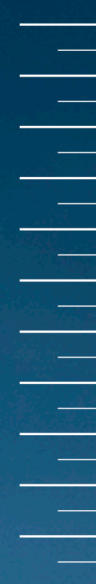


•REPORT 2015:06

Future narratives for two locations in the Barents region



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Future narratives for two locations in the Barents region

Report for scenario-building workshops in Kirovsk,
June 9th 2015, and Bodø, August 25th 2015

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Abstract: What does the future look like from the perspective of municipalities in various locations in the Barents region? What climatic, social and environmental challenges might there be, and how might local people respond?

This report documents the results from two workshops held in Kirovsk and Bodø in 2015, addressing above questions. These workshops are part of a series of four workshops across the Barents region with the aim to build visions of different local futures in the Barents region under different climatic and socio-economic contexts. All workshops use the same methodology and research question, and connect local change to global scenarios.

A secondary aim of this report is to offer a description of and reflection on the methods employed as a basis for further development of the approach. The method follows a bottom-up, participatory scenario building approach, and is based on identifying local drivers of change which are of especial importance or uncertainty in the region. These locally important drivers are then evaluated in the form of narratives in context of four different global scenarios of alternative futures of societal development, known as the shared socioeconomic pathways (SSPs). The entire exercise, from driver identification to narrative development, involves a mixture of local actors together with researchers, using knowledge and understanding from both communities.

The resulting narratives highlight locally important issues different from pan-Arctic evaluations of future change. They also show that local development is perceived as closely linked to global processes, such as changes related to climate, but especially socio-economic factors such as demography, resource markets or politics.

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Preface

This workshop report is written by Bob van Oort (CICERO), Maiken Bjørkan (Nordland Research Institute), and Elena M. Klyuchnikova (INEP). Ownership of and responsibility for the contents of this report belongs in equal measure to the above mentioned individuals and institutes. The institutes that were directly involved in the organization of the Bodø and Kirovsk workshops are

- CICERO Center for International Climate and Environmental Research – Oslo
- Institute of Industrial Ecology Problems in the North, Kola Science Center, Russian Academy of Science
- Luzin Institute for Economic Studies, Kola Science Center, Russian Academy of Science
- Nordland Research Institute

The following contributing authors have played an important role in the organization of the workshops, participating in a coordinating role, and/or contributed to parts of the text used in this report: Ingrid Bay-Larsen (Nordland Research Institute), Lize-Marie van der Watt, Annika E. Nilsson and Henrik Carlsen (SEI - Stockholm Environment Institute).

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1 Introduction

This report presents the results from two workshops held in Kirovsk and Bodø in 2015. The Bodø and Kirovsk workshops are part of a series of four workshops held in the Barents region, following an earlier workshop held in Pajala, Sweden, and preceding the final workshop in this series held in Inari, Finland. These workshops are part of a larger effort to build visions of different local futures in the Barents region under different climatic and socio-economic contexts.

The workshops use the same methodology and examine the same research question, but the sites are distinct. All are based on an understanding that local future changes are connected not only to climate change, but also to socio-economic changes. Moreover, local change is connected to global change and vice versa. Thus, the aim is to connect projections of global socio-economic to local processes, cultures, and understanding of the global to local - and local to global – consequences of change. The workshops follow a bottom-up scenario building process: they are based on local knowledge and understanding and follow a participatory methodology ensuring inputs from all participants to all parts of the process.

This report documents the processes and findings of the Kirovsk and Bodø workshops with the aim of 1) providing feedback to the participants, 2) allowing for local reflections of the results and potential support for local decision making and 3) documenting the scientific reflections on the methodology to improve future replications. Since the methodology in these workshops is the same, several sections of this report (including background, methodology and appendices referring to the methodology) are adaptations or taken directly (with permission) from the Pajala workshop report (Nilsson et al. 2015).

The Bodø and Kirovsk workshops are funded as a stand-alone Norwegian Research Council funded project entitled “Future narratives cross-national perspectives on adaptation to climate change among local and regional actors”. Their results however feed into two different, larger projects: 1) The Barents regional report of the project Adaptation Action for a Changing Arctic (AACCA) under the auspices of the Arctic Council (www.amap.no/adaptation-actions-for-a-changing-arctic-part-c), and 2) The research program Mistra Arctic Sustainable Development (MASD - www.mistraarctic.se) as part of the work package “The Changing Global Context of the European Arctic” (WP3).

This report is structured as follows: First we describe the setting of the project in its aim to support planning for a sustainable development, including developments in the ways that local knowledge, scientific knowledge and policy making are working together in future planning. Secondly we describe the background for why scenarios are used, the importance of local involvement and co-production of scenarios, and the importance of linking global and local development. Next, we explain the methodology we applied in the workshops and how this was used 1) to create an overview of locally important and uncertain issues, and 2) to develop local scenarios following four different global development pathways. Finally we summarize the workshop findings and discuss how the methodology played out in the local setting, which parts of the method worked well and which revealed issues of caution with regard to applying the methodology in certain contexts. A detailed set of appendices with information relating to the individual workshops or methodology follows the report.

1.1 Background

Sustainable development has become an overarching policy goal that is increasingly ingrained in global, national and local decision-making processes. Its basic premise is an ambition to strive for “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (World Commission on Environment and Development 1987). It thus points to a need for understanding not only challenges of the present but also to imagine the challenges of the future. Imagining the future have a long history, not least in a northern context where various actors have projected their dreams and visions of modernity (e.g. Sörlin 1988). In recent years, the focus on the future has intensified. Climate change has become an important variable and we can no longer take for granted some basic premises regarding the environment in which future generations will live. In addition, globalization, with its compression of time and space, has quickened the pace of change and broadened the geographical scope of what may affect the future of any particular locality. This pertains also to northern regions (Heininen and Southcott 2010; Keskitalo and Southcott 2015). Thinking about the future thus involves thinking about a rapidly changing world in which the local and the global are intimately interconnected.

Some of the changes that we are likely to see in the next one or two generations are fairly predictable, given the current knowledge base and the fact that there is a certain built-in inertia in some systems. For example, we know with growing certainty that the global average temperature will increase due to the emission of greenhouse gases (Pachauri et al. 2014). We know that the global human population will continue to grow and that the middle class is likely to expand. The demand for food, water and energy will grow, fueled by changing economic conditions in the developing world. Various expert groups have identified a number of current megatrends that will affect the future, both at the global scale and for the Arctic region (e.g. Rasmussen 2011; EEA 2015; Andrew 2014). They also include so-called game changers. These are events that may change the course of history but can be very difficult to predict. The trends and game changers will not develop in isolation from each other. Instead, in a globalized setting, they increasingly interact. For example, a development that starts with a change in the physical environment, such as the decline in Arctic Ocean sea ice, influences how different actors view the Arctic and how they position their political and economic interests in areas that have little to do with the ice as such (Christensen et al. 2013). Sometimes, seemingly small changes in ideas, technology or behavior can interact and alter both the physical and the social characteristics of a region. This complexity makes it difficult to predict the future and makes it necessary to be prepared for surprises. Given this complexity and the consequent inherent uncertainty, how can we plan for sustainable development?

One way to approach this is to focus more on creating processes for continuous evaluation rather than trying to predict the impacts of each driver of change at a specific point in time. It includes creating processes that take different perspectives into account since we need knowledge on a range of different issues. Moreover, it includes creating processes that serve as platforms for learning to live with change and uncertainty. Historically, the future for most parts of the Arctic have been defined by actors from elsewhere, be it policy makers in southern capitals, scientists, transnational companies, or environmental NGOs (see e.g. Bravo and Sörlin 2002). Policy makers and researchers have only recently recognized local residents as legitimate political actors for defining development in the north (e.g. Healey 1999; Allmendinger and Tewdwr-Jones 2002). To ensure the legitimacy of scientific advice, local knowledge is also increasingly recognized as valid in scientific and advisory contexts, especially regarding issues such as public health, food safety and natural resource management (e.g. Agrawal 1995; Felt and Wynne 2007; Jasper and Delkin 1992; Krupnik et al. 2011).

What is new is the imperative to *design* research in such a way that it facilitates co-production of knowledge and learning across different communities of practice. This becomes especially relevant when thinking about the future in the northern regions, where much of the decisions traditionally are made from the southern capitals or by large industries with northern interests. In the context of climate change and narrating the future for the northern regions, knowledge creation and information is still mainly a top-down process: by scientists and other external actors with little or no knowledge about the local context. Moreover, many of these (northern) narratives speak about the Arctic in general, as a uniform region, without taking into account the myriad of different local contexts.

1.2 Scenario methods

Scenario methods are frequently used in decision-making situations when uncertainties are high, but it is still necessary to form a long-term view (Raskin et al. 2002). Scenario approaches have a history from the 60's and 70's when they were first used for military purposes (Kahn and Wiener 1967), the business environment (by Royal Dutch Shell group, see Wack 1985), and to global environmental concerns (Meadows et al. 1972). Today, scenario development is used in a variety of different contexts ranging from political decision-making to business planning, local community management, and global environmental understanding (Kok and van Vliet 2011).

Scenarios are usually constructed for exploring a range of plausible alternative development pathways, which is especially useful when there is a need to assess the usefulness of actions or decisions under conditions of inherent uncertainty. Scenarios and other related foresight techniques come in many different forms and can be roughly organized in relation to the principal questions an actor may want to pose about the future: Trend analysis (or forecasting) aims to answer the question “What will happen?”, explorative scenarios address “What can happen?” and normative scenarios ask “How can a specific target be reached?” (Börjeson et al. 2006). In this work, we focus on explorative scenarios, which can be defined as “... plausible and often simplified descriptions of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces and relationships” (Ash et al. 2010).

Within the climate change community, scenarios have been used to better understand how emissions of greenhouse gases might develop in the future (e.g. the ‘SRES report’, Nakicenovic et al. 2000). They have also been used for assessing local impacts of climate change (e.g. Berkhout et al. 2002) and as a tool for climate adaptation planning (e.g. Kok et al. 2007; Baard et al. 2012; Carlsen et al. 2012). So far, most climate change scenario work has been carried out by scientists and experts (i.e. top-down approach) who have focused on global development. Researchers are also attempting to scale down narratives to the level of the Arctic region (Peters et al. forthcoming). However, given the complexity of the issues at hand and the need for processes for sustainable development, it would be useful to involve a more diverse knowledge base, including local and regional actors (i.e. bottom up approach), in building explorative scenarios. The latter approach would also ensure ownership of the scenario process and that relevant knowledge was included in the scenario building.

There is an on-going effort to create a new scenario framework aimed at being useful both for assessing possible future emission of greenhouse gases and the potential for adaptation within the same overall scheme (O’Neill et al. 2014 and references therein). It includes both attention to potential future concentrations of greenhouse gases in the atmosphere (using Representative Concentration Pathways – RCPs; see Vuuren et al. 2011) and storylines of global social and economic development (using Shared Socioeconomic Pathways – SSPs; see O’Neill et al. 2015). The SSPs offer plausible and internally coherent alternative visions of future global society and natural systems throughout the 21st century without any

assumptions about climate change or climate impacts, nor any assumptions about new climate policies. The climate policies can be addressed using Shared Policy Assumptions (SPAs) (Kriegler et al. 2014), a third key determinant of uncertainty in future evolutions. Together, the RCPs and SSPs (and SPAs) aim to serve as a coherent framework for analyzing challenges to mitigation and adaptation both worldwide and regionally.

1.3 Workshop aim, method and structure

When planning for the narrative workshop series (including Kirovsk and Bodø) we sought to use the new global scenario framework that has been developed within the climate change research community, with the research aim to better understand climate adaptation and mitigation challenges. We also aimed to take advantage of the positive aspects of narrative approaches and participatory methods (see also Nilsson et al. 2015). We therefore developed a methodology that uses the global socio-economic pathways as boundary conditions for creating locally informed future scenario narratives. In the process, narratives about the future are created based on discussion taking place in a local context with the aim of producing so-called extended shared socio-economic pathways, local scenarios linked to global pathways of change. Other boundary conditions for the scenarios process are given by the overall context of the Adaption Action for a Changing Arctic (AACA) project which the workshop is connected to, including the time frame and the geographic boundaries of the exercise. The time frame of one or two generations into the future, or 30-50 years. In the workshop introduction, participants were encouraged to think about the world in which their children and grandchildren would live and were also alerted to how much has changed in the past 30 years. The time horizon of 30-50 years is longer than what is used for most policy-related planning processes, such as spatial planning, but still relevant and useful in relation to needs for dealing with uncertainty in decision-making. The geographic perspective, or focal spatial scale, is on the Barents region, with special attention to the decision-making at county and municipal levels. One overarching purpose is to aid local and regional actors in making decisions about the future, given rapid social and environmental changes.

The workshops follows the standard workshop procedure by Mercer (1995) with some slight changes, the most important difference being that we combine a bottom-up and a top-down approach. A detailed manual that was used for guiding the steps throughout the workshop is included in the appendix. A main emphasis in the workshop process was to follow an interactive, participatory approach. A major issue in using participatory methods is choosing and engaging with participants early on in the process. Within this context, the first task in the process was to define a focus question, with purpose of framing the scenarios in a way that would be relevant for the users. In a longer engagement process, an alternative would have been to start even more open-ended and use participatory approaches also for defining the focus question, but time constraints limited this process. Thus, a small team of researchers elaborated the initial focus question:

Which future changes will affect this region economically, socially and environmentally in the next 30-50 years?

Next, invitations including this focus question and some background to the workshop intentions were send out to targeted, professionally active people, resulting in an overrepresentation of people in the 30-60-year span and youth and people past retirement largely missing. We chose a setting of approximately 20-25 participants who were representative of local, regional and sector-specific perspectives, including both practitioners and researchers (appendices C and F). The premise was that a mixed group would facilitate

learning across different experiences and knowledge. The practitioner participants were recruited via prior contacts in Nordland Research Institute and Kola Science Centre research projects, web-based searches for names in relevant organizations, and by recommendations by the initial contacts. In the final group, there was no great bias in distribution between researchers and practitioners, or women and men in the group.

While the first workshop in the series (Pajala) was held over two days and included many introductory presentations by scientists and local participants to set the stage, the Bodø and Kirovsk workshops were limited to a duration of only 1 day to minimize the demand on time of the participants. There are also several options regarding the amount and type of information the participants should receive before and at the start of the actual workshop. One approach is to provide extensive information regarding possible climate change and information on possible climate change impacts in the region or various sectors (Carlsen et al. 2012). For the Bodø workshop however we opted for limited background material to an invitation letter (appendix E) placing the workshop in context and adding some background information regarding the SSPs (appendix H). Similarly, the invitation letter to the Kirovsk workshop was kept short: explaining the goal of this event and highlighting the importance to hear participant's opinions and experiences. Also during the workshop the amount of information and presentations was limited in these latter workshops. Using one convener to guide participants through the separate steps in the workshop (see below), the workshops followed the following structure:

Information and background: After welcoming participants and providing a very brief introduction to the context of the workshop, the first session was devoted to giving local and regional actors an opportunity to present some of the challenges to future planning as seen from their perspective. The purpose was to familiarize people who were not from the municipality and its surroundings to the local context and to give their perspective a priority in issue framing (in contrast to foregrounding a particular expert-identified issue from the start). In Bodø, these briefings were limited to some brief speeches, while in Kirovsk these had the format of presentations by invited speakers (see appendix B).

Identifying and clustering “drivers”: The building blocks of the extended SSPs socioeconomic scenarios are called drivers (many alternative labels are used, e.g. variables, driving forces etc.). The term driver may be slightly misleading as it implies something that brings about change, while the term factor is more neutral in relation to whether something might push for change or create stability and resilience in the face of change. Regardless, the idea was to generate a list of issues that are relevant for answering to the focus question. After the exercise was explained, the participants were given some time to think and to write down the two most relevant “drivers” on large post-it notes. One-by-one the participants placed their post-it notes on a wall creating a shared work-think space for the whole exercise, which also served as a vehicle for documenting the discussions. Ideas that had some similarities with notes that had been posted earlier by other participants were placed close to one another, which provided some initial clustering. Being a brainstorming exercise the general rule was that ideas should not be criticized, but instead only presented and accepted as part of the common pool of thoughts. A small group of people later organized these initial clusters into a number of distinct categories that were given cluster names (e.g. climate change, international security, energy demand, ...). Clustering adds a measure of subjective interpretation but starting from some self-clustering and having a group rather than an individual doing counteract some of this potential bias. The participants also had an opportunity to comment on the clustering.

Prioritizing clusters: In order to prioritize the number of clusters that we would work with in developing extended SSPs, participants had a chance to vote for the most important and the most uncertain clusters. This was done individually with red and blue sticky “dots” that participants were asked to place on the cluster names for important and uncertain clusters respectively. Each participant received a set number (5

or 6, varying per workshop) of these stickers, and these “votes” could be spread among the clusters as they wished – all on one cluster or spread across many. The clusters were then ranked by adding the number of votes on importance, with a separate ranking for the number of votes on uncertainty. While each cluster may be important to some people, the idea behind this voting is to single out the most important and uncertain clusters for the region and their relationship to global change as described by the extended SSPs. Focusing on uncertain clusters increases the likelihood that the socioeconomic pathways cover a broad range of possible futures and enhances the identification of future challenges of options.

The next step in the scenarios process was to articulate how these locally important or uncertain issues might play out at a specific scale or in a specific sector in the future of 2-3 generations from now. In our workshop design, we used four of the global SSPs as boundary conditions (see O’Neill et al., 2015). The SSPs describe four different worlds, differing in several key assumptions regarding policies, energy use, development, cooperation, education, etc. Table 1 describes some of the key differences between these worlds, with each world being named for some key characteristic: The green road - a sustainable world; a road divided – a world with large inequalities; a rocky road – a world with regional rivalry, and; taking the highway – a fossil-fueled development world. More detailed descriptions can be found in the appendix (H). These four SSPs were discussed in facilitated group discussions (see appendix B). Each group was given the task of discussing what the prioritized clusters might entail at the local and regional level, in one of the four above mentioned global contexts, given the focus question: “*Which future changes will affect this region economically, socially and environmentally in the next 30-50 years?*”. After the group discussions, all workshop participants gathered and each group reported back on its discussions, with some time to discuss similarities and differences between the groups. The following sub-sections describe the background, issues of importance and uncertainty, and the narratives from the group discussions for the Kirovsk and Bodø workshop.

These different worlds have different implications for mitigation and adaptation options and challenges (figure 1), but they may also be divided along several axes for comparison, for example along axes of the type of energy use – fossil versus renewables, or the level of equality and development within a society/between nations.



Figure 1. In the Kirovsk and Bodø workshops the focus was on the four SSPs indicated in the figure, which distinguish themselves among other details in the degree of challenges to adaptation and mitigation. Figure adapted from O’Neill et al. (2015).

Table 1. Summary of assumptions regarding Economy & Lifestyle and Policies & Institutions elements, based on (O'Neill et al. 2015).

Key assumptions	Regional Rivalry - A Rocky Road	Sustainability - The Green Road	Fossil-fueled Development - Taking the Highway	Inequality - A Road Divided
Environmental policies	Low priority for environmental issues	Improved management; strong regulations	Focus on local environment, little concern with global issues	Focus on local environment in high-income countries; no attention to global issues
Policy orientation	Towards security	Towards sustainable development	Towards development and human capital with free markets	Towards benefit of the political and business elite
Institutions	Weak global; national governments dominate	Effective	Increasingly effective	Effective for elite
Education	Low	High	High	Very low to medium, very unequal
Social cohesion and equity	Low	High	High	Low, stratified with medium equity
Health investments	Low	High	High	Unequal within regions, lower in low income countries
Inequality	High, especially across countries	Reduced across and within countries	Strongly reduced, especially across countries	High, especially within countries
Globalization	De-globalizing; regional security	Connected markets, local production	Strong and increasingly connected markets	Globally connected elite
Consumption and diet	Material-intensive consumption	Low growth in material consumption, low meat diets	Materialism, high consumption, meat-rich	Elite: high/material; rest: low
Population growth	Low in OECD; High in high fertility countries	Relatively low	Relatively low	Low in OECD, relatively high elsewhere
Technology development and transfer	Slow	Rapid	Rapid	High in high-tech economies and sectors; slow in others with little transfer
Carbon (energy) intensity	High	Low	High	Low/medium
Environmental status	Serious degradation	Improving conditions	Highly engineered approaches	Highly managed near high income areas; degraded otherwise

2 Kirovsk workshop - 09.06.15

Murmansk region development in a changing climate



Photo: Flickr creative commons, Ekatarina Sotova.

2.1 Brief background about Murmansk Oblast and Kirovsk

The city of Kirovsk is located in the central part of the Murmansk region and its main economic activities are represented by extraction and processing of apatite ore and tourism. In Murmansk Oblast, an area that covers about 150 000 km², the population is close to 800 000. 28 625 of these live in Kirovsk. The majority of people live in urban areas, and less than ten percent lives in rural areas. Murmansk Oblast is very rich in natural resources and has deposits of over 700 minerals. The main industries of the region are in the sphere of raw material extraction and basic processing. The largest industries are metallurgy (36,6%), electric power-production (22,9%) and food-industry, including fishing (13,7%). The oblast has a 41% share of the total Russian marine transport market.

In Kirovsk, mining has been the dominating industry since 1929 and still is, with major job opportunities provided by two mining companies JSC Apatit and JSC Northern – West Phosphor Company. Nature-based (winter) tourism, which was developed in Kirovsk during the Soviet era, experiences a revival due to a new regional development strategy. The municipality includes Koashva village where the office of JSC Northern – West Phosphor Company is situated. There are 29000 inhabitants in the municipality.

The Kirovsk workshop participants included mostly regional representatives of industry, small and medium sized enterprises, NGO and science. 25 people participated in the seminar, including the representatives of

the Government of the Murmansk region (the Ministry of economic development, natural resources and environment), local authorities, large industrial companies (Kolskaya mining and processing company, Kolskaya Nuclear Power Plant, JSC Apatit), small businesses, public organizations (environmental and entrepreneurial) and researchers.

Table 2. Kirovsk/Apatity climate, 1982 to 2012 averages.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	-13	-13	-8,1	-3	3	9,4	12,8	10,9	5,9	0,1	-6	-11
Precipitation (mm)	33	26	30	31	38	55	69	69	64	60	48	40

Sources: https://en.wikipedia.org/wiki/Murmansk_Oblast, https://en.wikipedia.org/wiki/Kirovsk,_Murmansk_Oblast and <http://en.climate-data.org/location/8457/>

2.2 Creating local narratives for different global contexts

The workshop started with a short series of presentations related to the forecasted impact of climate change on natural and economical systems of the Arctic. Summaries of these can be found in appendix B of this report. The workshop then commenced with a session on identifying key issues in the region, identifying and prioritizing drivers of change. This session followed the method outlined in the introduction to the methodology, and was divided in three stages.



SESSION 1: Driver identification and prioritization

In the first stage, each participant of the workshop was given four post-its to suggest important (driving forces for) future changes, which can have economic, environmental and social consequences for the Murmansk region during the next 30-50 years. Participants placed the notes on the wall, commenting briefly about their choice. Participants were asked to place matching ideas nearby each other, while different ideas should be placed separately. After a first round of ideas, participants were asked to add any remaining ideas if they noticed something of importance still missing. As a result, 60 ideas were identified and grouped into 10 clusters of drivers (table 3). Each cluster was assigned a number, and during joint discussions, given a generic name.

Table 3. Grouping drivers into clusters

Cluster name	Drivers (ideas)
Changing environmental conditions/ Ecosystem services	<ul style="list-style-type: none"> - Increase in probability of a man-made catastrophe (accident) - Increasing volumes of accumulated environmental damage - Increasing cross-border transfer of pollutants - Increase in household wastes (intensification of human impact on the environment) - Reduction of atmospheric air and water pollution, and environmental pollution in general - Kola Peninsula will be a waste storage and then turn into a desert - Violation of the carbon balance - Increase in emissions of polluting substances into the air and wastewater discharges
Changing demographic structure/ Demography	<ul style="list-style-type: none"> - Population decline - Outmigration resulted in degradation of the territory - Stabilization of permanent population - Population decline on the Kola Peninsula, change in population, change in population categories (connected to seasonality) - Decline of population of the continental part; Murmansk is the profit center in case of the Arctic development - Population decline - Continuation of population decline with slowing down of its rates - Decline of population and labor force - Rotational work method in the mining industry leading to population decline - Outmigration - Production optimization as a negative factor for population - Challenges of population migration - Increase in labor productivity
Changes at the market of mineral resources/ Mineral market	<ul style="list-style-type: none"> - Negative trends at the mineral market - Fluctuations at global mineral market - Changes in availability of energy will result in reduction of production - Deterioration of the economy, growth of social problems
Changing reserves of mineral resources/ -	<ul style="list-style-type: none"> - Depletion of mineral reserves will lead to decrease in mining activities and, consequently, reduction of jobs in this sector - Depletion of mineral reserves (common minerals) - Keeping the dominant role of the mining sector in the regional economy - Reduction of accessible mineral resources will result in development of other types of nature based activities (tourism, agriculture)
Development of technologies/ Technology	<ul style="list-style-type: none"> - Development of “green” energy on the basis of renewable energy sources - Access to clean energy - Shift in structure of energy sources towards gas and nuclear power - Ecological modernization of mining and energy productions - Emergence of new technology will significantly influence tourism development - Innovations – improvement of life quality, employment structure - Adaptation mechanisms within economy and organisms (human and other) - Development of the mining industry, new deposits, automated technologies
Reflection (perception, culture)/ Ideology/Values	<ul style="list-style-type: none"> - More attention of local self-government to environmental problems - Improvement of social health - Improving educational culture - Improving political culture

	<ul style="list-style-type: none"> - Improving ecological culture - Governance systems - Degradation of the institution of "hard" legal standardization in the environmental law - Strengthening civil society participation in governance of the region - Lack of ecological culture - Changes in legislation – not always for production development
Climate change/ Climate change	<ul style="list-style-type: none"> - Significant (mass) spread of species not typical for the region - Lack of drinking water of proper quality that leads to diseases - Lack of water for hydropower plants that leads to reduction of security of the region - Drought, changing the water regime
Foreign policy/ International security	<ul style="list-style-type: none"> - Changes in geopolitical situation - Paris 2015 - International relations - Changes in geopolitical situation - Political changes, international tension
Cultural diversity/ -	<ul style="list-style-type: none"> - Integration of economic and social projects, and a corresponding reduction in social and economic sustainability - Loss of cultural diversity (the Saami)
Morbidity/ -	<ul style="list-style-type: none"> - Growth of morbidity

These clusters were then voted for using the criteria "importance" and "uncertainty" (see appendix I for methodology), which were then ranked by the number of votes (table 4 and figure 2).

Table 4. Results of the prioritized clusters and ranking of importance and uncertainty.

Cluster	Importance		Uncertainty	
	votes	rank	votes	rank
Locally important values and drivers				
Technological development	23	1	10	4
Environmental conditions	22	2	6	5
Demographic structure	19	3	2	7
Reflection (perception, culture)	19	3	6	5
Mineral resources market	13	4	18	2
Foreign policy	8	5	18	2
Mineral resources reserves	5	6	10	4
Climate change	5	6	23	1
Cultural diversity	1	7	14	3
Morbidity	1	7	5	6

The third stage was to choose 8 clusters for further work in groups. The selection was based on the ranking in table 4 following "importance" as the main criterion for selection. Despite the greatest uncertainty indicator in cluster "Climate Change", it was accepted for further consideration. "Cultural diversity" and "Morbidity" were excluded as the least important according to the voting results.

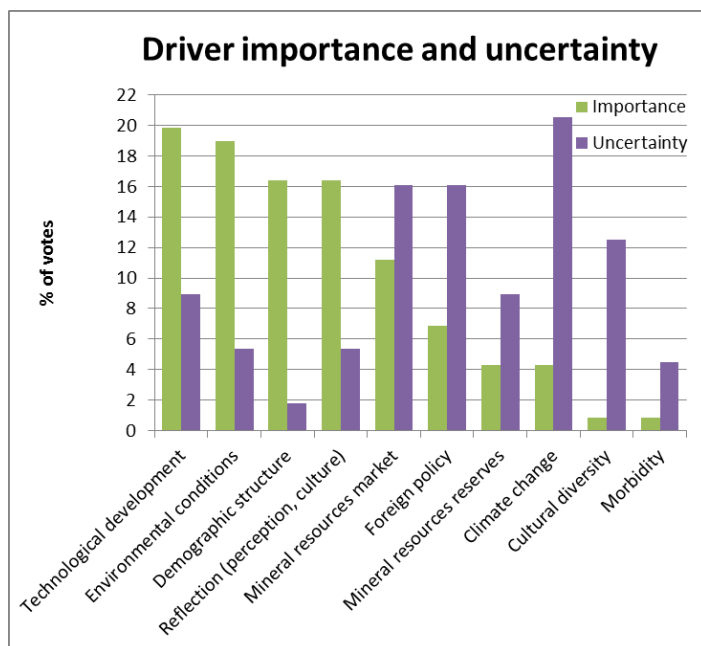


Figure 2. Results of the prioritized clusters and ranking of importance and uncertainty.

SESSION 2: Narratives

The above selected drivers and how they might develop at the local level over the next two generations in Nordland region were discussed in a global context of four different SSPs (see appendix H) in four different groups. Local narratives developed from these group discussions are described in the following summaries.



2.2.1 Regional Rivalry - A Rocky Road

Background scenario: Resurgent nationalism, concerns about competitiveness and security, regional conflicts, limited number of comparatively weak global institutions, uneven coordination and cooperation for addressing environmental and other global concerns. Barriers to trade, energy and food security goals within their own regions at the expense of broader-based development, authoritarian forms of government, highly regulated economies. Investments in education and technological development decline. Economic development is slow, consumption is material-intensive, and inequalities persist or worsen. Struggling to maintain living standards, strong environmental degradation, and poor progress toward sustainability. Population growth is low in industrialized and high in developing countries. High challenges to mitigation. High challenges to adaptation.

In this scenario, the environmental situation would not drastically improve. The factors constraining resolution of ecological and environmental challenges will be the state ownership for the lion's share of natural resources in the region and strong centralization of environmental supervision with weak powers of regional authorities in the field of environmental management. The Federal Centre will conduct a "soft" environmental policy in the interests of large export-oriented companies, in order to stimulate their production growth at the expense of reducing environmental expenditures. In this regard, there is possible slowing down the transition of Russian companies to the best available technologies, which should be implemented by 2022 and fully ensure environmental safety, both in the Murmansk region and in the BEAR. Maintaining the current level of opposition of the Arctic Council countries to Russia's plans for development of the Russian Arctic zone will cause the priority of defense activities in the Russian state policy in the Arctic at the expense of environmental activities.

Demographically, the population will not grow, but the following changes are expected: population outflow from the region for various reasons (study, permanent residence, due to loss of job, etc.); inflow of highly skilled migrant workers; use of the rotational method of work at new production, which may lead to some reduction in the proportion of women in the population structure.

Changes at the global resource market will have a strong impact on export-oriented companies, which are the economic basis of the region. Large companies in corporate strategies take into account the changing demands for natural raw materials and their prices, as well as the emergence of technological and technical innovations to be able to maneuver. Changes in mineral resource reserves will not be a limiting factor in development of industrial production in the region; their volume will increase due to replacement of reserves of exploited deposits, development of new deposits, and use of tailings and sludge, amounting to hundreds millions of tons.

Technology development will be one of the most important driving forces for implementation of the strategy of regional competition. In the future, the pace of technological development can be reduced due to the volatility at the global markets of natural resources and the lack of own financial resources of the companies, as well as lack of opportunities to borrow at the international financial markets.

In the future, there will be progressive development of individual reflection due to increasing education level and population mobility that is through access to the cultural centers of the country and the world. Development of political reflection will be promoted by the geopolitical situation around Russia and the Arctic and international cooperation in the framework of the BEAR, one of the main objectives of which is the formation of transnational northern identity with residents of the Russian North. However, with the worsening of international tension and sanctions against Russia moving towards achievement of this goal seems problematic. International politics of the Arctic Council and the BEAR will have an impact on regional development if there is no ignoring or belittling the national interests. The high potential for international cooperation achieved in the BEAR will be preserved, but there is a concern that without trust and willingness to compromise the integration can be reversed, that is, turn into disintegration.

Climate change will have a strong impact on regional development, especially in connection with the threats of anomalous phenomena in the Arctic, which will result in the need to develop a regional strategy for adaptation to climate change, above all, on the coastal areas.

In general, the global scenario "Regional Rivalry – A Rocky Road" is unlikely for the Murmansk region, as the majority of companies in the region are the major players at the global markets of natural resources and primary products, and international cooperation within the BEAR meets the national interests of all member countries.

2.2.2 Sustainable development – The Green Road

Background scenario: Sustainable development, respect for environment, just and equal distribution; more cooperation locally, nationally and globally; improved global governance; investments in health and education; low population growth; engagement with development goals; renewable energy attractive, incentives; targeted development of environmental friendly technology; low challenges to emission reductions and mitigation; low challenges to climate adaptation.

Clean air and water contribute to strengthening the residents' health in the Murmansk region and, as a result, life expectancy increases. The intact (sound) natural environment provides a full range of ecosystem services, quality of life is improved. The authorities established a clear and reasonable for the industry framework of environmental regulation of industrial activities. Due to the improvement of quality of management of the area, friendly relations between the authorities, industrial companies and the public are established. The balance between economic development on the one hand and social and environmental well-being on the other hand is observed.

Transition of the industry to using high tech, and development of new productions lead to increasing number of highly intellectual jobs. Therefore, young professionals, who left the Murmansk region come back, and highly qualified young professionals from other regions of Russia come to the region. A decent living standard and a favorable social environment contribute to increasing number of children in families. These factors lead to reduction in the average age of population of the Murmansk region.

Changes at the markets of mineral raw materials will lead to a diversification of the economy of the Murmansk region. Science (R&D) will be an important driver of economic growth. Inter-economic links at the international and regional levels, and between industrial groups will develop. New technologies and new raw materials will create new types of waste, environmental consequences of treating which are uncertain. Efforts will have to be made and money to be invested in elimination of accumulated environmental damage and secondary pollution. Reserves of primary mineral raw materials will reduce, but it will not affect the raw material base of enterprises, because secondary resources (current production wastes) will be involved in production.

Raising conscientiousness (culture, reflection) of all segments of the society will result in an increase in public health, and socio-environmental responsibility. Openness of the authorities at the local and regional levels will rise; the government will conduct a dialogue with the society and takes into account expert opinions in decision-making. At the same time conditions of forming authorities change, the procedure of entering into power becomes more open, selection of candidates is organized in such a way that people motivated to solve problems of the society and to develop the territories in the interests of people living there come to the power. Solving most of the problems is delegated to the local self-government; budget rates are redistributed in favor of local budgets. Regional authorities coordinate development within the adopted strategy, and control, consult and continuously train personnel of local self-government. There is a return to social care (welfare and well-being of the society as a whole), social responsibility of business increases.

Development of technologies will lead to development of automated, highly profitable and low-waste production. An important role in this will be played by regulation of industrial activities, which will be reasonable, promoting innovations, based on the consistent, systematic and internally coordinated legislation. The regulation will contribute to increasing demand for high-tech products and technologies and a balance between production and consumption. The power structure will change, adjusting to the needs of society and business.

Climate will be the most uncertain factor in future changes. Presumably, climate will not change too dramatically as mankind as a whole reduced its impact on the climate system. At the same time adaptive capacities of the society increased due to new technologies and predictive abilities. Perhaps, the regional and local budgets will have to spend more for maintaining comfortable living conditions.

Cooperation between countries in the Arctic will increase. The environmental legislation will be harmonized, and standards of environmental impact will be unified. There will be an intensive exchange of experiences and technologies, joint ventures and common markets will be established. Number of mixed marriages and people to people contacts will increase. It can lead to unification of the cultural landscape, and reduction of cultural diversity in the Arctic.

2.2.3 Fossil-fueled Development – Taking the Highway

Background scenario: Key words for the global Fossil-fuel development scenario are competitive markets, innovation and participatory societies to produce rapid technological progress and development of human capital as a way to achieve sustainable development. It is a world of intensive fossil fuel development, high energy demand and rapid technological progress, but also a focus on health, education, and institutions to enhance human and social capital.

If the environmental situation changes (most likely - worsens), the efforts to address environmental problems will be concentrated at the regional level. However, due to the cross-border location of the region it will be necessary to develop cooperation in the field of environmental protection with the neighboring countries - the Nordic countries. Changing the environmental situation in the event of deterioration will entail significant challenges to mitigate negative impacts.

Out-migration from the region will continue. The level of education, on the average, will increase because under the conditions of scientific and technological progress and high-tech nature of industrial production in the region employers will give preference to highly qualified professionals. In this connection, the interest of the regional authorities to invest in education and human capital development will grow. Population growth in absolute terms will be reduced due to the reduction of population.

The problem of replacement of the mineral resource base in the region during the considered period (30-50 years) will not be acute. The existing mining enterprises have sufficient reserves for this period. In addition, in the region there are deposits of various minerals, which have passed through different stages of geological survey, and if necessary (favorable market conditions) may also be involved in operation.

The key issue will be the demand for products of the regional mining complex at the global markets of minerals, which is indirectly linked to population growth or decline on a global scale.

Much attention will be paid to development of technologies that, in particular, will allow reducing production costs, solving regional problems related to the natural features of the area, increasing mobility of population and, ultimately, improving life quality of the population. Strong dependence on technologies will continue, which in case of climate change will contribute in solving challenges of mitigation.

The problem of low-level of the residents' self-identification as northerners will remain. Much of the population consider themselves living here temporarily, not the indigenous people, associate their future with living outside the region. Related to it is the resource- and energy-intensive way of life, wastefulness in using resources. Dissociation of the population will increase; social cohesion will decline.

To solve the above mentioned problems it would be expedient for the regional authorities to cooperate with the leading industrial groups involved in development of mineral deposits in the region, and to look for ways to reduce production costs by increasing production volumes. This will reduce outmigration from the region and increase tax payments to the regional budget.

The role of international cooperation in various fields will be strengthened as a result of the geographical location of the region and its immediate neighborhood with foreign countries. In the industrial sector level of international cooperation may vary depending on the situation at global markets of mineral raw materials. Independent on possible changes of the political situation at the federal level, contacts with the foreign neighbors at the regional level will be kept and developed.

Thus, socio-economic development of the region under the given scenario, basically, is a forward movement and does not assume any major deviations from the current development.

2.2.4 Inequality – A Road Divided

Background scenario: Increasing inequalities and stratification, a gap widens. Power becomes more concentrated in a relatively small political and business elite, vulnerable groups have little representation. Economic growth is moderate in industrialized and middle-income countries, while low-income countries lag behind. Social cohesion degrades; conflict and unrest become increasingly common. Technology development is high, underinvestment in new resources, diversifying their energy sources. Environmental policies focus on local issues around middle and high income areas. Low challenges to mitigation. Challenges to adaptation are high.

In the context of moderate economic growth in the industrialized countries and middle-income countries, given the uncertainty at the markets of fossil fuel, the markets of phosphate raw materials, non-ferrous metals rare metals and rare earths will develop. It will have a positive impact on the overall economy of the Murmansk region, including that at the expense of the export orientation of the main industries in the region, and will lead to development of new mining enterprises on the territory in question. However, the expected reduction in iron ore consumption will be a challenge for some mining companies (for example, JSC “Olkon”) and will lead to search for possible directions of their diversification.

For the existing mining companies in the region the following should be considered as threats: depletion of mineral resources, deterioration of mining and geological conditions of ore extraction, poor quality of extracted raw materials and restricted access to global markets of natural resources. In this connection the tendency to involve production wastes in economic circulation by operating companies, and the emergence of new enterprises for their processing will increase. Thus, like currently the Murmansk region will be used by the national economy as a raw materials appendage.

The greatest uncertainty for the region will be influence of climate change, which can have both positive and negative consequences. Due to climate warming the heating season is expected to be shortened. However, with fluctuating energy prices, it is impossible to predict definitely reduction of annual costs of electricity and heating for the local population living in apartment buildings. The need for energy companies to diversify their energy sources will be one of the incentives for development of new forms of energy in the region, such as creation of wind farms. Development of the Northern Sea Route will have a beneficial impact on the economy of the Murmansk region and its export orientation. With the spread of forests into the tundra number of forest pests and forest fires will increase.

Climate change clearly entail a reduction in amount (volumes) of fresh water and deterioration of its quality, which is caused by deterioration of the overall environmental situation in the region, accumulation of environmental damage and increase in both industrial and domestic wastes. The consequence of this situation will be a shortage of fresh water used for household purposes and for industrial production. In the context of increasing inequality and stratification of the society, poor people in the region will face the challenge of providing clean drinking water, while the political and business elites will not experience such restrictions.

In general, for the Murmansk region development of the best available technologies, use of biotechnologies in mineral processing, and search and development of new technologies for rational water management and new methods of water purification will become the most important. This in turn will require stirring up of internal regional resources (intellectual, institutional, etc.).

Introduction and spread of the rotational work method at the main companies will encourage migration inflow of low and medium-skilled labor force, increase in unemployment among the local population and, therefore, outflow of young people to other regions. Under such circumstances, degradation of the social infrastructure is quite likely.

In the context of intensified use of natural resources by the region's political and business elites, there will be expected narrowing habitats of traditional nature management while maintaining the existing culture of indigenous peoples living in the region. At the same time use of recreational areas by political and business elites will increase that will cause a decrease in access of the local population to recreational resources.

Decline in overall intellectual and cultural level of the region's population, and destruction of cultural commonality will help to change the regional political structure, including establishment of small political parties and public associations on national and religious grounds. With a weak representation of the interests of vulnerable groups, and a concentration of power with a small group of political and business elites, corruption, regional social tensions including regionalism, nationalism and the presence of elements of radicalism could see an increase.

Development of such a scenario would lead to isolation of the region on the international arena and weakening of international relations.

2.3 Summarizing table Kirovsk

Table 5. Summary of group discussions, indicating how different drivers play out locally under different global scenarios

	Sustainability – Taking the Green Road	Fossil-fuelled Development – Taking the Highway	Inequality – A Road Divided	Regional Rivalry – A Rocky Road
Changing environmental conditions / Eco-system services	Clean air and water, full range of ecosystem services	If environmental conditions change, most probable worsen, efforts for solution of the problems are concentrated at the regional level. Cooperation with the neighbouring countries develops.	With spread of forest to tundra number of forest pests and forest fires increases. Volumes of fresh water decrease; its quality worsens resulting in lack of fresh water for household and industrial consumption.	Environmental conditions are not significantly improved, mainly because of the persisting state ownership for most natural resources, centralized environmental control and weak powers of regional authorities.
Changing demographic structure/ Demography	Increasing number of highly intellectual jobs will attract young professionals, increasing number of children in families, reduction in the average age of population	Outmigration continues. Education level increases because of high tech production. Regional authorities are interested in investments in education and human capital development.	Introduction of the shift method of work at the main productions will promote migration inflow of low-skilled labour force, unemployment growth among local population, outmigration of young people.	Outmigration for study, permanent residence, job search; inflow of highly skilled workers possibly for shift work. Total population does not grow.
Changes at the market of mineral resources/ Mineral market	Diversification of the regional economy, science (R&D) will be an important driver of economic growth, new technologies and new raw materials will create new types of waste, invested in elimination of accumulated environmental damage will be made	The key question is demand for products of the regional mining industry, which is indirectly connected to increase/decrease of population in the global scale.	Markets of fossil fuel are uncertain. Markets of phosphorous raw materials, non-ferrous metals, rare metals and rare earths develop that positively influences the economy of the Murmansk region, including that because of the export orientation of the main productions. New mining productions develop. Demand for iron ore is a challenge for some mining companies, which have to diversify their production.	Changes at the mineral market have a strong impact on export-oriented companies. Appearance of technological innovations to be able to manoeuvre.
Changing reserves	Reserves of primary mineral raw materials will reduce, but it will	The problem is not crucial for the region. The existing mineral	Depletion of mineral reserves, worsening mining and geological	Changes of reserves of mineral resources is not a deterrent for

of mineral resources	not affect the raw material base of enterprises, because secondary resources (current production wastes) will be involved in production.	reserves are sufficient for the mining companies. In addition, there are perspective deposits, which can be involved in exploitation in case of favourable market situation.	conditions of mineral extraction, low quality of extracted raw materials, restricted access to world mineral market. Man-made deposits are involved into exploitation. The region remains a raw materials appendage of the national economy.	industrial development, they increase due to their replacement and development of new deposits.
Development of technologies/ Technology	Development of technologies will lead to development of automated, highly profitable and low-waste production	Technological development is important, because it helps to solve environmental problems, increase population mobility and quality of life. Dependence on technologies persists.	Development of the best available technologies is of top priority, use of biotechnologies in mineral processing, development of new technologies for rational water use and new methods of water purification.	Technological development is one of the most drivers for implementation of the strategy of regional rivalry.
Reflection (perception, culture)/ Ideology/ Values	Raising conscientiousness (culture, reflection) of all segments of the society will result in an increase in public health, and socio-environmental responsibility.	The level of self-identification of the population as northerners is low. People associate their future with life outside the region that results in resource and power consuming lifestyle.	Decline of intellectual and cultural level of population, destruction of cultural identity promote change of regional political structure of the society, establishment of small political parties and public association based on ethnicity and religious grounds.	Ongoing development of individual reflection because growing level of education and increasing mobility of the population. Political reflection develops due to the geopolitical situation around Russia and the Arctic and international cooperation.
Climate change/ Climate change	Climate will not change too dramatically, at the same time adaptive capacities of the society increased due to new technologies and predictive abilities	Climate change has a serious negative impact on the regional development in general	Due to climate warming, heating costs are reduced. Fluctuation of prices for energy resources. Development of new energy sources such as wind farms. Development of the Northern Sea Route has favourable influence on the regional economy and its export orientation.	Climate change has a strong impact on regional development, which requires regional adaptation strategies especially for coastal areas.

Foreign policy/ International security	Cooperation between countries in the Arctic will increase	Independent on possible changes in the political situation at the federal level role of international cooperation in various fields strengthens due to the geographical location of the region.	Relatively small political and business elite gets power. Interests of vulnerable groups are represented poorly. Possible corruption growth, increase in social tension in the region. Isolation of the region at the international arena and weakening international relations.	International policy of the Arctic Council countries and BEAR influences regional development provided respect to national interests. The high potential of international cooperation in BEAR continues in case of trust and preparedness to compromise.
Cultural diversity/ -	An intensive exchange of experiences and technologies, joint ventures and common markets produce increasing of mixed marriage and people to people contacts, can lead to unification of the cultural landscape, and reduction of cultural diversity in the Arctic			Was excluded from group discussions
Morbidity/ -	Clean air and water contribute to strengthening the residents' health in the Murmansk region and, as a result, life expectancy increases			Was excluded from group discussions

3 Bodø workshop - 25.08.15

Climate change and consequences for a coastal community



Photo: Flickr creative commons, Rune Lind.

3.1 Brief background about Nordland and Bodø

Nordland covers an area of about 38 500 km² and has a population of around 240 000, which has been decreasing with about -1,6% over the last 10 years. Bodø municipality, harboring 50 000 of the Nordland population, is the county administrative center and is located at the coast. Historically, Bodø has thrived as a stronghold for fisheries with roots that trace back to the Stone Age, and developed into an important trade center for fish. Today, fisheries and aquaculture remain key industries together with offshore petroleum exploration and other economic activities related to trade, finance and administrative tasks. Tourism and (mainly dairy) farming and livestock also play an economic role. Nordland has a long history of mining. The Bodø Workshop had 23 participants representing local, regional and sector-specific perspectives and including both practitioners and researchers.

Table 6. Bodø climate, 1982 to 2012 averages.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature (°C)	-1,9	-2,1	-0,5	2,4	6,6	10,2	12,6	12,5	9,2	5,2	1,5	-0,9
Precipitation (mm)	93	68	73	56	51	59	91	91	127	152	105	104

Sources: <https://en.wikipedia.org/wiki/Nordland> and <http://en.climate-data.org/location/717052/>

3.2 Creating local narratives for different global contexts

SESSION 1: Driver identification and prioritization

The first step focused on identifying key issues in the region, identifying and prioritizing drivers of change. The workshop followed the method outlined in the introduction to the methodology. The main important drivers and their uncertainty are listed in table 7, which is also presented as a bar graph in figure 3.

Table 7. Results of the prioritized clusters and ranking of importance and uncertainty.

Cluster	Importance		Uncertainty	
	votes	rank	Votes	Rank
Locally important values and drivers				
Energy/Petroleum	17	1	4	7
Climate change + impacts	13	2	7	4
Demography	12	3	7	4
Business structure	11	4	6	5
Global economy	6	5	13	2
New conflicts	6	5	7	4
Knowledge/competence	6	5	6	5
International security	5	6	12	3
National politics	5	6	3	8
Natural resources	5	6	2	9
Security	4	7	5	6
Local politics	3	8	14	1
Food security	3	8	1	10
Consumption	2	9	5	6
Transport	2	9	2	9
Health	1	10	6	5

SESSION 2: Narratives

Based on the results from session 1, these drivers and how they might develop at the local level over the next two generations in Nordland region were discussed in a global context of four different SSPs. These local narratives developed from group discussion and a summary for each is sketched in the sections below.

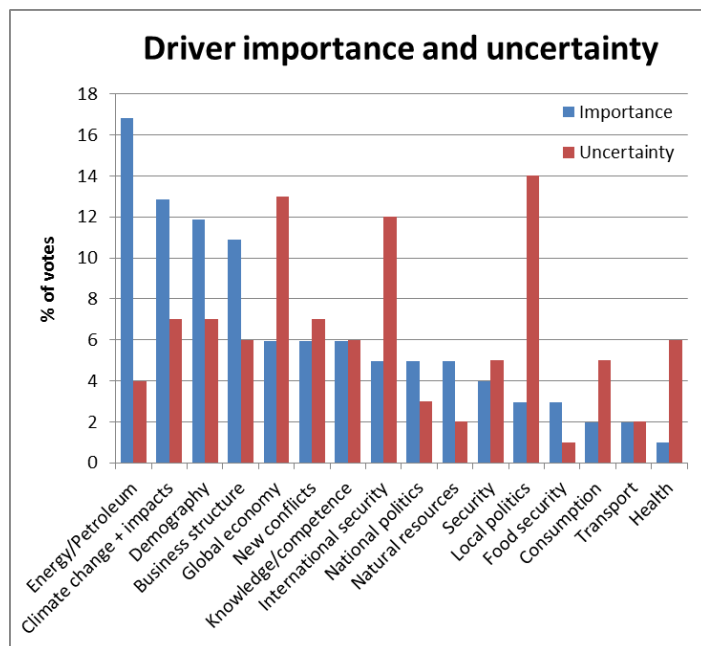


Figure 3. Results of the prioritized clusters and ranking of importance and uncertainty.

3.2.1 Regional Rivalry - A Rocky Road

Background scenario: Resurgent nationalism, concerns about competitiveness and security, regional conflicts, limited number of comparatively weak global institutions, uneven coordination and cooperation for addressing environmental and other global concerns. Barriers to trade, energy and food security goals within their own regions at the expense of broader-based development, authoritarian forms of government, highly regulated economies. Investments in education and technological development decline. Economic development is slow, consumption is material-intensive, and inequalities persist or worsen. Struggling to maintain living standards, strong environmental degradation, poor progress toward sustainability. Population growth is low in industrialized and high in developing countries. High challenges to mitigation and adaptation.

For Nordland, a global scenario of regional rivalry would most likely lead to a situation of little development and more “hand to mouth” ways of living. There is less cooperation. Since people have to focus on survival and there are few and weak institutions, the environment is given little attention in general. While Nordland is rich in resources such as oil, gas, water and mineral, there will be little focus on regional development. It is probable that there will be petrol activity in new areas such as Lofoten, but with little or no synergies locally since the oil, for example, will be taken directly to the capital.

Conflicts within the Barents region are dominating, and NATO is weak. There are worries with regards to if Russia would take over some territory to get access to resources. There is little focus on sustainability, and the main aim is to exploit resources. Confrontations both within and between sectors are common. The survival of the fittest dominates people’s actions, hence there is a lot of misery.

There is a new demographic pattern, as decentralization is the new trend. Accordingly, peripheral parts of the county are experiencing growth, while the importance of the traditional centers decreases. There will be less need for formal knowledge since the work opportunities in the research and development sector

disappears. Hence, the formal knowledge becomes less important, while practical, local knowledge becomes important to survive.

A renewed focus on the primary sector dominates, and people end up as farmers and fishers. Since there are few and weak institutions, the “tragedy of the commons” dominates the fisheries. Gas for fishing and other activities is expensive, but fishers will find innovative ways to continue fishing and they will cooperate more. In the beginning, the fish stocks will suffer. Then, the fish stocks will grow since fishing is mainly done along the coast.

The political landscape is changed, and people feel both disempowered but there is also a lot of local activism. Internationally, security is on the agenda. In Nordland, however, we are far away from the main conflicts. Due to the strategic geographic position of Bodø, the military presence will grow and this also generates employment opportunities. We will have a lot of climate refugees and conflicts.

In a global perspective the people of Nordland are lucky because they have food and we will not have too many climate-related problems.

3.2.2 Sustainable development – The Green Road

Background scenario: Sustainable development, respect for environment, just and equal distribution; more cooperation locally, nationally and globally; improved global governance; investments in health and education; low population growth; engagement with development goals; renewable energy attractive, incentives; targeted development of environmental friendly technology; low challenges to emission reductions and mitigation; low challenges to climate adaptation.

The world is ever more connected, and even though there is a focus on reduced and more climate friendly energy use, there is a continued need for energy. Nordland region is rich in natural resources. The focus on oil and gas is changing towards increased production and use of renewable energy in the form of wind and water: Hydroelectricity from rivers, but also the sea surface wave energy and strong marine currents in this region are important new sources of energy. The new “renewable energy” focus is competing on the market with an increased solar energy in the more southern, drier and sunnier regions of the globe, so the overall local economic gain of this new resource not much increased in comparison to the earlier focus on oil, but thanks to improved technologies it can deliver a supply to the grid and feed the growing urban area with its electricity needs. The reduced focus on oil and gas and increased focus on renewable energy use (including electric vehicles and transport) also make the region an environmentally cleaner and healthier one.

Climate change allows for an increase in aquaculture, and while some fish stocks move further north due to the inevitable increase of temperature, coastal fisheries can benefit from new species moving up north from southern regions. As a result, the local diet could change back to a more climate friendly one: less meat and more fish, which comes both from the regional fisheries which continue to flourish, and from aquaculture (fish and algae) which takes place in ever increasing degree both along the coast and on land build integrated production systems using the same area for fish and seaweed production. The climate driven increase in aquaculture provides for new jobs, also in decentralized areas, and a focus on technological development using algae for all kinds of products for the bio-energy-, food-, pharmaceutical- and other industries.

Nordland and especially Bodø becomes a growing knowledge center, supporting the increased investments in and needs for technology and education. This also provides the novel local industries to have access to highly qualified workers. More education options do not mean that all people take a higher education, but

the opportunity is there. Bodø being a knowledge center means that there may be a stronger urbanization with people from the region moving to the city, but also from other regions and abroad. At the same time, the aquaculture farms, premises and industries surrounding these may create a decentralization and multiple city-centers. More woman stays in the north following these new opportunities in less physical demanding jobs, and the increased study and working population is accompanied with an increase in cultural life and integration. People thrive in this new and vibrant environment. These transitions in the industry (with a greater focus on aquaculture and algae related products), renewable energy production and increased knowledge and technology centers substantially reshape the local and regional industrial structure. Incentives and local entrepreneurship has an increased focus on tourism, but the effects on this sector are uncertain: either 1) more tourists will visit the region as temperatures increase and innovative aquaculture and energy production develop, or 2) this sector does not really take off beyond today's level, as the climate becomes more unpredictable with more rain and less snow, altogether less attractive for winter and summer tourism. The increased cloud cover makes northern lights more difficult to see, and Norway remains an expensive destination for many.

Local politics swing from a focus to urbanization and centralization to decentralization, but the green focus ensures that the urbanized areas remain green and pleasant to live in, while the decentralized areas are accessible by green forms of transport. Regardless of the political party in place, the focus changes from an oil-based economy to a bio-economy with an increased focus on environmental sustainability. Especially the health, educational, and technological developments in the region are regulated by the national government, while energy production and raw material production (e.g. seaweed aquaculture) is stronger linked to the global economy and markets, while also placing its footprint on the local development and businesses. Local issues such as areal planning (with new conflicts related to the increased urban sprawl, placement of the decentralized urban and knowledge centers, and increased aquaculture on land versus the land-use and forest areas) take up most attention of local politics. The increased green focus in transport, carbon footprints, continued local fisheries and changes in diet make the region more self-sufficient in terms of food production, as increased temperatures also increase opportunities to cultivate a larger variety of crops in the region.

The presence of the military in the region is even further downsized as international security is increased following improved global and national cooperation and dependence on technology and renewable energy sharing. This decrease in military in the region also contributes to a further change in the demographics and industry in Nordland. Social and economic security of the region depends to a large extent on how the energy business changes from oil and gas towards wind, wave and hydro: the general expectation under this scenario is that the same (or other) companies take a more renewable focus, and at an economic level incomes remain at least the same.

3.2.3 Fossil-fueled Development – Taking the Highway

Background scenario: Key words for the global Fossil-fuel development scenario are competitive markets, innovation and participatory societies to produce rapid technological progress and development of human capital as a way to achieve sustainable development. It is a world of intensive fossil fuel development, high energy demand and rapid technological progress, but also a focus on health, education, and institutions to enhance human and social capital.

For Nordland, a global scenario of intensive fossil-fuel development would most likely lead to intensive development – “full speed ahead” in which Bodø becomes a hub for the region with a gas terminal and close cooperation between Lofoten and Bodø. The gas fields of Helgeland are developed and also Vestfjorden. At the same time, preparations have started for the end of the petro era. A major focus is on the Nordland region being globally competitive because of its high competence and also by exporting extraction technologies. However, in spite of the high global demand for fossil fuels, there is a risk that Norwegian oil and gas will have trouble competing because of high prices and tight regulations. The developments fueled by the investment in fossil-fuel extraction are very much concentrated to Bodø, and there are large socioeconomic differences between well-off Bodø and the districts that do not benefit as much in this future scenario.

The consequences of climate change are apparent in many ways and major resources are devoted to preventing impacts from flooding. As a major food production district, Nordland has to handle uncertainties caused by changing weather patterns and new species both on land and in the sea. Food production will look different. There are also other changes in the landscape. The bird mountain (Fuglefjellet) is gone as species have moved north, with negative impacts on the tourism industry. The tree line moves and forests may become established in the archipelago due to a combination of shifting climate and declining grazing pressure. Biodiversity politics interplay with climate changes, leading to more predators.

The economic structure of the region is characterized by new technologies, demands on high competence, internationalization, and global capital. The petro sector dominates the economic activities in the region with global companies at the helm. Ownership is likely to be somewhere outside Norway, maybe somewhere in Asia. Norway remains outside the European Union as the global context is seen as more important. Aquaculture is a growing economic sector, including development of products from algae. Its demands for space may create conflicts not only with fossil extraction but also with marine transport. Oil spill prevention also creates new jobs, as does investment in adaptation to climate change, such as flood prevention. The global companies dominate not only the business sector but are also increasingly involved as owners in the public service sector, including ownership of local schools, health care, and infrastructure.

Politics become more polarized along left-right dimension. There are also increasing conflicts surrounding climate refugees and immigration. New species lead to conflicts among different economic actors, including potential conflicts with Russia in the fisheries sector. While existing legal regimes within maritime law serve as important tools for conflict resolution, UNCLOS comes under pressure from imperialistic fishing in northern waters. Politics also become regional rather than local. Because local influence is linked to people with networks and ability to think strategically, small municipalities become too vulnerable in relation to large companies, and a move towards larger municipalities takes place to support better planning. National parliaments have very limited possibilities to influence development due to international trade agreements. In global politics, pressure on scarce resources is an important theme. Another international security concern is migration.

To keep up with global development, fostering local competences becomes increasingly important, both for local industries and for export. University education is mainly geared towards the needs of the oil and gas industry, while traditional knowledge is under continuous threat of disappearing. Knowledge is strategically important and becomes increasingly privatized. Ownership of data and knowledge become key issues.

The combination of many pressures leads to increasing socio-economic differences between Bodø and the rest of Nordland. In addition to the focus on big industry and global connectivity, investments in new infrastructure for transport are made in Bodø, while peripheral parts of the county become less well connected.

3.2.4 Inequality – A Road Divided

Background scenario: Increasing inequalities and stratification, a gap widens. Power becomes more concentrated in a relatively small political and business elite, vulnerable groups have little representation. Economic growth is moderate in industrialized and middle-income countries, while low-income countries lag behind. Social cohesion degrades; conflict and unrest become increasingly common. Technology development is high, underinvestment in new resources, diversifying their energy sources. Environmental policies focus on local issues around middle and high income areas. Low challenges to mitigation. Challenges to adaptation are high.

In a society with major differences and a political and an elite that is tightly interwoven in economic terms, control over the energy production, price and distribution will be on few hands. Nordland has a lot of energy and will be self-sufficient, but this will differ in other part of the country. There will be a big change and we can expect that today's (fair) distribution of energy resources will crumble if the elite takes control over these. There will still be a debate if the region should use the energy to the energy-intensive industries or sell it to other countries.

Uncertainty with regard to the fuel market results in a lack of investments. This will in turn generate consequences for the shipping industry and the general business structure. People with less income will spend less, which will have an impact on the investments. In sum, one can expect that Nordland will be on the plus side due to its rich natural resources. However, this does not mean that the demographic pattern remains the same as today. There will be a wave of urbanization and centralization. There may be a focus on four cities in Nordland that will experience tremendous growth, while rural area will suffer from depopulation. Maybe it will develop even further and one will develop Nordland into a platform, based on fly-in-fly-out ideas in petroleum, mineral based industries, aquaculture and other industries.

There are challenges in relation to the increasing amount of bad weather. Hence, the exploitation of marine resources entails that people will relate to more storms. What are the consequences of this in a society marked by inequality? The condition for small companies gets worse, and it is necessary to invest in big vessels. And, the society will not necessarily be prepared to pay for security at sea.

The scenario gives reason for optimism in relation to the development of mitigation measures. There are some low-hanging fruit with regards to implementing mitigation measures. If those with the necessary means join forces to reduce emissions, the emissions could remain stable and the need for adaptation diminish. If this occurs, the climate changes in Nordland will be somewhat less than if it becomes difficult to implement emission-reduction measures.

Nordland is not necessarily very vulnerable to climate change. We live in a cold part of the world, and can cope with higher temperatures, it is a mountainous area compared with poor and flat countries like Bangladesh. Climate adaptation happens in "rich" sectors with financial and technological resources to implement measures. The sectors that have fewer resources will not be able to adapt and may disappear, or they may be robust through developing adaptation strategies that do not require economic measures or technology.

Globally, we can expect that poor countries will have to settle for bad products and increased pollution and a larger market for bad products. If the consumption is turned against poor quality, the greenhouse gas emissions will rise through increased energy consumption. There will be a lot of environmental degradation

as a result of poverty. Since environmental policy focuses on local issues, not everybody will have the economic means to protect the environment.

Nordland becomes a working region based on rich natural resources where the financial rewards are kept locally. In addition, security politics require presence and sovereignty maintenance. Industries vary according to how labor-intensive they are. A society based on inequality will provide challenges in regards to gender issues and development of (formal) competence in rural areas and the primary sector. If the state and municipality becomes centralized, it will affect the gender balance. On the other hand, innovation in industry and aquaculture, as well as other knowledge-intensive industries will probably increase and perhaps these industries can provide a more balanced gender- and age composition. The youth will return and bring back new expertise in a region with geographical advantages. Or, it can lead to a substantial centralization in the south, and people come to work and disappear again. If so, the elderly will be left in the region. In a society dominated by inequality, there will be a lack of social services and families or poorhouses will take care of the elders. Those without families will have to manage on their own.

Today, people are flying from their countries/rural communities in other parts of the worlds. It may well be that people will have to move towards the north. Maybe they are forced to live in less expensive rural areas. With regards to ethnicity, climate refugees will be a challenge and there are not enough resources to ensure the integration of these.

A strong political- and business elite generates a uniform society, where the activity is concentrated around large companies at the expense of small businesses. There is reason to expect increasing movement towards branching out and use of international headquarters. For fisheries, the consequences will be a further concentration of fishing rights and production rights. Fish quotas, licenses and landings will be aggregated into fewer hands, there will be a need for fewer ports, and the economic benefits will not stay in the region but will go to Oslo.

Agriculture is for the poor, for those who have to fend for themselves. Agriculture in Nordland is primarily driven by a need for self-sufficiency. There are not too many places where one can envisage increased concentration/centralization of the operations. Therefore, nobody will be rich in the agricultural sector. At the same time this provides the basis for developing a subliminal economy where people manage themselves in new occupations and industries. In a city like Mumbai, for instance, there are many layers and rules. People make their own space and form informal networks. In Nordland, the lower social layer will use natural resources and form alternative networks outside the formal economy and they will use traditional knowledge about food production: grow their own potatoes and exploit the available sources of protein; and the hand-to-mouth way of living will be more important.

In this world, business priorities are the basis for policy formulation. Accordingly, there are reasons to suspect that there is more corruption. At the same time, one can imagine that the lack of critical voices causes the politics and the business world will evolve into a more unified and tightly interwoven constellation where policy spheres are narrowed down to only deal with economic development. Without a free political debate; will there be bloodshed in the trade, commerce and industries? More large-scale businesses could also generate more competition between companies and make industries less robust towards external challenges.

Nordland is an export county and hence depends on global markets and is sensitive to fluctuations in the world economy. We will continue to sell to those who pay well. At the same time, industries will be sensitive to high cost of labor. It is in the interest of an unequal society that labor is mobile and has a different price.

When this is not regulated, it will lead to major differences which could hamper the export industries. We will therefore use immigrant labor to keep the labor costs down, and thus the value of export products high.

It is possible that new and conflicting issues will develop with regards to issues such as the preservation of biodiversity, or engage in climate adaptation. Will tree planting strategies challenge for other environmental values? How do we operate with regards to industrial and trade development in countries that are poor? In present day, conflicts of interest are discussed in democratic societies, this will not be the case with a small political and economic elite. Less equality will generate this type of conflicts because different interests are found in different social groupings. The preservation of species is reduced; regional development is prioritized. For those with interests in development, this will be a positive change.

The expertise in Nordland becomes more uniform and there will be less room for critical reflection. If competence is unevenly distributed, it will cement inequality. Society will harden, until riots develop and so on etc. There will be threats of violence, war and terror. There will be a lack of middle class that works as a driver for climate mitigation and social development. Power Positions are inherited in elitist environments. There will be few think tanks, critical reflection and rather a process of "Kuwaitification". Unidirectional priorities and less room for innovation generate less robust societies. The will/force for development in society will be less than today.

We will get a community where the mayor and squire takes care of local politics. You will get what you are familiar with from ancient times in Northern Norway. To the extent that they have environmental policies, these will be issues that are local and with no importance at the national level. This will be the same with other issues, and local jurisdiction will not entail important ones, except land use politics. But local communities with great inequality can cause the emergence of gated communities as the level of conflicts increases. Here, those who can afford it have it safe, clean and comfortable living conditions. Outside there will be crime, littering and social challenges.

With greater inequality internationally, the refugee crisis will accelerate. This will give rise to more extremism, terror and violence that gives more fear in the community in the north. Arenas for integration will not be created and conflicts will increase. Xenophobia is growing because the poor will threaten those who are rich and prosperous. Conflicts between the poor migrant workers and those who are already underprivileged locally will increase the possibility of "gated communities". Immigration is a big challenge and there will be an increased level of conflicts between the underprivileged.

Due to Norway's foreign policy obligations, we can expect a large mobilization with regards to armament. In a society based on inequality we must prepare to defend ourselves against more violence, terror, and extremism. Russia is becoming less interested in Norway, as they make their own ice-free ports. There is less Arctic international cooperation with regard to culture, environment and so on, while Arctic economic forum will continue because it will benefit the elite.

3.3 Summarizing table Bodø

Table 8. Comparison of how identified local drivers play out locally under different global scenarios.

Values and drivers	Sustainable development	Regional Rivalry	Inequality	Fossil-fueled Development
Energy/Petroleum	Focus changes from oil and gas towards renewables wind and water.	Increased petrol activity without regional development.	Nordland has a lot of energy sources, and will be self-sufficient	Intensive oil and gas development; preparations for an energy shift; large socioeconomic differences between well-off Bodø and the districts.
Climate change + impacts	Increase in aquaculture; diet changes; green urban areas and transport with small carbon footprints.	Little attention to environment and sustainability; in general the region is self-sufficient in food and will not have too many climate related problems.	Adaptation takes place in economically and technologically robust sectors: larger boats in fisheries are required increase in mitigation measures, environmental degradation as a result of poverty	Major resources are devoted to preventing impacts from flooding and uncertainties caused by changing weather patterns; changed food production; changed landscapes - tree line moves and forests may become established in the archipelago.
Demography	More woman stay in the north following these new opportunities.	Military presence will grow; increased number of climate refugees.	Strong urbanization and centralization, migration from rural districts, possible fly-in-fly out industry; labor region based on rich natural resources; challenges to gender balance in primary industries ; youth people may come and go, while elderly people stay increase in climate refugees.	
Business structure	New jobs in renewable energy technology, aquaculture, supporting knowledge centers and spin-off industries; increased focus on tourism.	Renewed focus on the primary sector dominates, increased farming and coastal fishing.	Uncertainties related to fuel market lead to lack of investments in shipping and local businesses; sectors with less resources become vulnerable to climate change and may disappear. large companies remain, at the cost of SMBs; agriculture based on the need for subsistence	Petro sector dominates economic activities in the region and Bodø becomes a hub for the region; Focus on Nordland region being globally competitive because of its high oil and gas competence and also by exporting extraction technologies; changed landscape and reduced bird species negative for

				tourism industry; Aquaculture is a growing sector.
Global economy	Local “renewable energies” compete with global renewables; strongly linked local-global market; low overall local economic gain of energy shift.	The region does not benefit from local oil and gas resources, becomes more isolated, but increased coastal fisheries allow global exports.	Discussions on whether the region will export energy or spend it on energy demanding industries; export. Nordland depends upon global markets and industries are sensitive to fluctuations in world-economy, in particular prices on labor. Labor immigration keeps prices on labor down and export value high	Norway remains outside the European Union as the global context is seen as more important; global companies dominate the business sector and are increasingly involved as owners in the public service sector.
New conflicts	Related to increased urban sprawl, placement of the decentralized urban and knowledge centers, and increased aquaculture on land vs. land-use and forest areas.	Confrontations both within and between sectors are common; survival of the fittest dominates peoples actions, a lot of misery;	Goal conflicts between preservation of biodiversity and adaptation to climate change. Different interests clustered in social networks. preservation of species reduced to favor construction	Growing aquaculture demands for space may create conflicts with fossil extraction and marine transport; increased left-right political polarization; increasing conflicts surrounding climate refugees and immigration; new conflicts with Russia in the fisheries sector.
Knowledge/competence	Region is a growing knowledge center.	Less need for formal knowledge as work opportunities in the R&D sector disappear; local knowledge becomes important to survive.	Competence conformed and powerful positions inherited within small elites; uniformed policy efforts hamper entrepreneurship and innovation and lead to less robust and vital societies.	Knowledge is strategically important and becomes increasingly privatized; geared towards the needs of the oil and gas industry and towards export; Traditional knowledge is under continuous threat of disappearing; Ownership of data and knowledge become key issues.
Local politics	Urban planning takes most focus, swinging between green urbanized and centralized areas to decentralization accessible by green transport; Health, education, and technology regulated by the national government.	Decentralization is the new trend, in favor of peripheral parts of the county; local disempowerment combined with local activism.	Mayor and landlords run local politics; local sovereignty restricted to less important areas, expect for spatial management. Construction of gated communities escalated with increased social conflict, crime, environmental	Politics become regional rather than local; a move towards larger municipalities takes place to support better planning; focus on investments in new infrastructure for transport in Bodø, while peripheral parts of the county become less well connected.

			degradation and societal problems.	
International security	Improved global and national cooperation; decrease in military; Social and economic security linked to energy shift.	Conflicts within the Barents region are dominating, and NATO is weak; worries regarding Russian territory expansion.	Increasing global inequality boosts refugee crises, xenophobia, extremism, terror, violence, and public fear; increased rearming, less to fear from Russia that will have their own ice-free harbors.	Increasing socio-economic differences between Bodø and the rest of Nordland; In global politics, pressure on scarce resources is an important theme. Another international security concern is migration.

4 Overall discussion and conclusion

In this section we present a brief summary of the key drivers of change and workshop narratives in both settings. We finalize the report with a brief reflection about the findings in context of some methodological considerations and conclude with the main “take home message” from these workshops.

4.1 Workshop summaries

Kirovsk: The following drivers of change were identified as the most important from a local/regional perspective, ranked from highest to lowest: Technological development; Environmental conditions; Demographic structure; Reflection (perception, culture); Mineral resources market; Foreign policy; Mineral resources reserves and Climate change. The drivers ranked as the most uncertain where climate change, foreign policy and the mineral resource market. These key issues serve as basis for the creation of local narratives for different global contexts, differing in several key assumptions regarding policies, energy use, development, cooperation, education, etc.

Narratives summary

Fossil-fueled development globally entail demand for advanced mining technologies, which will be a reason of decreasing job opportunities and outflow of population from the Murmansk region. At the same time, demands of qualification of labor force will be high which will force increasing of investment to education and human capital. Risks relate to fluctuation of international mineral market and low sense of place of people which coming to the Murmansk region to work and go back to the native region when job opportunities dry up. International cooperation will play a significant role.

Sustainability: The research and development sector providing environmental-friendly mining and waste treatment technologies will be an important driver of Murmansk region development in the world that follows the green road. Demands to find environmentally friendly solutions of development problems will force transferring decision-making process to the local level, and transition to participatory government of the Murmansk region. The welfare and wellbeing of society as a whole will be in focus of government, birth rate will increase by the reason of high life quality. Climate change will demand increase investments for infrastructure.

Regional rivalry: While the global security situation worsens, the federal center will amass a maximum of administrative powers and the Murmansk region will be developed as a military outpost of Russia in the Arctic and a point of the Northern Sea Route, which will link the Arctic zone of the Russian Federation. The mining will stay as the basis of economic development of the Murmansk region. The risk is in reducing of environmental protection costs for cheapening the cost of products and services.

Inequality: In the divided world, the Murmansk region completely transformed into a raw materials appendage of the central regions of the Russian Federation. We will meet intense involvement in the operation of new mineral deposits that will reduce the areas available for traditional nature use (reindeer herding, picking mushrooms and berries, and fishing) and create difficulties with access for public recreations. The risks are in dividing of society and the emergence of nationalist political parties.

Bodø: The participants in the Bodø workshop identified the following drivers of change as the most important from a local/regional perspective, ranked from highest to lowest: Energy /petroleum; Climate; Demography; Business structure; Global economy; New conflicts; Knowledge/competence; while local politics and global economy were ranked as the two most uncertain drivers. These key issues were used to create local narratives for different global contexts, differing in several key assumptions regarding policies, energy use, development, cooperation, education, etc.

Narratives summary

Fossil-fueled development globally translates to “full speed ahead” for Nordland, with Bodø acting as a hub for the regions petrol and gas resources. In the economic sector, there are new technologies, with demands for high competence and global capital. The political landscape is more polarized with a larger focus on regional than local issues.

Sustainability: The world is ever more connected, and despite an increased green focus in all sectors and more climate friendly energy use, there is a continued need for energy. In Nordland, climate change allows for an increase in aquaculture, including algae production, while coastal fish stocks are migrating north and new stocks and species moving in. Bodø grows as a knowledge center, there is an increased focus on tourism, and the local military is downsized.

Regional rivalry: There is little development in Nordland and people live from “hand to mouth” with a focus on survival, while environmental issues are disregarded. There is little international cooperation. A new knowledge structure will develop around an increased focus on the primary sector. People feel disempowered but there is still local activism.

Inequality: In a divided world, also Nordland is a society with large differences, where a political and economic elite control the energy production, prices and distribution patterns. While there are few investments from the national level, Nordland does well since it is a region rich in natural resources.

The narratives in both workshops give a sense of how local developments are connected to the surrounding world but also how local futures in the European north are tied up in a different dynamic than the perspectives that drive the global SSPs.

The Kirovsk and Bodø workshops demonstrate that in addition to what happens at the global level, the local context plays a critical role in the scenarios developed. The regionally/locally most significant global processes are linked to climate change, but also to the impacts of resource demand on local job opportunities are crucial, in these cases especially related to mining and fisheries. Local demographic dynamics, including global migration patterns due to conflicts and resource scarcity, was also highlighted across countries. In general, the tone in the future narratives is optimistic. It is clear from all narratives that various “soft” capacities that favor diversity, for example entrepreneurship and cultural values, play a significant role for the more optimistic futures to play out. Nature plays a prominent role as a supplier of ecosystem services such as energy, raw material, food, aesthetic values, and leisure.

4.2 Methodological considerations

Methodologically it is important to understand how the issues flavor results introduced, and the tone set, at the beginning of a workshop. In Bodø, some of the local perspectives presented in the beginning of the workshop (e.g. related to fisheries) came out clearly in the narratives also from those groups that did not have a fisher in their group. These issues also reverberate in local importance and identification with e.g. fisheries in that region. In Kirovsk, climate change impacts on hydrology were introduced in plenary, and were later debated in groups. It is also apparent how ongoing political issues and debates may influence the agenda, discussions and finally narratives of the workshops. In Kirovsk this included a tense setting developing as a result of the world economic crisis and arguably as a result of international political crises. The Bodø workshop in particular demonstrates the critical role of the place-specific and time-specific context in narrative building regarding the future: The workshop was held just before local elections, and the petroleum sector was in decline. As a result, the narratives reflect a high uncertainty especially regarding local politics, and power relations between the local and national level were highlighted as an issue. These may not have been part of narratives derived in the same place, with the same people, with a similar methodology only one year ago.

Local awareness about scientific findings regarding the potential impacts of climate change may vary across participants. It may be difficult to distinguish when stakeholders report on their own observations or whether they stick to (general) scientific findings, more commonly known and accepted “truths and beliefs”. The initial presentations in the workshops may partly explain some of the issues debated in the narratives, e.g. climate and hydrology in Kirovsk, or fisheries and aquaculture in Bodø. They may however also be part of a more general shift in awareness compared to only a few years ago when the issues of impacts and adaptation had barely entered to public agenda in the Nordic countries (Nilsson et al. 2012; Dannevig 2015).

Scenarios are reflections of contemporary knowledge, discourses, ambitions, and power relations (Avango et al. 2013). The fact that futures and scenarios can be used by various actors as tools to push their particular visions of what the future should ideally look like raises questions about who has power to partake in producing scenarios. In relation to responding to future challenges, there is a need to reflect on how we ‘story’ the environment, and how our stories determine our understanding and adaptation in practice (Svartstad and Qvenild forthcoming). How are risks defined, who is authorized as actors in the change debate, and what are the range of policy options considered (Paschen and Ison 2014)? An important, related observation regarding representation and under-representation of some groups in society came from the Bodø workshop, which had (only) one younger participant, a local youth politician. In Kirovsk, specific groups of society were represented, such as the biggest industrial enterprises, regional and municipal officials, researches and environmental organizations. However, here too certain representative groups were missing from the workshop setting, including mining company’s employees, students and others. Thus, an important step would be to conduct similar workshops with a more diverse group of people representative of the population. It would be especially relevant to involve youth, with regard to the narratives being descriptive of particularly their future. This depends also on the framing of the process: are the participants part of a research activity, or do they have a chance to contribute to local politics and a decision making process in developing their own (regional and sectoral) future? Selecting from a larger and more diverse pool of participants would also avoid the additional risk of stakeholder fatigue (often the same people are asked to participate in the same type of events in different projects).

Other steps forward relate more to the methodology. For example, some of the factors identified as relevant for future challenges could be further studied using quantitative methods. This might be especially relevant for the demographic dynamics. For the global scenarios, there is a vision to develop integrated assessment

models. While this may be more challenging at the local level due to the resources needed for such work, a focus for future research could be to develop methods that better integrate narrative- and quantitative scenario approaches. A third line of further research is to link the future-oriented scenarios with studies of the history of the region. This has great potential in better understanding both path dependencies and trigger points for change in development direction. Thus, both historic- and future scenario studies could inspire efforts to think beyond the present.

These workshops provide some lessons learned that can be useful for further use in these locations. First, the discussions and local narratives generation not take place in a vacuum. They are very much time specific. The current economic, political and social context that influences people's everyday life will likely be important in how the scenarios unfold. One way to prepare for this can be for the facilitators to look at the local newspapers and ask for some local context ahead of the workshop. Second, scenario building is often linked to climate change, but the workshop approach rooting the scenarios in socio-economic pathways rather than climate pathways highlights the perhaps obvious, that not only climate change is important to northern communities and people. Third, given the time and participant dependent nature of the narratives, participation in the workshops, communication and mutual learning, is more important than the actual narratives stemming from the scenarios. The process increases awareness of how climate and socio-economics across scales (from global to local) are connected. Finally, it is important to reflect on the process of clustering the issues. This is not a neutral and straightforward exercise. Rather, it is based on world-views, and ways to structure the world, which differ from person to person. Accordingly, an alternative approach that could even better highlight the meaning of clusters and ideas that they contain, is to have the clustering done by workshop participants, including some reflection about "why" certain clusters end up as they do.

Our findings fit well with the growing body of literature on the importance of participatory knowledge production. If only scientific knowledge is used to inform local decision-making, two problems arise: 1) Important and relevant knowledge is overlooked, and 2) it is a democratically problematic to exclude the public from matters of general concern.

Workshops add value when compared to interviews and surveys because interactions between participants can encourage the generation of new ideas and insights beyond individual contributions. Ideally, a workshop provides a platform for social learning in which the participants re-evaluate earlier standpoints in ways that also affect their behavior – for example, when making decisions in relevant planning processes – even if such changes of opinion would likely require a longer process rather than participation in a single workshop. Interviews and surveys require less time from the participants and allow for the gauging of some of our own assumptions before going into the actual workshop. However, scenario planners often emphasize the value of the process as much as the value of the end-product (building scenarios, impacts assessments, identified strategies, assessed strategies etc.; e.g. Kok et al. 2007). Especially this latter finding favors a workshop setting, where complementary surveys and interviews can extend the process beyond a single event, increasing the chances of the exercise becoming useful for the participants.

4.3 Take home message

Scenarios raise awareness about the linkages between socio-economic and climatic issues and linkages across global, national and local relations. They highlight the relative importance of socio-economic developments and climate change in terms of local consequences, and they highlight the uncertainties of future developments as well as the need to place change and pro-active decision making on the local agenda. To this end, participation – and not the narratives themselves - is the most important asset of these workshops.

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7 Appendices

The following appendices contain the background documents and information for the two workshops:

- Appendix A: Kirovsk WS Organizing Committee
- Appendix B: Kirovsk WS introduction – stage setting presentations
- Appendix C: Kirovsk WS participant list
- Appendix D: Reflections on the Kirovsk workshop
- Appendix E: Bodø workshop invitation
- Appendix F: Bodø participant list
- Appendix G: Reflection on Bodø workshop
- Appendix H: Description of the 4 global scenarios used in the workshops
- Appendix I: Instructions for workshop facilitators

Appendix A: Kirovsk WS Organizing Committee

Chair:

Masloboev V.A. doctor of science.	Institute of Industrial Ecology Problems in the North KSC RAS, Apatity
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Members:

Klyuchnikova E.M.	Institute of Industrial Ecology Problems in the North KSC RAS, Apatity
Isaeva L.G.	Institute of Industrial Ecology Problems in the North KSC RAS, Apatity
Alieva T.O.	Luzin Institute for Economic Studies KSC RAS, Apatity
Ivanova L.V.	Luzin Institute for Economic Studies KSC RAS, Apatity
Kharitonova G.N.	Luzin Institute for Economic Studies KSC RAS, Apatity
Bay-Larsen I.	Nordland Research Institute, Bodo (Norway)

Appendix B: Kirovsk WS introduction – stage setting presentations

ENVIRONMENTAL AND ECONOMIC CONSEQUENCES OF CLIMATE CHANGE FOR THE BARENTS REGION

V.A. Masloboev, Vice Chairman of the Kola Science Centre, Director of the Institute of North Industrial Ecology Problems, KSC of RAS

The frequent confusion is that "climate change is a purely environmental issue that is not related to practical economic priorities and actions." In fact, in the current century global climate change has a tremendous impact on the society and the economy development, including productivity reduction in agriculture and forestry, increasing risks of water shortages, more frequent extreme weather phenomena, destruction of the fragile Arctic ecosystems, increasing risks of ill health and many more. The Arctic regions are particularly vulnerable to the impacts of climate change due to:

- Extreme nature and climatic conditions;
- Fragile ecosystems;
- Isolation from major economic and political centers of the country;
- Poorly developed transport and communications infrastructure as a whole;
- Population's greater sensitivity to changes in the environment and less adaptive capacity of organisms; The linked environmental problems and other factors.

At the same time, a feature of the Russian Arctic, in comparison with other countries of the region is in much greater population and a much greater involvement of its resources into the economy. Consequences of climate change can be both positive and negative:

Positive: development of the Northern Sea Route and development of oil and gas fields on the Arctic seas shelf; reduction of the heating season; improving comfort of living conditions in the sub-polar regions; growth of the potential for wind and solar energy; an increase in the vegetation period, etc.

Negative: complicated ice conditions, limiting development of the Northern Sea Route and mineral extraction on the shelf; erosion and flooding of coastal areas; destruction of the infrastructure due to melting permafrost; spread of dangerous infectious diseases; growth of meteo-pathological reactions of the population, etc. The peculiarity of the Russian Arctic is that the environment gets a double shock:

climate change + pollution of the atmosphere, marine and fresh waters, and soils.

The main criteria for environmental safety in the Arctic are:

1. High quality of the environment providing health of the population living here.
2. High biological productivity, providing needs of the population in self-renewable valuable protein and other food products.
3. Stable operation of water and related ecosystems, ensuring their biodiversity, and the ability to self-control and self-purification.
4. Environmental and aesthetic attractiveness of natural complexes (recreational areas), ensuring the needs of the population in recreation, education and spiritual enrichment.

Surface waters are at the forefront among natural resources of the Arctic. Lakes and rivers largely determine economic and social development of the northern regions, are closely linked to the cultural heritage of the indigenous peoples and are an integral part of their living environment. Unfortunately, in the past decade the following negative trends in changes of Subarctic freshwater ecosystems began:

- Increasing water toxicity, accumulation of pollutants in ecosystems;
- Changing trophic status of water basins;
- Changes in seasonal bio-geochemical cycles as a result of increasing instability of the climate and ecological systems;
- Changing direction and speed of successions;
- Reducing sustainability and stability of aquatic ecosystems.

The main reasons are the synergistic effects of global and regional environmental pollution against the background of global climate change.

Analysis of the possible development scenarios shows that climate change in the Barents Region happens and brings not only economic benefits, but also significant challenges, including environmental ones. For a successful planning and implementation of the measures on development of the Barents region as a whole and the Arctic zone of the Russian Federation it is necessary to record ecological and economic effects of climate change at all levels of the planning of socio-economic development of the region.

INTRODUCTION OF THE ALTERNATIVE ENERGY IN THE REINDEER BASES OF THE MURMANSK REGION FOR ADAPTATION TO CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

I.V. Vdovin, Director "Directorate of Nature Protected Areas of the Murmansk region"

Climate change destroys the traditional lifestyle of the indigenous population of the Kola Peninsula. Global warming adversely affects the main activity of the Sami – reindeer herding. In September - October reindeer move from pastures located on the coast of the Barents Sea inland of the Kola Peninsula. Since mid-December herders move reindeer herds to the village of Lovozero, where a slaughter point is located and reindeer are slaughtered there.

The period of reindeer meat provision before around 1995 was one month from mid-December to early January. Water bodies had time to freeze and for a short period, all the reindeer herds arrived to Lovozero. However, in recent years winters became warmer, for this reason, the rivers of the Peninsula began freezing late. As a result, collection of reindeer grazing in the tundra and moving them to places of counting and slaughter is delayed by several months. Animals cannot cross water obstacles on thin ice. They have to wait for frost, because of what slaughter time shifts, and now it takes a period from late December to mid-March. Due to the increase in time of moving reindeer herds to the point of slaughter animals lose up to 20% of the weight and get numerous injuries. In addition, spring – is the calving time, and if female reindeer this time have to move from one place to another, they lose their offspring. It threatens the future infertility and loss of productivity of the herd.

The problem could be solved by making mobile slaughters directly in the remote areas of grazing animals. This requires access to electricity. "Directorate of protected areas of the Murmansk region" together with the farm "Tundra" designed a slaughterhouse operating with 4-5 wind power plants and a refrigerator where the meat is stored until winter, when it can be transported to the mainland by snowmobiles.

Funding for the pilot project was provided by the international corporation "NEFCO", and in 2014 reindeer base "Polmos" was equipped with a wind-power plant. At present a mobile slaughter house has not been equipped yet, but herders already feel that they are not separated from the benefits of civilization, even when they are in the tundra.

CLIMATE CHANGE OBSERVED ON THE KOLA PENINSULA

A.R. Antsiferova, E.D. Siekkinen, S.B. Nozhenkova "Murmansk Department on Hydrometeorology and Environmental Monitoring"

On the Kola Peninsula the first regular meteorological observations began in 1843 on the White Sea coast, near the mouth of the river Ponoy at the lighthouse Terskiy - Orlovskiy. Regular meteorological observations over a long period make it possible to objectively evaluate the ongoing climate change. The results of the study of climate change on the Kola Peninsula indicate continued warming. An increase in average air temperature on the Kola Peninsula is higher than the average in the Russian Federation. Among ten warmest years for almost 80 years of observations there are 5 years of the XXI century. As shown in Figure 1 for the period from 1976 to 2014 the average annual temperature on the Kola Peninsula grew at the rate of 0,6 °C for 10 years.

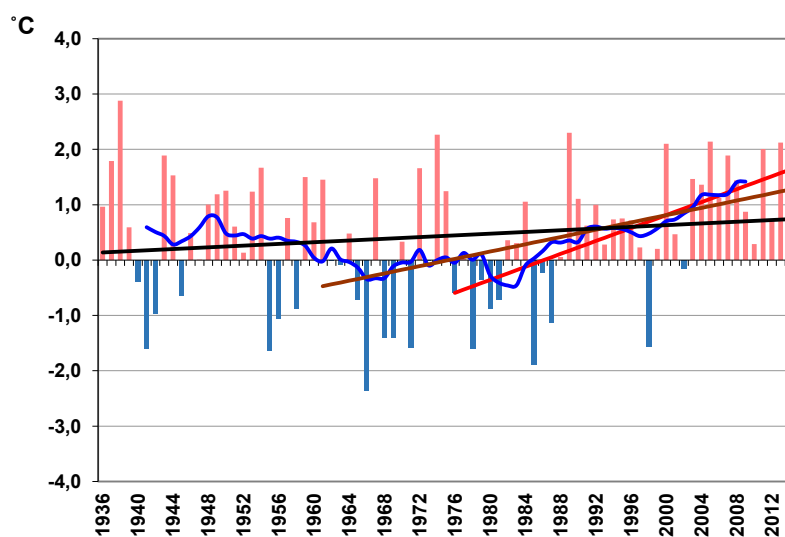


Figure 1 shows anomalies in the average annual (January-December), temperature (°C), averaged over the Kola Peninsula for the observation period from 1936 to 2014. The curve corresponds to the 11-year moving average. Straight lines show linear trends for the periods of 1936-2014, 1961-2014, and 1976-2014.

The maximum increase in the average temperature is noticed in winter in the west and southwest of the Kola Peninsula. It should be noted that in recent years the intensity of increasing average temperature went down. Since the mid-seventies of the last century, there is a trend of increase in the frequency of days with maximum air temperature extremes and decrease in the number of days with minimum temperature extremes. The Murmansk region is an area with abundant moisture. The average annual precipitation is about 500 mm. In summer months, precipitation is 2-2.5 times higher than in winter.

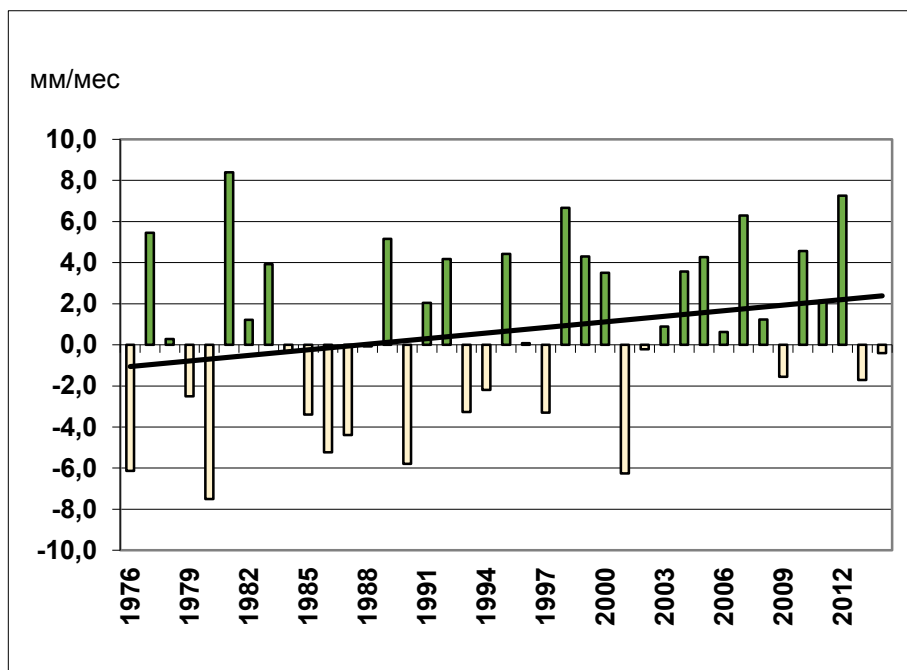


Figure 2 shows the spatially averaged annual precipitation anomalies for the observation period from mid-70s of the last century to 2014.

On average, annual precipitation increase on the Kola Peninsula is not significant with 1 mm/month for 10 years. Precipitation increases in spring and autumn at 2 and 3 mm / month for 10 years, respectively. And it remains unchanged in winter and summer. The number of days with extreme precipitation in recent decades also increases in autumn and spring seasons.

Increased precipitation results in increased water in basins of the Murmansk region. The air temperature increase on the Kola Peninsula would seem to contribute to an increase in evaporation. However, analysis of observations of evaporation from water surfaces shows a decrease in evaporation.

One of the negative manifestations of global warming is the increase in the frequency of hazardous hydro-meteorological events. On the Kola Peninsula the most frequent dangerous phenomenon is strong wind. Strong wind is noted in the northern part of the Murmansk region and mainly during the cold season. E.g., in February and March of 2015 there were 18 days in each of the months with stormy winds, and on the coast of Murman - 25 and 26 days respectively, that is nearly twice more than the historical averages.

IMPACT OF THE CLIMATE CHANGE ON THE FOREST ECOSYSTEMS OF THE KOLA PENINSULA

L.G. Isaeva, Head of Laboratory, Institute of North Industrial Ecology Problems, KSC of RAS

New species and new disorders

Climatic impacts on forests are often negative, up to weakening and destruction of forest plantations. To date, the dominant cause of forest destruction in Russia are forest fires, losses of forests due to adverse weather conditions are also very significant.

On the territory of the Barents Region the possible consequences of global climate processes are the dissemination to the North of unusual for these latitudes insects, including pests and carriers of associated with them pathogens: in recent years a number of migratory species of Lepidoptera revealed in the north of the Ugra Peninsula - in typical tundra (the settlement of Amderma) and the arctic tundra islands of Vaigach and Kolguev; the results of long-term ecological and epidemiological monitoring in the European subarctic within the northern boundary of taiga tick (*Ixodes Persulcatus*) habitat – carriers of tick-borne encephalitis have shown that in the Arkhangelsk region there have been recorded a significant rise in the incidence (almost 60 times) in the period 2000-2009 compared to 1980-1989. Increasing average temperatures determine the spread of ticks to the North.

In the Murmansk region today climate change is most evident at the northern border of the forest: climbing of tree and shrub vegetation up the slopes of the mountains in the forest-forest tundra-tundra (Murmansk region, the islands of Vaigach and Kolguev Polar Urals); activities of causative agents of forest diseases (Murmansk region); the condition of the forests is influenced by strong winds causing windfalls and windbreaks, excessive falls of wet snow result in snow breaks and icing of trees and shrubs; phenological phases change, for example, an active fruiting of willows and other plants was noticed.

Appendix C: Kirovsk WS participant list

Name	Organization, position
Tatyana V. Russkova	The Ministry of Economic Development of the Murmansk Region/The First Deputy Minister
Svetlana G. Makeenko	The Ministry of Economic Development of the Murmansk Region/Head of the Department of Strategic Planning
Renata I. Khardikova	The Ministry of Natural Resources of the Murmansk Region/Consultant of the Department of environmental protection
Ivan V. Vdovin	The Directorate of regional nature protected areas of the Murmansk region/
Elena D. Siekkinen	Murmansk Department of State Meteorological Service/Head of the Department
Elena V. Kislitsyna	The municipality of Apatity/Head of the Department of Economic Development
Anton V. Tourtanov	JSC "Apatit"/Head of the Department of Environmental Protection
Mikhail Yu. Jakimov	Kolskaya Nuclear Power Station/Deputy head of the Technical Department
Anatoly A. Dambrovskiy	JSC "Kolskaya MMC"/Deputy head of the Department of Environmental Safety
Vladimir A. Zadvorny	JSC "Kolskaya MMC"/Head of the Monitoring Department
Anatoly M. Gloushkov	The Northern Chamber of Commerce/President
Andrey E. Ilyin	The Northern Chamber of Commerce/Vice-President
Victor N. Petrov	Kolskiy Centre for Wild Nature Protection
Vadim A. Likhachyov	Kolskiy Centre for Wild Nature Protection
Svetlana S Touinova	Kolskiy Environmental Centre/ volunteer
Elena N. Krouglukova	Kolskiy Environmental Centre
Margarita Pukhova	The Barents Department of WWF Russia / Project coordinator
Vladimir A. Masloboev	Kola Science Centre / Vice-Chairman, Director of INEP KSC RAS
Ludmila G. Isaeva	INEP KSC RAS/ Head of the Department of Terrestrial Ecosystems
Elena M. Klyuchnikova	INEP KSC RAS/ Head of the Sector of International Cooperation
Tatyana V. Malysheva	INEP KSC RAS/
Galina N. Kharitonova	IES KSC RAS/ Head of sector
Tatyana E. Alieva	IES KSC RAS/ senior researcher
Ludmila V. Ivanova	IES KSC RAS/ senior researcher
Tatyana K. Vlasova	The Institute of Geography of RAS/ senior researcher
Vladimir A. Kotelnikov	Technopark - Apatity/ Director
Ingrid Bay-Larsen	University of Norland/ Dean of the Faculty of Sociology
Maiken Bjørkan	University of Norland/ Researcher

Appendix D: Reflections on the Kirovsk workshop

Anatoly Dambrovskiy, Deputy Head of the Department of Environmental Safety, JSC “Kolskaya Mining and Metallurgical Company”, Monchegorsk

1. **Did the workshop influence your vision of the Murmansk region’s future?**
Yes, it did.
2. **Will the information obtained during the workshop be taken into consideration (used) in your work?**
50/50. Forecast vision is good but everyday activities are based on the existing regulations.
3. **In your opinion, which form of work is the most efficient: lectures of experts, “brain storming”, or group work?**
All forms are efficient.

Andrey Ilyin (Vice President, the Northern Chamber of Commerce): It would be good to make a presentation based on the workshop materials at the International Conference “The Mining Industry in the Barents Euro-Arctic Region: View to the Future 2015” Group work seems more efficient.

Elena Siekkinen (Head of Murmansk hydro-meteorological center): Thank you for the invitation to the workshop. I have not participated in such events before. It was very interesting and informative to work in the proposed format.

For me as a person related to short-term forecasting it was not so easy to immediately switch to long-term forecasting. No doubt that the workshop influenced the vision of the Murmansk region’s future.

An especially striking was the almost unanimous opinion of the participants that outmigration of young people from the Kola Peninsula will continue. It is difficult to say about a possibility of using the information obtained in the future work, but no doubt that the workshop will be remembered.

In my opinion, the group work was the most productive. This form of interactions seems better for people to hear each other.

Appendix E: Bodø workshop invitation

UNIVERSITETET I NORDLAND
25. august 2015

*Aktører knyttet til olje og gass, fiskeri og havbruk kommer.
Vi dekker kostnadene for reise og opphold
Samme workshop er holdt i Sverige og Russland. Nå er et Bodø sin tur!*

Klimaendringer og konsekvenser for kystsamfunn

Det snakkes mye om klimaendringer og hvordan de vil påvirke oss i fremtiden. Det eneste vi vet helt sikkert, er at det er mye usikkerhet knyttet til klimaendringer. Vi påvirkes alle av verdensmarkedet og geopolitikk, og hvis vi i tillegg endrer tidshorizonten til å gjelde de neste 30-50 år frem i tid – ja da er det meste usikkert. Samtidig vet vi at viktige valg som påvirker morgendagen tas hver dag. Kostnaden ved å ta gale valg kan bli høy når vi snakker om bærekraft i ulike sektorer. En måte å redusere usikkerheten på er å få oversikt over dagens utviklingstrekk – eller scenarier – og hvilke verdier vi ønsker å ivareta. Disse kan bli nyttige for lokale og regionale beslutningstakere.

Dette er bakteppe for at vi nå inviterer deg til å delta i en prosess hvor vi skal utvikle ulike scenarier som er relevant for vår region, Nordland. Basert på kunnskap, erfaringer, ønsker og bekymringer til dere som bor og arbeider i regionen, skal vi diskutere innvirkningene (positive og negative) som det globale og regionale kan ha lokalt. Det overordnede spørsmålet for workshopen er: *Hvilke fremtidige endringer vil påvirke Nordland økonomisk, sosialt og miljømessig de nærmeste 30-50 årene?*

Workshopen vil foregå på norsk og det er god anledning til å komme med innspill og ideer. Workshopen er en del av prosjektet «Adaptation Actions for a Changing Arctic».

PROGRAM

- 08.30 – 09.00 Kaffe og registrering**
- 09.00 – 09.15 Velkommen og introduksjon til dagen**
Annika Nilsson, SEI Ingrid Bay-Larsen, NF
- 09.15 – 10.15 Lokale og regionale perspektiver**
Presentasjoner ved Celine Rebours; Bioforsk, Harald Jensen, kystfisker; Jan Wasmuth, Bodø Kommune.
- 10.15 – 10.45 Drivere i nordlige kystsamfunn**
- 10.45 – 11.30 Stemmegivning – usikkerhet og viktighet**
- 11.30 – 12.30 Lunsj**
- 12.30 – 12.45 Oppsummering og intro til gruppearbeid**
- 12.45 – 14.30 Gruppediskusjon -lokale perspektiver på globale endringer**
- 14.30 – 14.45 Kaffe**
- 14.45 – 15.30 Presentasjon av scenarier fra hver gruppe**
- 15.30 – 16.00 Oppsummering og avsluttende kommentarer**
Annika Nilsson, SEI Ingrid Bay-Larsen, NF

Vi inviterer til middag kl. 18 på Bjørk i Bodø sentrum

Appendix F: Bodø participant list

Name	Organization, position	Group work:
Anders Skogheim	Kystfisker, Steigen	
Anna Hultgren Olsen	Fiskeriparken Vesterålen	Fossil-drevet utvikling
Annika Nilsson	Forsker	Fossil-drevet utvikling (Ordstyrer)
Anniken Nylund Aasjord	Seniorrådgiver Kystverket	Regional rivalisering
Asgeir Johan Jordbru	Bodø Kommune Miljø	Regional rivalisering
Bente Lorentzen	Leder Folkeaksjonen mot olje og gas i LoVeSe	Regional rivalisering
Bente Åsjord	Fagforbundet/skribent	Fossil-drevet utvikling
Bob van Oort	Forsker	Bærekraft (Ordstyrer)
Celine Rebourse	NiBio	Bærekraft
Erlend Skaug Ingebrigtsen	Ungdommens FK	Ulikhet
Grete Hovelsrud	Forsker	
Harald Jensen	Rekefisker	Ulikhet
Heidi Meland	KIG (Kunnskap og Opplæring)	Ulikhet
Ingrid Bay Larsen	Forsker	Ulikhet (Ordstyrer)
Jan Arild Jensen	Senioringeniør Kystverket	Regional rivalisering
Jon Fuglestad	AMAP sekretariatet	Bærekraft
Kirsti Jylhä	Forsker	Bærekraft
Lize-Marie van der Watt	Forsker	Bærekraft
Maiken Bjørkan	Forsker	Regional rivalisering (Ordstyrer)
Marianne Kroglund	Miljødirektoratet	Ulikhet
Solfrid Henriksen	Salten Akva	Fossil-drevet utvikling
Svein Einar Stuen	Fylkesmannen i Nordland	Fossil-drevet utvikling
Ørjan Wendberg		Fossil-drevet utvikling

Appendix G: Reflection on Bodø workshop

- Workshop demonstrated the importance of different regional and local contexts
- Participants were especially interested in the methodology
- Value of the method for stakeholder/ rights-holder integration
- Transparency of method important
- Youth involvement useful

The workshop was wrapped-up by both oral and written evaluations to give a general impression of the workshop.

In general these group discussions were perceived as creative and fun, and generated rich material, which we have summarized in tables for each of the workshops and for each of the global contexts.

Table: summary of most important drivers comparing three workshops held in this project

	Pajala	Kirovsk	Bodø
1	Climate change	Ecosystem services	Energy /petroleum
2	Local-national power relations	Demography	Climate
3	International security	Mineral market	Demography
4	Ecosystem services	Changing reserves of mineral resources	Business structure
5	Ideology/values	Technology	Global economy
6	Energy market	Ideology/values	New conflicts
7	Material market	Climate change	Knowledge/competence
8	Demography	International security	Local politics
9	Raw material market	Cultural diversity	International security
10	Entrepreneurship	Morbidity (?)	

Narrative of potential futures based on the results from the group discussion were edited for consistency in format and then presented via e-mail to the workshop participants with a request for comments. The round of comments on the narratives provide one more opportunity for bottom-up input and also helps ensure that the local and regional actors remain engaged in the scenario process.

Reflection on scenario method

Discussion on method issues

- Participants and getting the “right people” to attend
- Influence of facilitators
- Importance of clustering

- Importance of locality
- Renaming the global SSPs with neutral names
- Possibilities to compare across workshops
- The method's strengths in facilitating engagement across sectors
- Pinning down scale in small-group discussions
- Expense of method
- Importance of local coordinator with social capital, and ethics around social capital
- Stakeholder fatigue and the necessity to compensate some stakeholders for their time
- Density of global narratives

Discussion on common themes

- Have exercise caution when comparing across clusters – there are nuances in understanding
- Process not necessarily designed to be scaled up
- Remarkable diversity
- Need for transparency regarding methodology
- Some trends and remarks
 - Importance of demography
 - Local-regional-national power balance issue in Bodø (and Pajala: see Nilsson et al., 2015), not Kirovsk
 - International security featured prominent on lists, not in small group discussions

Appendix H: Description of the 4 global scenarios used in the workshops

The global scenarios as distributed before and during the workshops are taken directly from their original source, O'Neill et al. (2015).

Fossil-fueled Development – Taking the Highway

Driven by the economic success of industrialized and emerging economies, this world places increasing faith in **competitive markets, innovation and participatory societies** to produce **rapid technological progress and development of human capital as the path to sustainable development**. **Global markets are increasingly integrated**, with interventions focused on maintaining competition and removing institutional barriers to the participation of disadvantaged population groups. There are also **strong investments in health, education, and institutions to enhance human and social capital**. At the same time, the push for economic and social development is coupled with the **exploitation of abundant fossil fuel resources** and the adoption of **resource and energy intensive lifestyles** around the world. All these factors lead to **rapid growth of the global economy**. There is faith in the ability to effectively manage social and ecological systems, including by **geo-engineering** if necessary. While local environmental impacts are addressed effectively by technological solutions, there is relatively **little effort to avoid potential global environmental impacts** due to a perceived tradeoff with progress on economic development. **Global population peaks and declines** in the 21st century. Though **fertility declines rapidly in developing countries, fertility levels in high income countries are relatively high** (at or above replacement level) due to optimistic economic outlooks. **International mobility is increased** by gradually opening up labor markets as income disparities decrease. The strong reliance on fossil fuels and the lack of global environmental concern result in potentially **high challenges to mitigation**. The attainment of human development goals, robust economic growth, and highly engineered infrastructure results in relatively **low challenges to adaptation** to any potential climate change for all but a few.

Sustainability – Taking the Green Road

The world shifts gradually, but pervasively, toward a more **sustainable path**, emphasizing more **inclusive development** that respects perceived environmental boundaries. Increasing evidence of and accounting for the social, cultural, and economic costs of environmental degradation and inequality drive this shift. **Management of the global commons slowly improves**, facilitated by increasingly effective and persistent cooperation and collaboration of local, national, and international organizations and institutions, the private sector, and civil society. Educational and health investments accelerate the demographic transition, leading to a **relatively low population**. Beginning with current high-income countries, the emphasis on economic growth shifts toward a **broader emphasis on human well-being**, even at the expense of somewhat slower economic growth over the longer term. Driven by an increasing commitment to achieving development goals, **inequality is reduced** both across and within countries. Investment in environmental technology and changes in tax structures lead to **improved resource efficiency, reducing overall energy and resource use and improving environmental conditions over the longer term**. Increased investment, financial incentives and changing perceptions make **renewable energy more attractive**. Consumption is oriented toward **low material growth and lower resource and energy intensity**. The combination of directed development of environmentally friendly technologies, a favorable outlook for renewable energy, institutions that can facilitate international cooperation, and relatively low energy demand results in relatively **low challenges to mitigation**. At the same time, the improvements in human well-being, along with strong and flexible global, regional, and national institutions imply **low challenges to adaptation**.

Inequality – A Road Divided

Highly unequal investments in human capital, combined with increasing disparities in economic opportunity and political power, lead to **increasing inequalities and stratification** both across and within countries. Over time, a **gap widens** between an internationally-connected society that is well educated and contributes to knowledge- and capital-intensive sectors of the global economy, and a fragmented collection of lower-income, poorly educated societies that work in a labor intensive, low-tech economy. **Power becomes more concentrated in a relatively small political and business elite**, even in democratic societies, while **vulnerable groups have little representation** in national and global institutions. **Economic growth is moderate in industrialized and middle-income countries, while low income countries lag behind**, in many cases struggling to provide adequate access to water, sanitation and health care for the poor. **Social cohesion degrades** and **conflict and unrest become increasingly common**. **Technology development is high** in the high-tech economy and sectors. Uncertainty in the fossil fuel markets lead to **underinvestment in new resources** in many regions of the world. Energy companies hedge against price fluctuations partly through **diversifying their energy sources**, with investments in both carbon-intensive fuels like coal and unconventional oil, but also low-carbon energy sources. **Environmental policies focus on local issues around middle and high income areas**. The combination of some development of low carbon supply options and expertise, and a well-integrated international political and business class capable of acting quickly and decisively, implies **low challenges to mitigation**. **Challenges to adaptation are high** for the substantial proportions of populations at low levels of development and with limited access to effective institutions for coping with economic or environmental stresses.

Regional Rivalry – A Rocky Road

A **resurgent nationalism, concerns about competitiveness and security**, and **regional conflicts** push countries to increasingly focus on domestic or, at most, regional issues. This trend is reinforced by the **limited number of comparatively weak global institutions**, with **uneven coordination and cooperation for addressing environmental and other global concerns**. Policies shift over time to become increasingly oriented toward national and regional security issues, including **barriers to trade**, particularly in the energy resource and agricultural markets. Countries focus on achieving **energy and food security goals within their own regions at the expense of broader-based development**, and in several regions move toward more **authoritarian forms of government with highly regulated economies**. **Investments in education and technological development decline**. **Economic development is slow, consumption is material-intensive, and inequalities persist or worsen** over time, especially in developing countries. There are pockets of extreme poverty alongside pockets of moderate wealth, with many countries **struggling to maintain living standards** and provide access to safe water, improved sanitation, and health care for disadvantaged populations. A low international priority for addressing environmental concerns leads to **strong environmental degradation** in some regions. The combination of impeded development and limited environmental concern results in **poor progress toward sustainability**. **Population growth is low in industrialized and high in developing countries**. Growing resource intensity and fossil fuel dependency along with difficulty in achieving international cooperation and slow technological change imply **high challenges to mitigation**. The limited progress on human development, slow income growth, and lack of effective institutions, especially those that can act across regions, implies **high challenges to adaptation** for many groups in all regions.

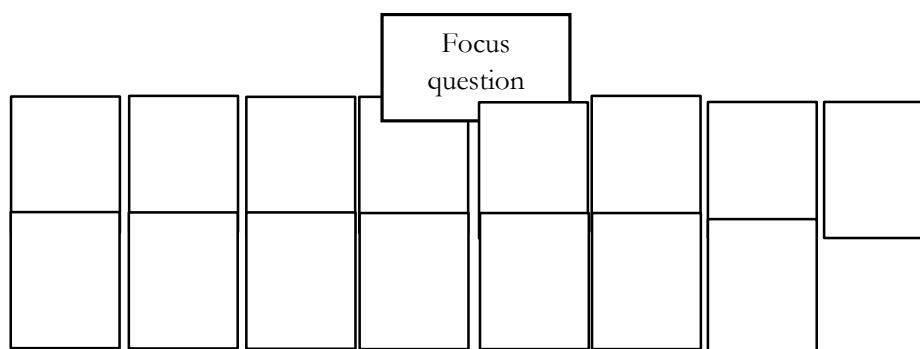
Appendix I: Instructions for workshop facilitators

By Henrik Carlsen 2015-06-02

This document gives instructions for facilitators of a “scenario building workshop”. The methodology for the workshop combines participatory approaches with information about the global context generated from on-going scenario work within the climate change research community. The methodology described here has been used in a workshop in Pajala, Swede 9-10 March 2015.

Preparations

This should of course be done before the participants arrive. Put up flipcharts on the biggest wall. Position the charts as shown below (close together):



As indicated in the figure above a dedicated flipchart for the focus question of the workshop should be placed above the rest of the flipcharts. It is preferable to put a blank flipchart above the focus question, a chart which is removed when introducing the focus question later.

The horizontal length of the working wall (i.e. the flipcharts) should be something like 4 meters. Put a number on each of the flipcharts (for later references).

Arrange the chairs with no tables and two half circles. If the power point presentations (which usually comes before the first participatory working session) is in another direction of the room there needs to be a short rearrangement.

Prepare sets of post-its (of 4 ovals; only two ideas (see below) but people sometimes need to restart writing) to each of the participants.

Prepare voting stickers for the participants. Each participant should have 5 voting notes in one color (called “X” below) and 5 in another color (“Y”) (for “Voting session”, see below). Prepare also a flipchart for voting. This chart has three columns:

No. of cluster and name	Number of votes for importance	Number of votes for uncertainty
1. Name of cluster 1		
2. Name of cluster 2		
3....		

Another task here is to prepare the group rooms. Each of the rooms should be assigned one scenario. Prepare approximately two flipcharts with information about the scenario in each room. These should be based on the “bold face” versions of the SSPs (see document “Global Scenarios”). These are for reminding the participants about the global world in which they are working. For instance, the room working with Fossil-Fueled development should have flipcharts with the following:

Fossil-fueled Development – Taking the Highway

- Competitive markets, innovation and participatory societies
- Rapid technological progress and development of human capital as the path to sustainable development.
- Global markets are increasingly integrated
- Strong investments in health, education, and institutions to enhance human and social capital
- Exploitation of abundant fossil fuel resources
- Resource and energy intensive lifestyles
- Rapid growth of the global economy.
- Faith in high-tech, e.g. geo-engineering
- Little effort to avoid potential global environmental impacts
- Global population peaks and declines
- fertility declines rapidly in developing countries, fertility levels in high income countries are relatively high
- International mobility is increased
- high challenges to mitigation.
- low challenges to adaptation

Introducing the workshop (approximately 10-15 minutes)

This is the session in which the working process around the scenario process is introduced. Apart from the information that has been sent out before the workshop, the participants cannot be assumed to know a lot of things about scenario planning, or the reasons behind we are doing scenario planning in this project. Hence this short talk (it should be short in order to save time for actual participatory work) need to:

1. Tell the stakeholders what it is all about;
2. Convince them about the advantages for using scenarios; and
3. Give them an overview of the scenario process in the workshop and after the workshop.

Some examples slides are provide in “PPT set no.1”.

Interactive session: Assessing uncertainty and significance (joint work) of drivers of change (1.15 – 1.30 h)

If necessary (see above) rearrange the room for the first interactive session. Remove the chart in front of the Focus question.

Now the real participatory work starts. The lead facilitator starts with explain the working rules:

“This is an exploratory session in which we are going to try to come up with ideas for drivers in relation to the focus question. In this session all ideas are equally valid; we do not critique or discuss the ideas here, that will come later. Ideas of drivers can of course be discuss if it is about understanding the driver, but not if it is important or not. You will first get the chance to think for yourself 5 -10 minutes and write down two ideas on post-its, one idea per post-it. Please write with capital letter and write so that we all can read.”

A facilitator hand out 4 ovals to each of the participants. Leave the participants to think and write. After approximately 10 minutes the lead facilitator asks one person at a time to come up and position the two ideas on the working wall. If the two first ideas are close to each other (i.e. that we already now can think they belong to the same cluster later on), place them close together. Then the lead facilitator asks the next person in line to come up and place his/her two ideas on the working wall. If any of the new ideas are close to any of the existing ideas, place them close together. In this way each participants place two ideas on the wall and the lead facilitator and the supporting facilitator tries – together with the participants – cluster on the move.

After this first round there is a wall with a lot of ideas for drivers, hopefully in some clusters. After this the lead facilitator says:

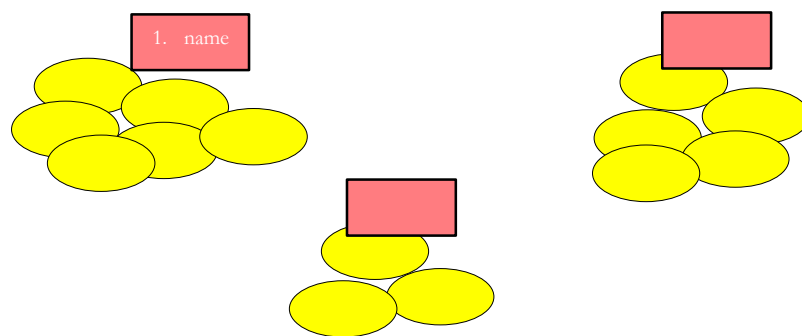
“OK, now that we have all these ideas, we might get inspired by them and probably we can generate more ideas. I will now ask you (one at a time) for more ideas and I will write them down on pots-its and position them on the wall.”

The lead facilitator asks one participant at a time. Here it is important that the supporting facilitator helps the lead with the clustering; the lead facilitator will be busy interpreting and writing down the ideas on pots-its. Of course this is done interactively with the stakeholders. The lead facilitator goes around the participants until there are no more ideas, or until run out of time.

Break (at least 30 minutes)

If possible it is good to have a longer break here, e.g. lunch or extended coffee for networking. The core team need this time for some work on the drivers.

The core group (facilitators and perhaps one or two from the stakeholders group) gather for revisiting the clusters and perhaps to some changes and modifications. When the core group agree on the clusters (perhaps 10 to 20 of them) they should be named. Put also a number in front of each of the cluster names. The wall should look something like this (more than 3 clusters in reality):



Voting session (appr. 30-40 minutes)

The lead facilitator starts this session with a presentation of all the clusters, their names and the reasoning behind them if there were some big changes in the work after the previous session. The lead facilitator then says:

“We cannot work with all those drivers and therefore we need to prioritize among them. This we are going to do in two dimensions. First, we would like to focus on those drivers that are important in relation to the focus question. Second, we would like to focus on those drivers that are uncertainty, i.e. those drivers for which you assess the future development is very uncertain. You will now get 10 voting stickers each, five in color X and five in color Y. Color X represent

importance and color Y represent uncertainty. You should now place your stickers on the clusters (not individual drivers). You can divide your votes among more than one cluster, or put all five in any of the colors on one cluster; it's up to you."

Participants then go up to the wall and place there stickers.

When the voting is over the facilitator sum the number of votes in the two dimensions and fill in the flipchart prepared in accordance with the description above. This gives the drivers toplist.¹ In the following the groups will work with the 8 most important drivers in the group work. Scenario building is also about prioritizing the uncertain drivers. Therefore in this stage of the process some flexibility needs to be used: if there are some drivers which are not that important but very uncertain one could opt for including those in the list of the drivers that is going into the group work.

The supporting facilitator produces four copies of the 8 drivers that are the focus of the group work.

Introduction to group exercise: Future worlds – future regions (20 min)

In this session the perspective from the local to the global is introduced, see “PPT set no.2.”

Group work (2h)

Each of the four groups will work in one of the four global context scenarios:

- Regional Rivalry
- Sustainability
- Fossil-Fueled Development
- Inequality

The global scenarios here enter the work as a “boundary condition” for the local development. The task for group work is to interpret the regional developments for each of the prioritized drivers in relation to the scenario they are working in. The group work facilitator for group Y asks: “How could driver X play out at the regional scale in a world as the one described by scenario Y?”

The group work like this:

	Regional Rivalry	Sustainability	Fossil-Fueled Dev.	Inequality
Driver X	Interpretation of driver X given the context described in the scenario Regional Rivalry	Interpretation of driver X given the context described in scenario Sustainability
Driver Y:	Interpretation of driver Y given the context described	...		

¹ If time permits, the result could also be positioned in an importance/uncertainty diagram with two axes.

	in the scenario Regional Rivalry			
Driver Z:	...			
....	...			

Note that this is the summary table; each group only work with one scenario.

The working process of the group work is as follows:

1. The group gets 15 minutes for reading the summary of the scenario they work in (print outs).
2. The group facilitator goes through the summary of the scenario on the flipcharts; short discussion about the scenario.
3. Starting with driver X, the facilitator asks the group (not each individual) about how this driver might play out given the context as described in the scenario. The facilitator takes down this on post-its.
4. Then take next driver, etc. for each of the eight drivers.

With this as a basis, the group starts to work with the interactions of the drivers as interpreted in the scenario. This is the stage when the dynamical interplay – given a global context provided by the scenario – between the locally derived drivers is starting to evolve. At this stage it could also be valuable to introduce a time line for important event from now until two generations into the future.

Reporting and conclusion of the workshop (1h)

Each group is requested to report back on the work on connecting the local to the global.

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