, international cooperation is taking place. At the global level, guiding principles and goals are agreed-upon to solve challenges that demand collaboration across national borders. Global sustainability challenges include climate change, emissions, population growth, unavailable and low-quality education, underemployment, and overuse of resources (Meld. St. 24 (2016-2017); Meld. St. 40 (2020-2021)). These challenges, among others, are attempted to be addressed through the definition of and work towards sustainability goals such as the SDGs. The SDGs are overarching and target many major sustainability challenges. The world is highly globalized and countries are interconnected. Therefore, efforts, whether they are causing conflicts and poverty or creating viable markets for sustainable solutions, will affect other countries positively and negatively. The adoption of the SDGs by the UN member states has therefore facilitated necessary international collaboration to work towards sustainability across national borders (Meld. St. 40 (2020-2021), pp. 6, 8).

The SDGs have, in turn, contributed to shaping the global definition and perception of sustainability, where working to achieve the SDGs is perceived as equivalent to working

towards sustainability (Fleming et al., 2017; United Nations, n.d.-c). Operationalizing sustainability, therefore, includes efforts to reach the SDGs through comprehensive top-down processes like international conventions and policies. For example, in December 2022, the 15th Conference of the Parties to the United Nations Convention on Biological Diversity took place. UN member states agreed on global targets for 2030, among them being to adopt effective conservation and management of at least 30 % of the marine, freshwater, and terrestrial area. Currently, 17 % of terrestrial and 10 % of marine areas are under protection globally (Convention on Biological Diversity, 2022). Hence, a vast increase in protected areas has to take place to protect biodiversity. It is a necessary step towards biodiversity conservation and the SDGs 14 and 15 (United Nations, n.d.-a, n.d.-b). These top-down goals are agreed-upon at a global scale, but the jurisdiction for use and limitations of, for example, natural marine and coastal resources, lies with nations in their respective territorial zones (Havressurslova, 2008, § 1-4; Økonomiske soneloven, 1976, § 1; UNCLOS, 1982). Therefore, although the globally agreed-upon goals create the basis for which actions the countries shall take, the actual implementation and enforcement depend on efforts made by the countries themselves.

In Norway, the SDGs are increasingly used as the main direction for policy and planning. They are part of the management plans at the national, regional, and local levels, and shall contribute to achieving sustainable development in the society, environment, and economy (Meld. St. 40 (2020-2021)). In the case of improved conservation to reach environmental sustainability goals, however, increased protection of areas may cause unknown social and economic repercussions in addition to that the rules on area use will change. Therefore, working towards global or national sustainability goals may come at the expense of activities or sustainability at lower levels. The SDGs and their respective subgoals and indicators are adapted to a global scale that does not necessarily reflect national or local needs. For example, when it comes to SDG 2: Zero hunger, from a Norwegian perspective, challenges are more often connected to obesity rather than malnutrition (Meld. St. 40 (2020-2021)). These mismatches can make it challenging to translate global goals into especially local politics and goals.

On smaller scales, such as within a municipality, the main challenges and goals can deviate from those on a national level. For example, in Senja Municipality, the main challenge as

presented in the Municipality plan's society part is the estimated development of the local population. The majority of the inhabitants are expected to consist of elderly people which will generate major socio-economic challenges in the Municipality (Senja kommune, 2019). Concurrently, the key challenges in Norway at the national level concern consumption patterns, greenhouse gas emissions, and biodiversity (Norwegian Ministry of Local Government and Modernisation, 2021, p. 7). As previously described, the regional and local level governance have to implement and follow through on national planning guidelines (Plan- og bygningsloven, 2008, § 6-1, 6-2; Senja kommune, 2020). Norway has, for example, obliged to reduce greenhouse gas emissions by 55% by 2030. This entails major adjustments for municipalities such as Senja which must allocate resources and work specifically to reduce greenhouse gas emissions (Senja Kommune, 2022c). The local and regional GSs also aim at balancing the needs of locals against the national demands and regulations (Senja kommune, 2020). This "balancing", however, may force local and regional GSs to choose between global goals, national goals, and regional or local needs in cases where these do not overlap. Resources are limited, and without proper communication and coordination between different levels of government and stakeholders, the achievable sustainability may be limited (Moallemi et al., 2020).

Additionally, there are major variations in how sufficiently and actively the goals are implemented and coordinated at smaller scales in general (Hjorth-Johansen et al., 2021; Meld. St. 40 (2020-2021); Ministry of Local Government and Modernisation, 2019; Nordregio, 2022). In addition to, and possibly as a result of, a mismatch or lack of goals, subgoals, and indicators adapted to different scales, local and regional administrations do not necessarily know how to work with the SDGs. Although being demanded by higher levels of government, there is no manual, or "good benchmarking", for how to work effectively towards and with the SDGs at regional or local levels. Hence, there is a need for support mechanisms in the shape of resources, adequate tools, and expertise to mobilize local and regional authorities while building up institutional knowledge and competence on sustainable development across scales (Hjorth-Johansen et al., 2021, pp. 4-5, 7). This includes looking into, understanding, and addressing interactions, relationships, and components making up an SES in which sustainability is the aim (Norwegian Ministry of Local Government and Modernisation, 2021, pp. 120-122).

As a measure, management tasks must be coordinated across different levels of government (e.g., state, county, municipality) and be carried out with predictability, transparency, and inclusion of stakeholders (Plan- og bygningsloven, 2008, § 1-1). Larger planning areas across municipalities and counties may facilitate a more holistic and ecosystem-based management contributing to sustainable development across scales. This is partly since biological, hydrological, and geological elements do not recognize human-made management borders such as municipality borders (Senja Kommune, 2021). Then again, perceived sustainability challenges may deviate in addition to that the size of an area and the number of management bodies makes the governance increasingly challenging and wicked (Sørdahl et al., 2017).

At a local scale, there are fewer components, relationships, and interactions to be governed. Therefore, governance on a local scale will be relatively less diverse, complex, and dynamic, and thus also less wicked. At higher governance levels, such as at a global scale, the GS and SG become very comprehensive and complex. There are myriads of components, relationships, interactions, and boundaries at play concurrently, which makes it increasingly difficult to define challenges and find lasting agreed-upon solutions. The global GS reaches across multiple levels of GS, SG, and GI that must cooperate, and solutions may thus more easily be found at the lower levels, depending on the context. However, in cases where management falls within a specific area of jurisdiction, such as national jurisdiction, the national GS is responsible for addressing the challenges. Although a higher leveled GS will have more wicked governance compared to such as a local GS and SG, multilevel governance contributes to grasping over perspectives and ensuring that administration and efforts are being made to reach goals and objectives across scales (NOU 2019: 5, 2019).

Then again, issues that are suitable for lower levels of government to address are often within their jurisdiction. The idea of local politicians being more suitable to deal with local matters compared to higher levels of government is one of the drivers for local management in the first place (Stortinget, 2022). For example, although also being managed nationally by the Planning and Building Act, the planning of the coastal zone is carried out by the municipalities in Norway. The Planning and Building Act states that the Norwegian municipalities must attend to input from stakeholders and make sure that decisions are based on relevant knowledge to result in sustainable decisions, also at a local level (Plan- og bygningsloven, 2008). It is, however, the municipalities that decide how this shall be done.

This can, for example, entail having input workshops gathering knowledge of stakeholder activities and plans. This is one of the efforts made in Senja (Senja Kommune, 2021). Senja Municipality works actively with sustainability and uses some of the SDGs as a guide for development (Senja kommune, 2020, 2022a). The Municipal administration gathers knowledge about the local use of the coastal areas, and different stakeholders' area use is addressed and discussed in the Municipality's planning processes. Conflicts are attempted reduced through the sharing of knowledge (Senja Kommune, 2021). Based on the input, the Municipality recognizes areas for improvement and focuses on specific efforts to tend to the input (Senja Kommune, 2021, p. 8).

The efforts made by local and regional authorities are decisive for development and whether sustainability goals will be reached. The degree of political focus on the SDGs in municipalities correlates with those municipalities that have come furthest in including the SDGs in municipality plans. Hence, political commitment and ownership impact the direction and speed at which SDGs are implemented on a local scale (Hjorth-Johansen et al., 2021). There is, however, varied maturity in working with the SDGs amongst local and regional administrations in Norway. Some local and regional administrations actively try to use the SDGs in their planning, management, and development, whilst others are unfamiliar or unsure about how to initiate such work, which challenges the achievement of the SDGs (Hjorth-Johansen et al., 2021).

4.2 Systems-to-be-governed

An SG consists of all components of nature and people where relationships create groups and interactions between them in turn affect the system's dynamics across scales and therefore also perceived challenges and how development can take place. As with the GS, the SG exists at various scales and can be seen in relation to the GS. That is, the global GS governs the global SG, while a local GS governs a local SG, although, as previously described, the different levels are connected. As a result of a growing human population with increasing average per capita income the demand for resources globally has continuously increased. Global biodiversity and nature's ability to provide ecosystem services have severely deteriorated despite comprehensive evidence of persistent global unsustainability. As a result of being part of an SES, humanity's existence and people's quality of life depend on the quality of nature's contribution to people (Díaz et al., 2019; Guerry et al., 2015; IPBES,

2019). Additionally, nature also has intrinsic value that is threatened by the unsustainable ways of today. Furthermore, the capacity for sustainability is undermined by existing inequalities (IPBES, 2019), in turn adding to the elements challenging sustainability.

In Norway, economic growth is and has been highly dependent on the Nation's natural advantages. Large and productive marine areas, growing forests, and key knowledge in technological innovation regarding the exploitation of nearby resources are part of the national SG. The components and their characteristics are among the elements that have contributed to enabling the enormous potential for value creation in Norway (NHO, 2018). The attractive economic opportunities related to natural resources have facilitated various stakeholders to contribute to development through innovative solutions, technology, knowledge, and jobs (NOU 2020: 12, p. 13). For example, in the municipality of Senja, the local GS aims for 1 600 jobs solely as a result of growth in the aquaculture industry and the related service and supply industry within the next 10 years. Sustainable economic growth can, in turn, include increased tax income from economic activity, more and new types of jobs, enhanced resilience from climate change, and improved physical and digital infrastructure. Furthermore, this can increase the quality of life, which is recognized (and desired) by those living in Senja (Aanesen et al., 2018; Senja kommune, 2019). However, the outcome of the governance towards sustainable growth depends on which choices are made to steer the development, both by different levels of GSs and the local SG.

Economic growth is perceived as important in Senja but must be balanced with conservation, especially since the natural environment is inseparable from the quality of life, health, work, and economy in Senja (Senja kommune, 2019). The Municipality is located in the Arctic region of Troms and Finnmark in northern Norway. It has 1 861 km^2 of land area and a connected marine area (Mæhlum, 2023). It has nearly 15 000 residents, of which the majority is expected to consist of retired and elderly people in the coming years (Senja kommune, 2019, 2023a). It is a rural municipality created on the 1st of January 2020 through the merger of the smaller municipalities Tranøy, Lenvik, Torsken, and Berg (Forskrift om sammenslåing av Berg kommune Lenvik kommune Torsken kommune og Tranøy kommune til Senja kommune, 2017), and the Municipal center Finnsnes has 4 771 residents (Senja Kommune, 2023a; Statistisk sentralbyrå, 2022). After the merger, the Municipality gained overall great strength within fisheries, aquaculture, tourism, and culture, to mention some (Lenvik

kommune et al., 2017; Senja kommune, 2019), although it already had a long history of utilizing the adjacent natural resources through coastal fisheries and agriculture especially (Hansen, 2001).

The Municipality is the largest in Norway when it comes to value creation in the seafood industry, when including both fisheries and aquaculture (Senja kommune, 2019, 2023a). A positive development is seen in industries such as aquaculture, agriculture, industry, energy, trade, and service. Especially the tourism sector, which is an increasingly important industry for the Municipality in terms of value creation and expected growth (Senja kommune, 2020). Also, outdoor recreational and conservation interests are present in Senja and are recognized by the local GS as part of the main stakeholder groups in Senja (Sørdahl et al., 2017). The local SG values pristine nature, and both industrial and recreational activities aim to be carried out sustainably within the frames of nature. Furthermore, the region, and especially the isle of Senja, is characterized by its varying landscape with many fjords, high mountains, and open valleys (Thorsnæs, 2022). The region's attributes (especially the natural components), such as its nature types and native species, make it attractive for commercial and recreational activities in the coastal zone (Senja Kommune, 2021). However, when an increasing number of stakeholders wish to use overlapping areas and resources for different activities (including non-use and protection), the outcome may be synergies or challenges (Hersoug & Johnsen, 2012, p. 18). These challenges and synergies may be addressed by GSs or by the SG collectively or individually. In the Senja region, user conflicts exist and are expected to increase as sectors such as aquaculture and tourism develop further, especially in the coastal zone (Senja Kommune, 2022b), in turn challenging sustainable development.

5 Results from the workshops

By applying thematic content analysis to the empirical data, I was able to identify the key topics (or themes) that the stakeholders presented relating to challenges for economic growth in Senja. Many of the identified key topics relating to the perceived sustainability challenges in the system were identified as *key* by more than one sector, but even more often discussed although not as the *most* important. The topics concerned elements within both the governing system (e.g., management complexity) and system-to-be-governed (e.g., local ecosystems) in Senja. The majority of the identified topics were socio-economic and related to, such as, industries or infrastructure, while there were also environmentally related topics such as fish mortality or temperature. The topics and related challenges were categorized inspired by IGT, grouped into challenges that were in the control of the local SG, local GS, regional GS, national GS, or global GS, and presented as narratives developed from the discussions with stakeholders.

5.1 Challenges within the system-to-be-governed's control

The SG, or rather the stakeholders within the sub-system, can make efforts to address various challenges within the SES. Although ecological elements are considered part of an SG, this section focuses on challenges that may be addressed through efforts made by the social or human part of the local SG. In the case of Senja, challenges within the SG's control were those possible to meet through efforts including knowledge sharing, mediation, and making compromises among and between local stakeholders. The challenges concerned people's perceptions, competing interests, unsustainable (mainly industrial) activities, infrastructure, and bottlenecks.

According to stakeholders, sustainable development in Senja has been challenged by negative perceptions and interactions between people and businesses. This was discussed concerning increasing costs especially relating to food products' prices that have contributed to making it more expensive to live in Senja. Stakeholders explained how local people have lashed out at them for high prices on products and expected them to "give more" or "do more". However, increasing external costs and unpredictability have forced businesses to increase their prices (agriculture stakeholder 2; 3). They are thus blamed for something that may be outside of their control. Although, stakeholders argued that the negatively associated interactions between people and businesses, for example from the increased costs, may be reduced if

businesses managed to mediate and teach locals about such as the consumer-price-index, inflation, and other economic trends that affect the businesses' costs and choices (agriculture stakeholder 2; 3). Also, if knowledge sharing were to happen through the local media it may convey solved challenges, facts, and achievements from industrial activities in a way that common people understand (agriculture stakeholder 1).

In some cases, however, mediation of information may not be sufficient to persuade locals that businesses' choices are the best for the system. This has been the case, for example, when the shared information provides evidence of unsustainability. Fish mortality in aquaculture production is a key indicator affecting how people perceive aquaculture production. In Senja, relating to specific aquaculture productions, the mortality has not been conveying sustainability. This has made it difficult to gain consensus about local aquaculture development. As a stakeholder said:

> The mortality in some facilities […] is very high. That does not look good using any indicators. (aquaculture stakeholder 1)

Research should, therefore, be carried out to find more sustainable ways to practice aquaculture and improve the industry's reputation, according to stakeholders. Improved production systems, for example, can reduce the spreading of diseases, parasites, and escapees, which in turn is important for sustainable growth (aquaculture stakeholder 1; recreational river fisheries stakeholder 1). Then again, the aquaculture industry already has and shares a lot of knowledge about its production and development. Still, it has proven to be challenging to effectively mediate information. As a participant said:

> Knowledge exists, but it is about getting it out there. (aquaculture stakeholder 1)

According to stakeholders, in Senja, people have turned to social media above the word of local businesses to search for information about (especially aquaculture) productions and related consequences. For example, despite the aquaculture expansion's key role in sustainable development in Senja, development is challenging to achieve if the local community (the local SG) believes it to be unsustainable (aquaculture stakeholder 1; management stakeholder 1). As a participant elaborated,

> Although […] [a TV show host] said that there are fewer diseases and less accumulation [of heavy metals] [and] no antibiotics in the farmed salmon compared to the wild salmon, […] [people] still preferred wild salmon! […] Yes, there is knowledge and expertise that informs us about the negative sides of salmon farming which we need to acknowledge, but it is not as bad as many people think! (aquaculture stakeholder 1)

On the other hand, and perhaps regardless of how knowledgeable one may become, interests and opinions will collide. For example, development in one industry may limit development in another. Thus, depending on the interest one holds, the evaluation of a governance outcome will be affected. In the case of Senja, this concerned, for example, the aquaculture and tourism industries. Increased industrial activity in aquaculture entails more net pens in the sea and can have both ecological footprints and visually pollute the area where it lies. Any form of pollution, such as occupying space, is a delicate subject in terms of tourism development, considering that tourists travel to Senja for its purity, fresh air, and untouched nature (recreational river fisheries stakeholder 2; 3). These interactions have contributed to why, for example, tourism, in addition to fisheries and recreational activities, in Senja have been very critical towards new aquaculture localities. As a stakeholder said:

> It is evident that when more [actors] want access to areas, naturally the fight for areas will increase. (aquaculture stakeholder 1)

As a measure, stakeholders suggested that the industry that gets prioritized for development (such as through licenses or allocated space provided by the GSs) should do their activities as noninvasive as possible to limit effects on the system, for example towards the wild salmon or recreational activities, and take responsibility for (environmental) challenges that emerge as a result of their activities (aquaculture stakeholder 1; fisheries stakeholder 1).

Furthermore, industrial and infrastructural development in Senja has in some cases been challenged by uncertainties among stakeholders leading to bottlenecks. For example, in Senja, a local fisheries port and potentially also a fish processing plant wanted to develop and/or expand their productions. However, first, they needed to reduce their uncertainties. That is, they could not oblige themselves to build new facilities without knowing for sure that there would be sufficient power capacity for their intended activities. Concurrently, the

power grid developer said they were interested in but could not expand and upgrade the power grid until they knew for sure that there would be activities using (and therefore also buying) the intended extra supply of energy (management stakeholder 1). To remove their bottleneck and thus reduce uncertainties, both parties relied on the other party to "make the first move".

Nevertheless, as a result of the expected industrial growth in Senja, goods transportation would expectedly increase in the coming years, especially on roads. Local stakeholders thought opportunities may emerge in the discussion about how transportation should be performed. For example, relating to aquaculture production, there are two main factors contributing to emitted CO_2: feed and transportation. Driven by customer preferences and demands, businesses search for alternative ways of transportation and local processing to lower their CO_2 footprints (aquaculture stakeholder 1). This makes it possible for local stakeholders to share their opinions, for example through readers-articles in the local newspaper, and possibly affect which interactions that will occur in their system. If people demand specific certificates, traceability, or lower CO_2 footprints from productions, for example from aquaculture feed or transportation of products to market, then businesses must follow, and this is the trend (aquaculture stakeholder 1; recreational river fisheries stakeholder 1). One of the suggested alternatives to address the increase in goods transportation was to move parts of it from land to sea. However, this required infrastructural development and upgrading of the ports, in turn depending on political will and municipal financial allocation outside of the SG's control (agriculture stakeholder 2; 3).

5.2 Challenges within the local governing system's control

The local GS can function as a coordinator, funder, and planner. The SG does not always possess the necessary capacity or resources to address challenges, and may, for example, need funding or other services from the local GS to do so. Challenges within the local GS's control included those that depended on efforts such as integrating local knowledge in decision-making, bottom-up approaches, or balancing governance objectives from higher governance levels with local demands. The challenges, as shared by stakeholders, concerned governance processes, political priorities, governance structure, balancing growth and conservation, opposing interests, infrastructure, communication, costs, workforce, collaboration, invasive species, and limited resources.

During the workshops in Senja, all the participating sectors raised concerns about decision-making and political priorities, for example about processes leading to how infrastructure- or industry development-related challenges were addressed by the local GS in manners that were not transparent. The state of, for example, infrastructural components in Senja is, to a large degree, decided by the Municipal administration and municipal financial allocations (recreational river fisheries stakeholder 2). As municipal financial allocation is a matter of political priorities, solutions may be found concerning the governance processes affecting these priorities. To navigate the myriad of opinions and demands within the SG, local knowledge was proposed gathered, and increasingly integrated in local decision-making. However, there remained many different ways of doing things in the governance sector in Senja as a result of people thinking and acting differently. Governance processes and management do not aways have systems in place to ensure consistency, where, for example, in a smaller municipality one person may have many areas of responsibility, while in a larger municipality, there may be one person per area of responsibility. For the merger of Senja, there has been a restructuring aimed at improving governability. However, work remains on finding the optimal structure, both regarding the Municipal administration's structure and how to improve local participation in management. As a participant exemplified:

> If you have a normal regulations plan, then, of course, those nearby, or those involved and the neighbors will be informed during the [planning] process, and then can come with input on the plan. Often there are somewhat bigger plans, so people prefer meetings. And then there is this with public meetings and contributions which is challenging. Maybe there are other ways than these public meetings [to share plans and get input on them]? (management stakeholder 1)

Stakeholders argued that the potential to improve the use of local resources may increase by being aware of which (environmental and social) values exist and how they are connected to the environment, economy, and society (fisheries stakeholder 1; management stakeholder 1). These values were suggested mapped, as it could make it easier for, for example, businesses to see where they could invest and build without doing so at the expense of important local (e.g., cultural) values. Simultaneously, sharing maps (e.g., on the Municipality's website) over existing values in the Municipality could signalize to locals to what degree the Municipal administration was aware of the values existing in Senja (management stakeholder

1). Then again, despite sharing information about local values, the question of how development *should* take place remains. For example, as emphasized by the stakeholders from the aquaculture and management sectors, the local aquaculture industry is expected to grow in Senja, and how this growth should be realized is a governance challenge trying to find the best course of action, which in itself is a challenge. As a stakeholder expressed:

> The question is […] what kind of [aquaculture] localities do we want? Do we want many smaller localities with sustainability that barely holds two-three-four thousand tons [of fish], or do we want bigger localities that have even more sustainability? We want the last, right? […] The risk is higher but it is much more rational to operate one facility rather than operating two-three facilities with less biomass. […] Also when it comes to costs. It's a win-win situation. […] Although, this will obviously generate some uneasiness. (aquaculture stakeholder 1)

As mentioned earlier, the course of action generating the most sustainable development from one point of view may not correlate with the view of others, and different activities must therefore be considered against each other. Due to different industrial, recreational, and conservation interests existing simultaneously in Senja, it is necessary, although extremely challenging, to search for a balance between allowing for specific industrial activities and protecting areas (management stakeholder 1). Stakeholders in Senja recognized that biodiversity needs protection, and biodiversity protection in Senja has been carried out through, for example, conservation plans. However, conservation plans may cover large areas, be very comprehensive, be potentially harsher than strictly necessary, and not receive the follow-up necessary to ensure that values are not being lost, according to stakeholders. As a participant said:

> They are protected, and then they are abandoned. (management stakeholder 3)

Stakeholders argued that there were many ways to protect values and that doing so through municipal planning may be one of the better alternatives (management stakeholder 1; 2). As one of the participants explained:

> It is fully possible to protect the values without having […] major closed protected area[s]. […] And this potentially opens for fisheries, and […] military activities. […]

> A very good question is, […] how do we best protect our biodiversity and natural resources. Is it by conservation? Or is it by somehow being aware of the values, opening up [for activities], and governing? (management stakeholder 1)

In terms of planning, stakeholders expressed that municipal planning should consider all sectors to achieve the most sustainable and long-term plan. As a participant said:

> What this area lack is an agriculture plan that plans ahead. […] There has been work done on this for the fisheries. […] A plan like this must be seen with tourism and infrastructure. And all the things on the white board [the conceptual map] are things that should be included in a plan and provide context. (agriculture stakeholder 1)

A more comprehensive management plan could contribute to facilitating cross-sectoral synergies, for example, between agriculture and tourism (agriculture stakeholder 2). Furthermore, communicating across sectors may increase local agreement on decisions, gain consensus about local communities' needs, and further generate more ownership in decisions (aquaculture stakeholder 1). Also, by including more stakeholders in planning it may be possible to bring to light socio-economic differences across Senja, for example, due to the varying infrastructure quality. As a participant explained:

> I am positioned all the way on the outside [of the island of Senja] and was calling the milk truck to hear whether he could come, and he said that 'I would've come if it was possible to turn the truck around'. (agriculture stakeholder 1)

Although higher participation in decision-making was discussed as an approach to facilitate decision-making, challenges remained as the many competing interests could delay the implementation of measures facilitating industry expansion or upgrading of infrastructure. That is, people have different opinions on how and where development should happen, and therefore, there may not exist one agreed-upon solution. As a participant explained:

> There are many stakeholders, right, because if you want [for example] electricity, then you need to place [the cables] either in the ground or in the air [via poles]. And clearly, if you are going in the air and choosing the optimal path, then you will come across a pasture sooner or later, a migration route, or an area with reindeer. (aquaculture stakeholder 1)

The same point was made by another participant. Development can be inconvenient, and cases of not-in-by-backyard exist. As a stakeholder elaborated:

> When you are building new cables or routes, there will be conflicts with nature, the Sami people, cultural sites, you name it, and [with] the local community, right, because "we do not want a scary cable in our house or where we go for walks". (management stakeholder 1)

Nevertheless, to facilitate decision-making, it was proposed to make it more predictable and evidence-based. One of the stakeholders suggested that the Municipal administration could apply cost-benefit analyses before determining priorities, regulations, and measures to be made. As part of the analyses identifying the costs (economic, environmental, and social) and the benefits (economic, environmental, and social) from governance tasks, it was key to involve those who lived and worked in the area to provide intel. Increasing communication and inclusion of stakeholders in planning processes and decision-making, of which the cost-benefit analyses would be part, could save time and money for both the Municipal administration and local stakeholders (fisheries stakeholder 1).

Despite the many and often opposing interests among the workshop-participating stakeholders, all the groups agreed that infrastructure development in Senja had not followed the development of local industries and technology. One of the discussed infrastructure-related challenges concerned how local industries and households pollute, especially in the form of wastewater. Stakeholders expressed that one of the biggest backlogs in Norway concerned wastewater treatment from households (management stakeholder 3), although treatment of wastewater from public plants also was an issue (management stakeholder 1). Enforcing that private households and businesses in the SG act within rules and regulations are, as suggested by local stakeholders, matters of political priorities within the Municipal administration and Council's responsibility. As a participant explained:

> Exactly this with operations, it is not prioritized. And thus it comes at the cost of too little money set aside for upgrading […] drainage and water in general. […] [Upgrading infrastructure] is a boring thing to set aside money for. […] No new buildings are built. It is all just digging in the ground and making noise, […] and it can be compared to roads. It's not fun to listen to that someone placed some asphalt

> on the road, but arriving at a completely new road and cutting the ribbon, now that is fun! (management stakeholder 1)

Furthermore, the roads in Senja were brought up by all the stakeholder groups and discussed as being not built for the wear and tear they currently experience and expectedly will be exposed to as a result of industrial developments and increased production (management stakeholder 3). The narrow, winding, and potholed roads make vehicles often end up in ditches along the way or get stuck in the middle of the road, especially during the winters, making transportation in Senja less safe and unpredictable. The quality of roads threatens carriers working with goods transportation as well as other road users such as pedestrians and cyclists (management stakeholder 2). As a participant said while referring to the number and severity of car accidents in Senja:

> It is a miracle that it is not going any worse. (fisheries stakeholder 1)

Many of the industrial activities in Senja (e.g., agriculture, fisheries, aquaculture) depend on goods being transported the whole year. However, it can be challenging to, for example, get goods transported at certain times of the year. There can be much precipitation during spring and fall that wash away the roads that are not of sufficient asphalt quality. This issue will expectedly grow with increased precipitation (agriculture stakeholder 3). Furthermore, the winters in northern Norway can be characterized by snowy and icy roads. During this season, the roads are heavily in need of plowing and sprinkling, work which often is carried out by farmers in the more rural areas. However, locals do not always perceive the carried-out work as sufficient, which has been recurringly expressed by locals to the farmers in Senja. Yet, the responsibility for how the roads are plowed and how much gravel is to be sprinkled lies with the Municipal administration, which decides farmers' efforts through directions and funding (agriculture stakeholder 3).

Furthermore, the infrastructure quality such as the quality of the roads was in some cases reportedly worse in the outermost (and more rural) parts of Senja compared to the Municipality center. This made it more challenging to deliver goods for businesses positioned in these more rural parts, and the carriers charged extra for deliveries there (agriculture stakeholder 1). Also, in cases where the roads must close, local industries such as the fish processing industry in Senja adjust how much raw material they buy from fishers. This, in

turn, affects how much fish the local fishers can sell at the port, reducing predictability and profit for the local fishers. As a participant explained:

> We get restrictions on how much [fish] we can deliver […] which affects both the price and quality [of the fish]. (fisheries stakeholder 1)

Dynamic interactions exist within the SES of Senja, and the quality of key components in the system such as roads can generate ripple effects throughout the system, especially affecting the human dimension of the SG. Therefore, according to the stakeholders, choosing to prioritize infrastructure development, especially roads, would facilitate sustainable development and the quality of life in Senja. However, upgrading infrastructural components is heavily time- and resource-demanding, which makes it challenging to prioritize (management stakeholder 2).

On the other hand, infrastructure in the form of roads as well as schools and other public services must meet certain criteria defined by locals for people to want to stay and live in rural areas such as Senja (recreational river fisheries stakeholder 1). Businesses and the Municipal administration in Senja depend on people for their daily operations. Moreover, they want to hire locals, especially when they invest and create new jobs in the region. However, the unemployment rate is low in Senja and young people are continuously moving away. It has proven difficult to make people, especially younger generations, want to stay in Senja (aquaculture stakeholder 1; management stakeholder 2). Stakeholders suggested this may partly be due to how the Municipal administration makes changes without it being predictable and transparent to the locals on how they landed at specific decisions (aquaculture stakeholder 1). As a participant explained:

> This is how it is when it comes to planning. On one side it is administration and scientific knowledge, while on the other it is hearings, people, and then it becomes politics, right. And when you are in it, that long phase before further processing of the [proposal's] parts. [The proposed plan] can be turned upside down if they do not manage to mobilize a majority. (aquaculture stakeholder 1)

Mediating, or "selling", why Senja is the place to be, was perceived as necessary for people to want to stay (and work) in Senja. The more people that stay, the more growth may be

realized. However, often, the available jobs are physically hard which reduces the workforce applicable for many of the jobs, such as those out on sea farms (aquaculture stakeholder 1).

To find out what people and especially youth want, attention was suggested given to the new "Senjakonferanse". The conference provides an opportunity for local youth to bring forth what they want to prioritize, and communicate this to local politicians to facilitate the inclusion of future generations in the decision-making, and perhaps adapt the municipality to their demands (recreational river fisheries stakeholder 2). To achieve sustainability, the Municipal administration must facilitate activities in the community to strengthen social coherence and contribute to creating a community for those who live there, according to stakeholders. Only this way will people want to stay in these otherwise relatively hostile areas (aquaculture stakeholder 1). This accounts for social meeting places but also industrial activities. Building up local communities and utilizing local resources locally is highly valued in Senja, and necessary to sustain and improve development in the rural communities (agriculture stakeholder 2). As a participant said:

> As a farmer, you are dependent on living in a rural area, but I see that rural communities gain many advantages from having agriculture nearby too. We are very active and interested in making things work here in the community. (agriculture stakeholder 3)

However, local demands, such as the social activities wished for or barriers to growth, may not always be adequately communicated between the local GS and the SG. For example, stakeholders reported that it was challenging to make politicians understand the importance of transportation to and from farms, and thus which quality of infrastructural components is needed to preserve and/or further develop industries and local communities (i.e., the local demands) (recreational river fisheries stakeholder 1). Then again, concerns about road quality may be a topic supposedly addressed during (public) plan hearings where participants can mediate their opinions. However, stakeholders such as farmers, for example, are not invited to the coastal zone planning as agriculture businesses, only as private persons. Therefore, they do not (officially) have the opportunity to speak on behalf of their businesses (agriculture stakeholder 3), limiting the input on local demands that the local GS receives before making decisions.

Nevertheless, sustainable development, in general, may be facilitated in Senja through businesses making new local investments (such as a fisheries port and a fish processing plant). Then again, to be able to realize potential synergies and opportunities for development and a more circular economy, the industries depend on the Municipal administration to be involved and dedicated and create meeting arenas (agriculture stakeholder 3). As one of the participants said:

> Personally, I would wish for the farmers to be more involved in various businesses and collaborations. We are a raw material producer, just like the fisheries, but there are very few arenas where we come together and meet. There should be an [local] arena for raw material producers since we are facing many similar challenges! (agriculture stakeholder 2)

Another perceived challenge within the Municipality's responsibility concerned port quality. Senja is a major port district, and the port quality was a "very known issue" (management stakeholder 2). Technological advancements have generated larger and more effective vessels. The development of local ports in Senja, however, has not happened accordingly and many of the ports remain too shallow (fisheries stakeholder 1). As a result, some fishers choose to wait for high tides before docking, while others cannot deliver their products at certain ports at all. As a participant said,

> If you buy a new boat you do not have time to wait 10 years for the port to be fixed, instead you find a new port. (fisheries stakeholder 1)

When fishers choose to use other ports, for example in another municipality, this can have negative repercussions for businesses and communities, especially for those communities with homogenous industry composition (fisheries stakeholder 1).

Furthermore, similar to the ports and roads, Senja's power grid has not been upgraded in line with the development of many of the local industries, in turn being a barrier to economic growth. New boats, bigger processing facilities, and larger machines have caused an increased power demand. As a participant explained:

> [The power grid] is not sufficiently developed. We struggle to use shore power without our instruments being taken out on board. (fisheries stakeholder 1)

As a means to compensate, for example, fishing vessels choose diesel motors, in turn using more energy and polluting locally. The power grid's (missing) capacity also affects production on land, potentially destroying whole batches of products in cases of power outages from capacity breaches (agriculture stakeholder 2; fisheries stakeholder 1). An agriculture stakeholder explained:

> If we are going to have stable production, we depend on electricity. (agriculture stakeholder 2)

Although it is not sufficient yet, improvements have been made to the power grid and supply (agriculture stakeholder 1). Still, the case of electricity in Senja in general is very vulnerable. The capacity is maxed out, and before other electric cables are in place there is only one power line supplying the whole island of Senja (aquaculture stakeholder 1).

Furthermore, unsatisfactory management outcomes were also discussed relating to municipal planning of protected areas. Concerns were raised that knowledge held by those interacting with ecological aspects within the SG (e.g., fishers that harvest fish) was not utilized as much as it had the potential to be. This happened despite it being indicated before the planning that the protected areas would be based on dialogues between stakeholders and the Municipal administration. As a result of unsatisfactory governing processes, local participants in the municipal planning felt led on by the government and disagreed with the governance outcomes, in turn generating frustration among locals. As a stakeholder expressed:

> The fishers that were involved [in the municipal planning] had a good dialog [with the Municipal administration]. […] [The fishers] knew exactly where all the coral reefs were and they did not want to fish there since it is not possible without loss of gear and high costs. [Therefore], they agreed [to prohibit fishing by the coral reefs]. But then, suddenly afterward, [the Municipal administration] took [the agreed-upon map] and decided that it was not that important anymore. [The Municipal administration officials] expanded all of the agreed-upon areas so that if it gets approved, everything will be protected! Not just that which needed to be protected, but all the rest too! […] I say yes to conservation but in actual collaboration with fishers. (fisheries stakeholder 1).

Additionally, occasionally, the Municipal administration comes with costly demands with short time frames. This causes unpredictability in costs which limits the businesses' room for action (agriculture stakeholder 2; 3). Predictability is also challenged by governance priorities that shift continuously as a response to newly elected politicians. Businesses often operate with small margins, and changes in political priorities and thus, for example, new regulations or limited access to resources in addition to costs, may be decisive for business performance and growth. As a participant said:

> Predictability is good. We like that. It is really important, we are talking about an [aquaculture] industry that has both many expenditures and revenues, and it is clear that with high costs it is preferable that you actually know your options and know what will be the limitations. (aquaculture stakeholder 1)

However, when dealing with politics, natural resources, or sudden incidents of any sort, predictability may not always be an option. For example, a potential consequence of aquaculture production can include farmed fish escaping from the net pens. However, to mitigate, contingency plans exist for all aquaculture localities in Senja in case of massive escapes of fish. Yet, some of the participating stakeholders explained that history has shown that these plans may not necessarily be properly communicated outwards, in turn limiting the actual contingency and contributing to cause doubt among stakeholders about aquaculture development. After the escape of farmed Atlantic salmon in 2008 in Senja the communication and messages from the GS to the SG on what to do were very ambiguous. As a participant exemplified messages being:

> Blanch the fish, do not blanch the fish, gut the fish, do not gut the fish, it is safe, no it is dangerous. (recreational river fisheries stakeholder 1)

This may have caused mitigation measures to be delayed or not carried out, which the local ecosystems (e.g., watercourses with wild Atlantic salmon) may have suffered from. In cases of escaped salmon, in addition to disease outbreaks, stakeholders thus stressed the importance of communication between stakeholders, and between government and stakeholders (recreational river fisheries stakeholder 1).

Wild species invading the local ecosystems in Senja were also identified as challenging for development. For example, the Pacific salmon displaced the other fish in the rivers in addition to that it may carry foreign unwanted diseases (recreational river fisheries stakeholder 3). Another example concerned jellyfish, an invasive species with negative socio-economic consequences in Senja. As a participant said:

> We have caught jellyfish, which we do not want. […] [It is] tiresome for […] the trawl fishery, and especially the shrimp fleet have struggled quite a bit with the shrimp[eating] jellyfish and that […] the fish shy away. […] It is impossible to fish with nets at some depths. (fisheries stakeholder 1)

Although, invasive species may be turned beneficial. For example, stakeholders explained how in May (2021) it "boiled" with Pacific salmon outside of Lofoten, but the fishing vessels could not yet get paid for selling the species. The fishers delivered the Pacific salmon together with their intended catch but it was not utilized. However, afterward, the Government opened up for payment for Pacific salmon, and anyone could come to the fish processing facility and deliver their catch of Pacific salmon since they got paid to do so (recreational river fisheries stakeholder 2). The Pacific salmon can be a high-quality food before desmoltification (aquaculture stakeholder 3; recreational river fisheries stakeholder 2). The species swims shallowly in the sea, and can thus be caught using for example drifting nets. Although, bycatch is likely when using drifting nets, and higher (sustainability) success may be achieved by using use wedge-shaped seines at the entrance of waterways with small enough masks so that the fish don't get entangled, and then manually removing the Pacific salmon from the traps. However, this is labor intensive and would require funding (e.g., municipal financial allocation), although private persons may operate (recreational river fisheries stakeholder 1). To benefit from the invasion and utilize the resource, the management must be precautionary but effective, otherwise, it will be the ecosystems that suffer (recreational river fisheries stakeholder 1).

Additionally, to be precautionary, stakeholders suggested monitoring in and near the watercourses in Senja through video surveillance. The surveillance could be used to, for example, regulate aquaculture development by counting sea louse on migrating smolt or deciding which efforts should be taken against the invasion of species such as Pacific salmon

(recreational river fisheries stakeholder 1; 3). Although, video surveillance in watercourses has proven a challenging and expensive task (management stakeholder 1). Municipal finances are limited, and choosing where to prioritize available funding is, as previously discussed, a difficult management task. As a participant explained:

> [Political priorities] fluctuate and change, at least every fourth year. […] With a tight municipal economy, it is […] a fight against nursing homes, schools, kindergartens, and this infrastructure in regards to roads, water, drainage, and so on. Everyone needs money. (management stakeholder 1)

5.3 Challenges within the regional governing system's control

Challenges within the regional GS's control are those depending on local involvement yet higher capacity or resources than available in the SG or local GS. In the case of Senja, these challenges concerned pollution, missing documentation, governing capacity, and infrastructure. For example, in Senja, concerning the missing wastewater treatment there also existed a documentation issue. Despite the local GS being aware that uncleansed sewage was running out in the sea and polluting, they were not sure what the effects were since the environmental status was undocumented and thus unknown. The stakeholders believed, however, wastewater from both households and industry buildings to have relatively good quality (i.e., environmental effects probably being near the regulation criteria). The backlog in wastewater treatment and related documentation was expectedly due to missing systems or governance mechanisms as well as there were not enough qualified and available people to carry out the much-needed work (management stakeholder 1). Besides, a lack of documented pollution effects also applied to such as the condition of the ocean by the local ports in Senja. They were subject to pollution, but it was not clear which type of pollution and how severe (management stakeholder 1). Although being within the local GS's responsibility, efforts may need to be carried out at the regional level considering that the regional GS has more resources at hand.

Furthermore, as described earlier, workers and carriers in Senja were reportedly exposed to unnecessarily narrow and potholed roads that reduced road safety and accessibility in Senja. However, the reduced infrastructural quality of roads also applied to other parts of northern Norway (aquaculture stakeholder 1). As a participant described:

> [The roads in northern Norway,] It is all just a patchwork. Poor drivers trying to transport salmon [on] narrow and bumpy [roads]. (recreational river fisheries stakeholder 2)

Considering that challenges relating to road quality were not unique for Senja but rather applied to the whole region (e.g., Troms and Finnmark County), efforts from higher governance levels (e.g., the regional GS) may be necessary to properly address them.

5.4 Challenges within the national governing system's control

Challenges that depend on more resources or expertise than available at the regional level or that depend on specific efforts within national jurisdiction may need to be addressed by the national GS. In the case of Senja, challenges of such characteristics concerned funding, governance processes, industrial activities, and regulations. For example, relating to infrastructure, stakeholders explained that the Municipal administration in Senja has invested millions of Norwegian kroner in new industrial areas and new ports while calculating how much mass needs to be removed. They are also starting up with environmental and bottom surveys in some locations to find out how polluted the ground is. However, the work is not cheap, and high costs challenge the much-needed infrastructural upgrade (management stakeholder 1). Therefore, efforts or resources from higher levels of government may be necessary. As a participant explained regarding one of the planned port developments:

> We believe that it will cost closer to 50 million [Norwegian kroner] to dredge the harbor basin. And then there is the question of who is paying. The ports that we have built have a type of self-funding since we have tenants, so since we get the money back over time, we get the loans because of the tenants. But no one is a tenant for dredging. I mean, it will help all of the fishers but I do not think we can expect there to be a joint contribution from them. (management stakeholder 1)

One of the challenges that makes it difficult for stakeholders to plan (and therefore also potentially invest) was shifting regulations. As a participant described:

> Regulations change so often, there is so little continuity in [the regulatory system]. A new government comes with a new idea, and the playing rules change so much. It is really difficult to plan. (fisheries stakeholder 1)

A similar dilemma applied to the development of the power grid. As a participant said:

> The challenge is that it is expected [from the government] that the Municipality and the local industry will contribute 10 percent, which equals 50 million [Norwegian kroner]. […] That is a lot of money for a poor municipality. So it is challenging to enter this deal. […] We are depending on continuous industrial growth in the outermost part of Senja, and for the industry to be able to settle there we depend on the new electricity cable. (management stakeholder 1)

Nevertheless, and as previously mentioned, management of resources has a history of being dealt with politically and participatory in Norway. Governance processes can affect social well-being and equity as well as the overall quality of life in Senja, and challenges thus arose when issues were managed with dispensations and processing behind closed doors, such as with the dispensations for farming Atlantic cod in Senja. As a participant said:

> You skip past all the democracy where you are supposed to identify other interests and who to take into account. (aquaculture stakeholder 1)

Decision-making about whether and where aquaculture of cod should take place in Senja went straight to a small committee, and was not brought up during the public hearings for the coastal zone plan carried out beforehand, stakeholders explained. This made locals feel like the government did not care what happen to the local environment or the people (recreational river fisheries stakeholder 1). Although a result of the local GS's governance approach, the use of dispensations is a tool to facilitate development within legislations where a municipality has the authority to provide dispensation in cases where beneficial (Plan- og bygningsloven, 2008§ 19-2, 19-4). Therefore, although the local GS can choose to act differently, it is up to the national GS to formulate in which cases specific governance approaches such as dispensations are within or outside of laws.

Furthermore, the governance processes leading to fish quotas and thus how much a fisher is allowed to catch is decided based on biomass estimations carried out by researchers. However, the process leading to estimated biomass relies on time series and the use of the same (potentially phased out) equipment or gear for measurements. This was concerning, according to stakeholders, as it may cause false estimations of the biomasses. One of the

challenges with relying on scientific knowledge was that to be able to successfully have time series and estimate biomass, scientists must have the same weather conditions for each measurement. However, a suggested solution was to integrate local (fisheries) knowledge in the knowledge base for biomass estimation since local fishers arguably have valuable knowledge of fish behavior, biomass trends, and areas of importance for conservation (fisheries stakeholder 1). As a participant explained:

> It rarely ever goes wrong, we [fishers] see changes in fish stocks long before the scientists see it. It has happened again and again, […] [the government] increase the quotas and we say that this is not right, […] [the fish stock] cannot handle it. The year after, the stock decreases rapidly, and thereafter comes the scientists saying we need to lower the quotas. It would be better if we did not get the ups and downs [in stock biomass] and instead had a more even extraction. (fisheries stakeholder 1)

While most variations in such as species behavior, weather, and temperature were accepted by the stakeholders as fluctuations part of the natural system's dynamics, some changes or responses were believed to be a result of human-nature coupled interactions from industrial activities. For example, concerns were raised by the fisheries stakeholder about the negative effects on the surrounding environment from aquaculture production:

> We question aquaculture's emission permits on sea-lice treatment. […] Something is weird, like in the fjord back home, [We] tried pots and traps that were supposed to be super effective […] and did not get a single shrimp! This was in a fjord that, before being protected, was used to trawl after shrimps! They [aquaculture] have emitted different [chemicals], and it shows. (Fisheries stakeholder 1)

However, considering that the perceived challenge was a consequence of emissions expectedly within the allowed amounts of an emission permit, addressing the challenge falls within the control of the national GS and more specifically within the responsibility of the Directorate for the Environment, which is responsible for emission permits (Miljødirektoratet, n.d.).

Nevertheless, to facilitate development within the frames of sustainability, stakeholders suggested there be more regulations and especially more specified or targetable policy system

that ensures that only the responsible ones get punished. In the case of Senja, this applied to, for example, the expected aquaculture expansion (aquaculture stakeholder 1; fisheries stakeholder 1). As a stakeholder said:

> I am not against it [aquaculture], it is a very important industry along the coast, but they can afford to be kept in reins and be told to clean up after themselves. They cannot be allowed to just rein freely. (fisheries stakeholder 1)

However, equally important was that existing and new regulations would be distinctly formulated and communicated to those they applied to so that there would be no doubt whether activities were in line with regulations or not (aquaculture stakeholder 1). As a participant said:

> With high costs, it is preferable that you actually know your options and know what will be the limitations. So in reality, one challenge is that when looking at [for example,] the traffic light system, not even the sector, and I say this with the utmost respect, understands the system which the traffic light system adds up to. (aquaculture stakeholder 1)

5.5 Challenges within the global governing system's control

As established challenges can be desirable to address at as low a level of governance as possible, yet, some challenges depend on cooperation at a larger scale to be addressed. Challenges that are caused by elements that span across national borders may rely on international or global cooperation and coordination to be addressed. In the case of Senja, such challenges concerned increasing temperatures.

Stakeholders in Senja explained that increasing sea temperature may have significant undesired effects on local marine wild and farmed species, in turn affecting the local ecosystems and ecosystem services. For example, and as previously described, in the case of Senja, challenges from invasive species were reported on by stakeholders, especially concerning the Pacific salmon and jellyfish. Water temperature is decisive for species' behavior, and warmer waters will facilitate species' migration northwards and especially deeper. Therefore, temperature variations will, for example, make it difficult to plan where to fish and also where to (not) allow for fisheries activities. As a participant said:

> Some fish species are highly temperature sensitive, […] that goes especially for the Greenland halibut. It is a challenging fish to begin with. She has a quite narrow temperature belt on which she depends, and she is not depending on the bottom. She takes off from the bottom and finds the right temperature, where she stands. So, you know it will be a bad [fishing] season if the temperature is not right when the fishery starts. (fisheries stakeholder 1)

This correlated with the statement of another participant:

> Fish in general may be a concern [because of increasing temperatures]. We are seafood region number one in this country since we have the width with aquaculture, fisheries, [and] shrimps. We are broad, and we have large amounts. (management stakeholder 1)

Increasing temperatures challenge aquaculture development specifically in that it may lead to more sea lice and potentially diseases which, through regulations, restricts the allowed growth and areas where new facilities can be placed (aquaculture stakeholder 1; management stakeholder 1). Furthermore, it may challenge the local fishing industry since major parts of the industry depend on the Skrei approaching the areas just outside of Senja from January till March. Additionally, it challenges the tourism industry. When species such as herring migrate, predators from higher trophic levels follow (e.g., whales). When species are utilized by any industry, such as the whale tourism industry depending on the presence of whales, then species migrations naturally will affect the businesses' viability (management stakeholder 1; 2).

Additionally, on a global scale as a result of increasing temperatures, a water shortage is experienced and expected to become more severe and may in time affect production also in the high north. The water shortage is and will increasingly be a challenge for sustainable development as it affects such as water quality, climate regulation, and invasive species (aquaculture stakeholder 1).

6 Discussion

In order to govern wicked problems for sustainable development locally we must understand what local stakeholders define as sustainable development. Perceptions and descriptions of sustainability challenges can be used to say something about how and where a challenge should be addressed. Challenges for sustainability in an SES can be comprehensive and composed of various elements that give the challenges wicked characteristics. This was true for the case of Senja. The local stakeholders discussed challenges that directly or indirectly affected governance and also that were partly created by it.

6.1 Sustainable development – local perceptions

Defining sustainability is a ubiquitous challenge. To make sense of the abstract and general concept, *sustainability* must be defined in relation to specific challenges, goals, and indicators. The perceptions of sustainability and sustainability challenges depend on who is being asked, the context, time, and scale. In the case of Senja, local stakeholders provided insights into their perceptions of sustainability as a complex concept encompassing a) the fundamental role of economic growth, b) the significance of well-being in communities in coastal and rural areas, and c) the interdependencies between social and ecological systems where activities within the system rely on the state of ecosystems. Consequently, the development challenges perceived at the local level that negatively impacted the local economy, society, and environment, were inherently sustainability challenges.

According to stakeholders in Senja, local development should achieve economic growth within the frames of the environment while contributing to social well-being. The economic, social, and ecological goals and aspects perceived as necessary to achieve desirable development in Senja from a stakeholder point of view correlated with descriptions of sustainability according to the triple bottom line. That is, sustainability (and thus also sustainable development) was something that could be found somewhere within a social, ecological, and economic dimension of sustainability. Sustainability can therefore be approached as a matter of compromise, as all three sustainability dimensions cannot be fully achieved without compromising each other.

From the discussions with stakeholders it became evident that they wanted the SG and GSs to facilitate synergies and find compromises between different businesses and with the Municipal administration, improve infrastructure quality, generally make it more desirable

for people to stay and thus be available to work in Senja, and gather and share information about products and productions. However, while working towards these objectives, activities (or lack thereof) that negatively affected nature contributed to shaping the local perceptions of challenges that were barriers to development. This correlated with the perception of sustainability as the ability to sustain, as negatively affecting nature may compromise nature's ability to enable future generations' opportunities to meet their needs relating to the resource in question (United Nations, 1987, p. 16).

Nevertheless, for activities to be perceived as within the frames of the environment (e.g., environmentally sustainable) in Senja, from a stakeholder perspective, they would need to be as little invasive as possible and have minimal ecological footprints (e.g., concerning the amount of sea lice in aquaculture production or the use of diesel-engines in fisheries). This arguably goes beyond the ability to sustain, as nature, although vulnerable, can be robust and may have higher thresholds than the effects of *minimally* invasive interventions in nature. That is, nature may withstand "moderately invasive" interventions, yet the local stakeholders in Senja would not settle for moderate if there was a chance to achieve minimally invasive interventions. However, if activities did result in an ecological footprint, the extent to which stakeholders regarded further development as desirable would hinge on the effectiveness of mitigation measures and the related communication process within the governance system in Senja (e.g., contingency plans for escaped farmed salmon).

Furthermore, the stakeholders elaborated on social aspects that needed to be considered when discussing a preferable future trajectory of development in Senja. The stakeholders expressed that business activities and governance processes needed to be carried out transparently, responsibly, and reliably, and promote safety for locals. They saw economic growth as something that should generate positive development within the local economy, environment, and society, such as contributing to improved quality of life and social well-being in Senja. These values correlated with descriptions of "good governance", and arguably serve as conditions for sustainability in the case of Senja (Jentoft, 2023, pp. xiii-xv, 24, 186).

Efforts to facilitate sustainable development in Senja, however, varied contextually, and a parallel to the triple bottom line can be drawn as there in both cases was no one clear agreed-upon compromise recognized as most sustainable. Stakeholders' perceptions within the same

system varied where, for example, some oriented more towards one or two of the sustainability dimensions. For example, in Senja, some stakeholders praised growth and mitigation while others desired a more precautionary approach to development including preservation, depending on the context and individuals asked. If all viewpoints of sustainability carry equal weight in evaluating sustainability, but these perceptions can be contradictory, the definition of sustainability and which efforts are needed to facilitate sustainability remain ambiguous. Sustainability may, therefore, become a state endlessly strived for but that can never truly be achieved as there exists no solution. With this in mind, IGT would define sustainability as a wicked problem. However, sustainability can be understood as a normative concept that continuously evolves depending on the context, particularly in response to specific challenges. Therefore, a more precise description of sustainability's meaning from a stakeholder perspective should be considered within the context of sustainability challenges.

6.2 Local sustainability challenges

Given the local perceptions of sustainability, challenges for sustainable development in Senja were challenges that negatively affected the local economy, society, or environment. The challenges often related to several topics, as the different challenges were directly or indirectly connected through relationships and interactions in the system. For example, increasing temperatures will expectedly cause an increase in invasive species, which in turn has local socio-economic and ecological repercussions.

Many of the perceived challenges in Senja were barriers to industrial growth, which was expected considering the topic of the workshops concerned development. In Senja, as established, the quality of infrastructure was perceived as challenging for sustainable economic development. For example, Senja's power grid had not been upgraded in line with the increased power demand from the development of many of the local industries, and the businesses' sustainable economic growth remained limited until the power capacity would be improved. Additionally, the power grid quality was also challenging for sustainable environmental development. Among the consequences of the outdated power grid was that, for example, fishing vessels turned to fossil fuel as opposed to electric or hybrid options. Furthermore, top-down governance objectives demand a reduction in fossil fuel use (Senja Kommune, 2022c), and upgrading infrastructure thus becomes a necessity to reach the

national sustainability objective. However, based on inputs from stakeholders, this was not possible to do locally, and it thus became difficult to contribute locally to a greener economy. Therefore, improving the quality and capacity of the power grid may facilitate more environmentally friendly business operations and reach national governance objectives for green economic growth.

Some challenges can be perceived as tame in isolation. This applies to a power capacity issue or missing wastewater treatment. For example, in Senja, wastewater treatment was expected to be improved if the local GS would prioritize it, and the power capacity could be improved if the government funded the development of power grids that could provide the necessary capacity. However, there were other challenges connected to the power issue and infrastructure development in general that made addressing it wicked. For example, access to electric power and the efforts needed to provide sufficient power capacity may come at the expense of other uses or non-use of the areas where the development needs to happen. As the stakeholders in Senja explained, the areas where power cables and other infrastructural components must be placed can be the same areas where animals graze or migrate through, or where people live and do recreational activities, in turn causing negative ecological or socio-economic consequences from the development. Thus, the power capacity issue becomes a sustainability issue through the costs and consequences of improving the power grid. Also, as stakeholders discussed, some activities or developments that take up space inhibit other activities to be carried out in the same areas, as in the case of aquaculture and tourism developments in Senja. Therefore, efforts to facilitate economic growth in one industry or area can limit economic growth in another, and thus challenge the perceived sustainability of the efforts made.

According to IGT, Senja's system properties are what make sustainability challenges such as the power grid challenge wicked at the local level. That is, in Senja, opposing interests among stakeholder groups (which generate diversity and complexity) were present and there seemed to be no one solution to be agreed upon. The areas (or boundaries within) where development could take place overlapped with areas where people had conflicting plans for or activities in. With a long-term perspective where the discussed development can cause lasting changes to the local system and one activity limits the development of another, infrastructure development of power grid components collided with some of the local

perceptions of sustainable development as the efforts would conflict with their standpoint on sustainability.

Although the power grid needed to be upgraded for economic development to be realized and national goals reached, other challenges were equally critical, including transportation which remained a barrier to growth. Within the SES in Senja, mutually reinforcing relationships existed between infrastructural components such as the power grid and roads and economic growth. Improving the quality of the roads was expected to contribute to economic growth and social sustainability. However, even if the roads would be upgraded, many of the local businesses would still depend on the development of the power grid to utilize the benefits of the developed roads. This would also apply if only the power grid was upgraded but the road quality remained the same. A problem (e.g., missing power capacity) could initially be perceived as tame but becomes wicked due to the connectivity in the system and interactions between components that makes it difficult to find solutions that leads to a desirable system state. Additionally, and as stakeholders discussed, to gain the benefits of economic growth from upgrading infrastructure, high efforts would be necessary from the GSs as these developments take time and are expensive. This would in turn raise the cost of facilitating economic development, potentially at the expense of socially promoting efforts given that resources are limited.

In some cases, the local level GS may choose to allocate funding to upgrade infrastructural components in cases where they over time will generate a return (e.g., building ports and having tenants as a way of self-funding). However, in cases without estimated return (e.g., concerning environmental investigations or dredging the basins outside of ports) the upgrade costs increase which can make it challenging to prioritize politically. Resources (including governmental finances) remain limited, and trade-offs must be made. With many different opinions on how available funding should be allocated, making priorities becomes increasingly wicked. For example, although stakeholders proposed solutions to challenges that seemed relatively simple, such as how surveillance of marine fauna in Senja or registration of fish caught by tourists may only need funding to be solved, discussions about what these efforts will come at the expense of must be held.

Despite economic growth being perceived as key to sustainable development, some would argue for development in terms of change towards, for example, more environmentally friendly activities. In Senja, people's quality of life highly depends on natural resources and nature's state. This includes the overall economic wealth, employment in marine industries such as fisheries, aquaculture, or marine tourism, and recreational and cultural activities and values where a healthy and accessible nature is part of people's identities and well-being (Senja kommune, 2019). Perceptions of sustainability depend on values, and these values may come to light through prioritization and demands. For example, in Senja, some stakeholders argued for unsustainability caused by aquaculture because of its impact on nature (e.g., high mortality at some production sites, sea lice, and emissions). In Senja, as well as in other parts of northern Norway, for example, the causes for the decline in local shrimp stocks have been recurringly debated by stakeholders as whether the aquaculture industry is to blame (e.g., Martinussen, 2017; Rybråten et al., 2018; Strøm, 2018), arguing towards a demand for more regulations or other efforts that would contribute to lessen the environmental impact from the production for it to be viewed as sustainable.

Furthermore, the perceptions of activities considered development challenges in Senja were in some cases shaped by who was perceivably in control of affecting their outcomes. For instance, in the case of diesel engines applied in fisheries in Senja, fishers depended on the Municipal administration to take action – it was arguably perceived as out of the fishers' control. However, in the case of aquaculture, the perception seemed to be that aquaculture "could afford to be kept in reins", indicating that their effects were within their control, although depending on regulatory measures to be enforced.

One might expect an environmental focus on sustainability to be consistent when discussing other topics with environmental consequences. However, in Senja, this was not necessarily the case. For example, from some of the stakeholders' perspectives, although they perceived that aquaculture should be regulated and their productions restrained, environmental issues were not brought up concerning such as fish slaughterhouses, although pollution effects from industrial facilities in Senja were present (e.g., wastewater), as other stakeholders mentioned. This inconsistency in perceptions may be a result of not knowing the effects of other industrial activities. On the other hand, it may argue that the perception of sustainability is not rigid. Therefore, that which is perceived as sustainable cannot be simplified into terms

applicable outside of a specific context or divided into separate ecological and social systems, but rather something that must be found within coupled systems where interactions are considered. For example, the fisheries stakeholder's take on aquaculture concerned effects on a resource that the stakeholder had interacted with over time (i.e., the local fjord that was the shrimps' habitat). The activities carried out by aquaculture affecting the environment also limited the opportunities that the fisheries stakeholder had to utilize the resources that aquaculture production interacted with. That is, aquaculture's industrial activities limited the fishery's stakeholder recreational and/or professional opportunities. Therefore, from a perspective of sustainability being to preserve existing local fauna in a small fjord and recreational activities, aquaculture growth and thus emissions in the fjord is a sustainability challenge.

Furthermore, stakeholders' perceptions of interconnections and feedback mechanisms within their systems played an important role in shaping their understanding of challenges to sustainable development. For example, arguments about challenges were often composed of how activities or lack thereof affected environmental, social, and economic aspects directly or indirectly. For example, achieving local sustainable development and keeping rural (fishing) communities viable in Senja depended on a certain standard of infrastructural components. One of the participants explained that the choice of port by fishing vessels, for instance, depended on the port's quality. Ports of low quality may cause fishers to seek other alternatives, triggering ripple effects within communities. First, economic activities linked to the local fisheries industry could reduce. Second, if fishing boats travel further to find an accessible port, fuel use would increase, and this would in turn affect the (personal) economy by increasing costs. From a global perspective, and perhaps even from a national perspective, at which ports fishing vessels choose to land their products in northern Norway is not decisive for sustainability. At the local level, however, this interaction can play a key role in sustainability in the local communities, without which many people may move away from the area. Specific measures may therefore be made to the port in question to preserve one of the local communities.

Nevertheless, stakeholders in Senja questioned how the local government attends to local needs in light of other goals and expectations. For example, the dispensations given from the coastal zone plan in the region for farmed cod were not perceived as carried out transparently

or fair. Another example relates to the government's structure and ways of doing things in general. The local government is made up of people, and people act differently in the same role as a result of missing systems for carrying out tasks, in turn causing unpredictability and affecting the degree of, for example, local participation in decision-making. In the case of Senja, work remains related to restructuring the government, especially after the merger into Senja Municipality. This, combined with little common understanding of what it means to implement the SDG framework at the local level (Hjorth-Johansen et al., 2021), may challenge the balancing of local needs and global goals. Another example relates to the planning processes where proposals can drastically change (i.e., *"be turned upside down"*) from start to finish (aquaculture stakeholder 1). In addition to the unpredictability, it can be frustrating and difficult for stakeholders to understand why the knowledge provided in the early stages of a planning process has been applied differently from how it was discussed during a workshop, especially if you as a participant are held accountable for the decision outcome, reducing the ownership to decisions.

Nevertheless, stakeholders emphasized that reaching top-down goals at the local level in Senja such as achieving increased seafood consumption (and production) in Senja relied on local economic growth, especially in the seafood sector. From a perspective of sustainability being to produce more food from the sea, gaining consensus to allow for growth in aquaculture can be that which is identified as a sustainability challenge. Aquaculture in Senja became a "necessary evil" to facilitate social sustainability and reach national objectives. Nevertheless, in Senja, a major challenge identified by local stakeholders regarded the lack of an available and qualified workforce that was needed to fill the jobs. To strengthen the workforce and in turn achieve more sustainable development and produce more seafood, Senja must be attractive to people and businesses. Stakeholders argued that by prioritizing good jobs, schools, and communities contributing to social coherence, it should be possible to make people want to stay in Senja. This may contribute to keeping rural communities alive, facilitating social and economic sustainability concurrently.

With this in mind, approaches to sustainability in Senja arguably consisted of, for example, efforts necessary for locals to want to stay in the community. Young people moving away from Senja could be perceived as a challenge regardless of the sustainability aspect of it. However, the demography challenge becomes a sustainability challenge because of how the

system is connected. That is, in order to achieve sustainable economic growth in Senja, which is a sustainability objective from the GSs and desirable among stakeholders, businesses and the Municipal administration depends on having an available workforce. This in turn depends on people staying in Senja, which in turn hinges on what Senja can offer people, in terms of, for example, infrastructure quality, local meeting places, or the local GS's focus on business development. The interactions between the SG and GSs illustrate how actions and objectives across subsystems and levels affect what the system is able to achieve. However, in contrast to IGT, in the case concerning the available workforce in Senja to achieve the governance objectives, the coastal governance needs to make efforts to increase the system's diversity (e.g., more and different public services to attract more and different people to Senja to fill different jobs) as opposed to less diversity.

Although some suggestions were brought to light during workshops on how Senja can become a better place to live, such demands were not always mediated to or integrated by the local GS. For instance, the stakeholders wanted the Municipal administration to work as an active coordinator in meeting arenas to bring stakeholders together to address common challenges and identify synergies. It is possible that such an arena that would facilitate communication between businesses and sectors also could have value in terms of creating a slightly more formal arena where businesses could tackle bottlenecks such as uncertainties relating to a lack of trust or belief that the other part will take action.

However, local desires among with local knowledge may also be integrated into municipal planning through more comprehensive management plans. However, as stakeholders argued, despite a comprehensive plan being able to be founded on more knowledge, it also makes planning increasingly wicked by that more considerations have to be made before the plan will be finished and higher participation could entail more competing interests in turn delaying implementation of suggested efforts. This, in turn, makes it increasingly challenging to make time-sensitive decisions. With increasing temperatures, invasive species such as jellyfish and Pacific salmon can be expected to increase in numbers (Occhipinti-Ambrogi, 2010). Failing to address the challenges they cause may lead to more socio-economic and ecological challenges over time. However, mitigation at the local or maybe even national level oriented at managing problem symptoms (e.g., physically removing jellyfish from the sea) is not necessarily sufficient due to the characteristics of invasive species (e.g., migration

across national borders) and the problem causes (e.g., globally increasing temperatures) that need collaborative efforts across scales to be managed.

Based on the discussions during workshops with stakeholders in Senja, it was evident that Senja was a diverse and complex system. The SES in Senja is composed of many stakeholder groups and different and often contradictory desires on how to utilize the coastal areas and resources in addition to differing perceptions on what challenged sustainable development. Consequently, there was no agreed-upon specific solution to sustainability, only efforts that could be made to address specific challenges, in turn contributing to *more sustainable* development. To address the wickedness, IGT suggests turning to bottom-up governance approaches to identify compromises and goals that reflect the values, norms, and principles held by stakeholders in the system. This could take the form of, for example, higher use of local knowledge as the basis for decisions, cost-benefit analyses, and increased stakeholder participation in decision-making, all of which were measures suggested by local stakeholders during workshop sessions. However, due to the system's dynamics, it seemed to remain challenging to agree on permanent solutions, especially in cases where a solution for one stakeholder occurred at the expense of another.

The outcomes of measures to improve sustainability are heavily dependent on the degree of stakeholder involvement and ownership in management decisions. For example, basing decisions on local knowledge to a higher degree could facilitate this, as indicated, for instance, relating to the estimation of fish biomass. Mutual trust between different institutions and organizations and groups of people is a necessity to achieve effective multilevel governance (Norwegian Ministry of Local Government and Modernisation, 2021, pp. 94-95). In terms of the local GS's ability to address local challenges, the efforts of more knowledge-based decisions may also be facilitated by integrating local knowledge in decision-making through participatory approaches, providing a more transparent process, furthermore increasing stakeholder ownership in decision-making (Tiller et al., 2021). Diverse systems need locally adapted and stakeholder-driven governance solutions to successfully respond to local or regional demands, as opposed to a strictly top-down approach (Jentoft & Chuenpagdee, 2009).

In the case of Senja, this could be done by, for example, as local stakeholders in Senja suggested, gathering scientific and local knowledge about which values exist, mapping them, and sharing them with the system on digital platforms. Challenges involving local stakeholders and a specific local natural resource may exhibit lower complexity and can potentially be addressed at the local governance level. However, despite being more wicked, some challenges need to be addressed at higher governance levels. Also, although a challenge may have characteristics that should be manageable at a local level, the local GS or SG needs capabilities that can handle the challenge for it to should be managed at the local level. In the case of Senja, this occurred regarding upgrading and especially documentation relating to wastewater treatment.

Furthermore, provided that industries such as aquaculture and tourism grow in northern Norway, more frequent and differing user conflicts may arise (Aanesen et al., 2018), emphasizing the necessity of sustainable decision-making. When managers make decisions that are not in line with people's perception of sustainability, the decisions can be perceived as unsustainable. The same accounts for people's perception of the sustainability of the choices made by businesses. For example, promoting aquaculture growth in Senja will not be perceived as a sustainable path if people believe the production to be unsustainable, as exemplified by stakeholders. Therefore, to find which decisions are perceived sustainable (i.e., reach a consensus about sustainability) it is necessary to identify sustainability compromises based on local perceptions of sustainability.

Deciding which options or approaches to follow and which trade-offs to make relates to politics and compromises people and the local management are willing to accept. Based on discussions with stakeholders in Senja, in reality, there will rarely be agreement on the definitions of the most sustainable practice. In the cases where one ends at an impasse, that is, people do not manage to agree on the best course of action, this is where the GSs come in to identify which trade-offs are the best ones and which we choose to follow. They interpret the situation and alternatives and decide and thus make the ideas of what should be and propositions turn into words (e.g., policy) which people turn to action by how they choose to act, preferably transparently and inclusively (Johnsen, 2013).

In the case of Senja, local stakeholders had many suggestions as to how their system could become more sustainable. According to IGT, these suggestions need to be integrated into local decision-making to address the wickedness in coastal governance. However, to which degree local integration should be part of decision-making is challenging in terms of responsibility. For example, how much of the responsibility for achieving local sustainable development and good governance should lie with stakeholders, the Municipality, or such as with the different national directorates? Solving wicked problems goes beyond addressing specific issues as they, due to their characteristics, require processes that manage to respond to the wicked characteristics of the challenges (Gilmore & Camillus, 1996; Jentoft & Chuenpagdee, 2009). Improving interactions between the GSs and the SG by promoting communication and collaboration is key to finding these processes and thus solutions to wicked problems, which coastal governance and sustainability arguably are. Improving governability by working on the interactions between the GSs and the SG can, therefore, facilitate sustainable development across scales, which based on these findings indicates a more transparent governance with higher stakeholder integration combined with more localized global and national goals including local adaptations of such as the SDGs. However, working towards locally perceived sustainability challenges would entail targeting specific challenges that depend on contextual solutions, which arguably can be provided by local stakeholders.

There are many challenges in any context, including in Senja, and only some of them have been brought to light in this study. By identifying and targeting challenges for sustainability in a local SES the sustainability in the system could be improved, based on perception. Trade-offs must be found and considered in terms of objectives from other governance levels and local consequences (e.g., long-term and short-term effects on the environment, economy, and society). Considering that there is no true-or-false answer to the fitness of proposed solutions as a result of varying preferences and perceptions between different groups, sufficient knowledge from various stakeholder groups needs to be part of the knowledge base to generate evidence-based decision-making. However, the methodologies for stakeholder integration should continuously gain attention as to whether they are optimal.

6.3 Operationalizing local sustainability

With an understanding of what sustainability is and which challenges must be addressed in order to become more sustainable at the local level from a stakeholder perspective, the question of by which means can the local governance system move from its existing state to a locally desired one remains. That is, how can sustainability be operationalized at a local level? Arguably, local sustainability can be operationalized by addressing locally perceived sustainability challenges. Furthermore, the challenges' characteristics and the governing capacity in different GSs determine how and at which level within multilevel governance the challenges can be addressed. In the Norwegian context, wickedness in coastal governance, stemming from the challenges' inherent characteristics and the existing capacity gaps among different governance levels, is managed through governance processes that occur at local, regional, and national levels that are linked to the global level. The dynamics of governance are complex, influenced by interactions from both higher and lower levels within the hierarchy that aim to address challenges (Figure 5) (NOU 2019: 5, 2019, pp. 6, 82-89).

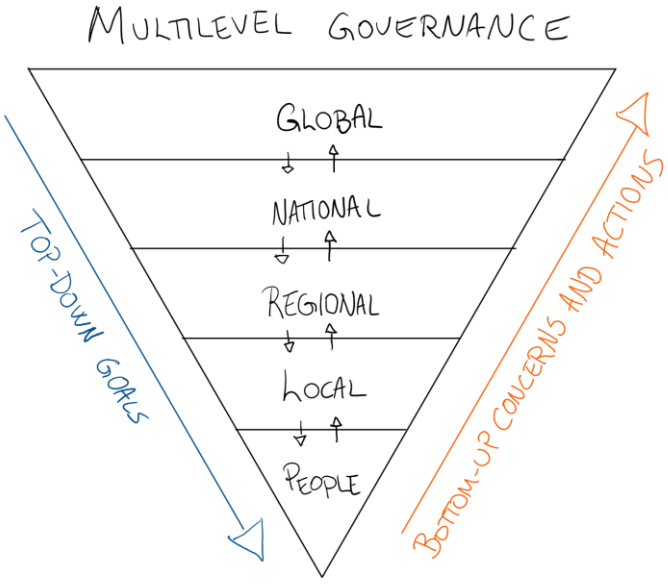

Figure 5 - Interactions within multilevel governance.

Furthermore, the locally perceived sustainability challenges affect the local GS's success depending on the GS's capacity and the challenges' characteristics. The GS's capacity, or its governability, to address the challenges, in turn, depends on objectives from higher governance levels. For instance, climate change, greenhouse gas emissions, and population growth are considered global sustainability challenges that require efforts from all parts of society to be addressed. These challenges, among others, are attempted to be addressed through the definition of and work towards common goals: the SDGs (Meld. St. 24 (2016-2017); Meld. St. 40 (2020-2021)). This can affect local governance through that in order to be sustainable at the global level, the higher governance levels have made guidelines that limit the room for action at the lower level in order to ensure development in accordance with the SDGs (Figure 5).

As a response, the national governance system tries to make decisions that are within the governance outcomes decided upon at the global level by interpreting and adapting objectives to the scale at which governance efforts are carried out (e.g., creating national objectives). This, in turn, narrows the room for action at the next levels of governance (e.g., regional and local), and new interpretations are made and measures decided upon which in the end affects people (e.g., ideas materialized as regulations such as The Planning and Building Act). Hence, ideas at the top (e.g., global SDGs) are turned into specific words such as policies, regulations, or expectations. These in turn affect how the local GS can work towards locally perceived sustainability challenges, as efforts to sustainability become governance objectives from the top-down that are interpreted while attempting to fit the context as opposed to shaped from the bottom up. Issues arise when the measures to work towards global sustainability and towards sustainability at lower levels do not match, which in turn affects people (Johnsen, 2013). In such cases, the local GS must find compromises to initiate trade-offs between working towards reaching global goals and solving local challenges. In this sense, the globally formulated sustainability goals limit the achievable local sustainability by that the local challenges may have to be deprioritized. This, in turn, increases the wickedness in local coastal governance by that it removes the possibility to explore certain solutions.

In Senja, one of the Municipality's focus areas, which proclaims that Senja shall be based on sustainability, looks into the sustainable use of resources on all levels and parts of society, while being in line with the SDGs (Senja kommune, 2019). The Municipal administration

recognizes that not all of the global sustainable development goals are equally relevant for Senja. Therefore, they have chosen seven of the 17 SDGs that they will work towards from 2019 through 2023. These were the SDGs 3, 4, 8, 9, 11, 13, and 17. However, the Municipality has not described how they chose these goals or how they intend to work with the goals, except for a compilation of brief connections between the chosen SDGs and subgoals related to the Municipality's focus areas (Senja kommune, 2020). Based on local perceptions of sustainability encompassing transparent governance, efforts to facilitate sustainability arguably contribute to limiting it. That is, despite aiming to translate SDGs to a local context to facilitate sustainability, the lack of transparency in the governance process identifying relevant SDGs for Senja contributes to challenge local sustainability.

Additionally, the absence of connections between the chosen SDGs and local challenges may indicate a gap between top-down sustainability objectives and local sustainability challenges, and working towards local sustainability cannot necessarily be simplified into predetermined and overarching parameters (Kemp & Martens, 2007). In the coastal and seafood municipality of Senja, it is, for example, not evident why SDG 14 has not been prioritized, considering that the main industrial activities and key stakeholders in Senja depend on life below water (Senja Kommune, 2021). More specifically, they depend on a healthy and resilient ecosystem, productive fish stocks, and clean water, all of which correlate with SDG 14, its subgoals, and its indicators (United Nations, n.d.-a). On the other hand, the Municipality may have reasonable arguments for their prioritization. For example, they may have evolved so far on SDG 14 that they wish to catch up on other goals. Then again, local stakeholders frequently discussed challenges during the workshop sessions that can relate to SDG 14. These challenges included biomass estimation, fishing quotas, aquaculture emission permits, conservation and protection of biodiversity, escaped salmon, disease treatments of farmed salmon, invasive species, pollution including through wastewater, climate change, and increasing temperatures. The prioritization and decisions made by the local government might, therefore, be a result of lacking methodological expertise, or good "benchmarking", on how to carry out work with SDGs and sustainability at a local level. This is the case for many municipalities in Norway, according to the Norwegian Association of Local and Regional Authorities (Hjorth-Johansen et al., 2021).

Sustainability across scales is connected, and global sustainability thus cannot be achieved without local and regional sustainability as its foundation while acknowledging the cross-scale connections of social-ecological systems (Wu, 2019). However, as the higher levels of governance in multilevel governance reduce the room for action further down in the hierarchy, arguably local sustainability cannot be achieved without formulated objectives, goals, and indicators that are in line with local sustainability challenges. Efforts are needed in this regard, given the notable mismatch. For example, when investigating sustainability, the SDGs appear fairly quickly in governmental plans and priorities as being the basis for actions taken (e.g., Meld. St. 40 (2020-2021), Senja kommune (2019), Senja kommune (2020)). Yet, development and planning at the local level, which is regulated by the Planning and Building Act, which aims at being sustainable, does not mention the SDGs (Plan- og bygningsloven, 2008). Additionally, when asking local stakeholders about the main challenges for development in Senja, the SDGs were not mentioned once. There may be an overlap between the criteria for local sustainable development and the SDGs, but this connection seems unnoticed or not acted upon at the local level, or that value is not recognized by local stakeholders in how working towards SDGs can facilitate local sustainable development. This points towards a gap between local perceptions of sustainable development and global top-down sustainability objectives, in turn limiting the achievement of each other.

As operationalizing sustainability in the case of Senja depends on addressing wicked sustainability challenges, efforts must be taken to reduce the wickedness, according to IGT. This entails reducing diversity, complexity, dynamics, and scale issues by targeting efforts to affect the components, relationships, interactions, and boundaries within the SES in Senja (Jentoft & Chuenpagdee, 2009). At the local level, both regarding the local SG and GS, the diversity, complexity, dynamics, and scale are lower compared to that at higher governance levels. Therefore, addressing challenges at a lower governance level would entail less wickedness.

However, in cases where the local GS's capacity does not suffice to handle the wickedness in question, as illustrated by the division of the challenges in the results section as well as exemplified earlier with global sustainability challenges including climate change, they will need to be addressed at a higher level. However, at the higher levels, local knowledge and participation in decision-making are limited, which may result in that enforced solutions are

not sufficiently contextual and, therefore, do not necessarily address the challenges' root causes (Jentoft & Chuenpagdee, 2009). As a measure, bottom-up concerns are attempted to be communicated upwards in the governance hierarchy, for example from the local SG to the national GS through GIs with the local and regional GSs (Figure 5). This can be to, for example, attempt to affect decisions that are not perceived as being in line with local sustainability. However, evaluation and decisions about actions and progress towards sustainability remain decided higher up in the multilevel governance hierarchy, and local stakeholders may not have the ability or resources to break through nevertheless.

Furthermore, local stakeholders do not necessarily know how to facilitate sustainability across scales, yet it is necessary to take into account local perceptions when working towards a more sustainable development and aiming to address sustainability challenges. This is, for instance, in terms of identifying tailor-made solutions or improving local ownership in decisions (Jentoft & Chuenpagdee, 2009). The solution to operationalizing sustainability may, therefore, have to entail changing the governance systems in ways that make them able to handle the challenges in question. However, this would entail comprehensive systemic changes on all levels which is not possible to achieve short-term, if at all. Yet, decision-making and management will continuously develop as a response to the dynamic local, national, and global demands and ecosystems (Hersoug & Johnsen, 2012, pp. 40-43). Considering the gap between global sustainability objectives and local demands, it is essential to continue looking for solutions so that the GSs can provide more opportunities rather than limitations further down in the multilevel governance hierarchy.

6.4 Limitations of the Study

In any scientific work carried out, there will be limitations and uncertainties concerning results and conclusions. In this thesis, a qualitative approach was chosen to gather and analyze local knowledge about sustainability challenges in Senja. Due to being a time and labor-intensive research method, a compensation of a low number of participants was interacted with. Although participants were carefully selected to be individuals with valuable expertise, their perceptions of challenges and the local system will be colored by individual values and interactions with the system, among others. That is, opinions may be of subjective character as opposed to objective. This means that different results might have been produced by interacting with another sample within the system given that they have perceptions

developed from other values (e.g., those stakeholders that were mapped during stakeholder mapping but did not respond to workshop participation). Still, this does not mean that the results necessary are faulty, but rather limited to the perspectives of the participants. Therefore, uncertainty remains concerning that which is considered the *main* challenges.

Furthermore, uncertainty also exists relating to the interpretation of the empirical data as the findings based on the evidence provided by the different sectors were not validated in the intended cross-sectoral workshop. As a consequence, some of the points made about challenges may be outliers. This means that ideas that may have been considered important in terms of local sustainability may not have been captured if they did not come to mind during sessions. The same outcome may also be a consequence of the workshop facilitation, considering that participants' answers may reflect the questions asked during the sessions (e.g., the conversation starters). On the other hand, if something was perceived as a major challenge for the system it could be expected to naturally come to mind by at least one participant when participating in discussions about local challenges over 1.5-2 hours.

Another limitation of the study relates to that the results are only from one case area (i.e., Senja). The local case in Senja and how locally perceived challenges relate to global goals and how especially the Municipal administration work with sustainability is unique for the case. Therefore, these findings first and foremost apply to the case of Senja.

Additionally, perceptions of sustainability can be colored by how the term sustainability is applied, for example, in governance (such as how working towards the SDGs has been discussed as equivalent to working towards sustainability). Topics that are perceived as local sustainability challenges may initially be sustainability challenges on other levels.

Furthermore, global challenges are not necessarily experienced at the local level. For example in the case of Senja, some stakeholders did not experience local challenges that they would perceive as consequences of climate change. Consequences from global challenges such as climate change may or may not be present, but are perceived as if they were not potentially due to how global challenges can be mediated and politicized. For example, local stakeholders in Senja expressed how people turned to media for information about challenges and development, often instead of evidence provided by businesses. Hence, discussions about climate change in media may color local perceptions of how climate change would be

noticed, such as in the form of local wildfires, sudden death among fish, or heavy precipitation. In reality, however, local consequences from global sustainability challenges such as climate may be more hidden, for example as gradually loss of biodiversity (Peterson et al., 1998).

Another limitation of the study concerns the application of IGT, which is a highly theoretical and comprehensive perspective. For example, categories are applied to make sense of the world around us. However, categories such as the GS, SG, and GI used for analysis purposes may provide findings that are not in line with reality as the content within categories can be dynamic and not exclusive to one of the subsystems. For instance, the GS and the SG can constitute the same entities, as when a GS is subject to being governed by a higher level GS, or when elements within the SG (e.g., people) contribute to governing and thus becomes part of the GS (Song et al., 2017). Also, not all parts of a GS will actively participate in the governance of specific objects, yet are considered part of the GS as they have the ability to contribute. However, if the ability to participate constitutes the condition to be considered part of the GS, then all who possess the ability to govern will be part of the GS, which constitutes the human part of the SG, depending on the topic or challenge discussed. Therefore, which subsystem should address specific challenges is appointed based on expected capacities within the subsystems as opposed to their actual content and will therefore serve as an indicator rather for where to address challenges.

Moreover, in the case of Senja, to effectively govern fisheries, aquaculture, tourism, and so on, knowledge must be possessed about the area and its resources (e.g., fish banks, currents, hiking trails, and how they connect). For example, it is only possible to have a fisheries industry in Senja because there are fish nearby, and the fish stocks must be managed accordingly with their dynamics to withstand the pressure from fisheries activities (Johnsen, 2013). However, synthesizing and working with comprehensive data about all components in a system and how they interact and connect with other components are very challenging tasks that, despite being efforts to reduce wickedness in accordance with IGT (Song et al., 2017), would increase the wickedness of the coastal governance through the governance processes necessary to capture the knowledge in the system. Also, more knowledge will not necessarily make it less wicked to make a decision, for example in cases where increasing numbers of opposing interests are brought forth.

Moreover, IGT argues for decision-making based on local knowledge to address wickedness (Jentoft & Chuenpagdee, 2009). However, it is not written in stone that stakeholders always know what is the best governance solution, for example in terms of sustainability across scales. Given a certain understanding of the term sustainability, an individual may perceive sustainability in relation to herself or himself at a specific scale. Although this too can be termed sustainability (as a result of perception and scale), it is not necessarily equivalent to sustainability across scales. That is, perceptions of what needs to be done at the local level to facilitate individually perceived sustainable development may not be the same option resulting in the most sustainability at other scales or from others' points of view. Therefore, although recognizing high value in the integration of local knowledge and participation in decision-making, work towards sustainability will depend on coordination, collaboration, and communication across governance levels.

7 Conclusion

The two overarching research questions in this thesis concerned what local stakeholders perceived as challenges for sustainable development and how these challenges affect the local governance system. Multilevel governance attempts to address wicked problems of sustainability by managing the wickedness through governance processes at different levels. Efforts across governance levels and by all parts of society are deemed necessary to combat major sustainability challenges. However, working towards sustainability is challenging in cases where governance efforts are not perceived as contributing to sustainability at the local level. Local perceptions of sustainability are shaped by how people interact with and understand the system they are part of. In the case of Senja, local stakeholders arguably perceived their system as an SES where a more sustainable development could be found as compromises within environmental, social, and economic aspects, depending on the context.

Sustainability thus concerns trade-offs where steps must be taken to reduce or hinder irreversible measures that later will be regretted. The sustainability of measures and decisions becomes a result of the decision-making process before the measures are carried out. To find out if chosen trade-offs are to be considered sustainable it is necessary to learn about how people perceive sustainability and what they are willing to negotiate about. This has implications for the local governance through how identifying sustainable compromises, therefore, becomes a governance challenge and a question about which processes are needed to do so. Since the perception of that which is characterized as sustainable at the local level is contextual, it argues for local participation in governance.

It is locally that the stakeholders are, that is, those who shall be managed, and they have needs of their own whose achievement depend on local and regional management to succeed. However, they may depend equally much on higher governance levels. As a result of shortcomings in managing the gap between top-down sustainability objectives and perceived local challenges for sustainability, overall sustainability may be limited. Questions need to be raised about whether expectations and regulations from higher governance levels are applicable at a local level and what their consequences will be.

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